

U.S. DEPARTMENT OF COMMERCE

+ + + + +

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

+ + + + +

VIRTUAL PUBLIC MEETING

+ + + + +

WEDNESDAY
SEPTEMBER 23, 2020

+ + + + +

The Hydrographic Services Review Panel
met via webinar at 1:00 p.m. EDT, Ed Saade,
Chair, presiding.

HSRP MEMBERS PRESENT

EDWARD J. SAADE, HSRP Chair
JULIE THOMAS, HSRP Co-Chair
DR. QASSIM ABDULLAH
CAPTAIN ANUJ CHOPRA
SEAN M. DUFFY, SR.
DR. NICOLE ELKO
LINDSAY GEE
EDWARD J. KELLY
CAPTAIN ANN KINNER
DR. DAVID MAUNE
CAPTAIN ANNE MCINTYRE
CAPTAIN (ret. USCG) ED PAGE
CAPTAIN SALVATORE RASSELLO

GARY THOMPSON

NON-VOTING HSRP MEMBERS

**ANDY ARMSTRONG, Co-Director, UNH-Joint
Hydrographic Center**
**JULIANA BLACKWELL, Director, National Geodetic
Survey, NOS**
**RICH EDWING, Director, Center for Operational
Oceanographic Products and Services, NOS**
**LARRY MAYER, Center for Coastal and Ocean
Mapping and Co-Director, UNH-Joint
Hydrographic Center**

NOAA LEADERSHIP PRESENT

**REAR ADMIRAL SHEP SMITH, HSRP Designated Federal
Official; Director, Office of Coast
Survey, NOS**
**NEIL JACOBS, Ph.D., Assistant Secretary of
Commerce for Environmental Observation and
Prediction, performing the duties of Under
Secretary of Commerce for Oceans and
Atmosphere**
**NICOLE R. LEBOEUF, Acting Assistant
Administrator, NOS**

NOAA STAFF PRESENT

**VIRGINIA DENTLER, Center for Operational
Oceanographic Products and Services**
LYNNE MERSELDER-LEWIS, HSRP Coordinator
PAUL TURNER, Office of Coast Survey

C-O-N-T-E-N-T-S

HSRP Member Welcome and Roll Call.	4
Opening and Introductions	
Rear Admiral Shepard M. Smith.12
Ed Saade, HSRP Chair23
Nicole R. LeBoeuf.28
Dr. Neil Jacobs.37
The Honorable Don Young.49
Flash Updates: Opportunities and Challenges for NOS's Navigation Services Portfolio	
Nicole R. LeBoeuf.52
Capt. (NOAA, ret.) Andy Armstrong.53
Richard Edwing63
Juliana Blackwell.76
RDML Shep Smith	
Discussion of the Implementation Plans for Two Ocean and Coastal Mapping Strategies: MONEC and ACMS	
Ed Saade	106
RDML Shep Smith.	106
Paul Turner.	123
Juliana Blackwell.	128
Public Comment	147
Recap and Round Robin with HSRP Members and NOAA Leadership	
	164

1 P-R-O-C-E-E-D-I-N-G-S

2 12:48 p.m.

3 CHAIR SAADE: Okay. We are going to
4 officially kick off the September 23rd, 2020 HSRP
5 meeting virtual. I'll go ahead and start the
6 meeting.

7 I'm Ed Saade. I'm the President of
8 Fugro USA, and I am also the co-chair of the
9 HSRP. Member bios are in the advanced materials
10 on the web, and we'll go ahead and dispense with
11 reading speaker bios at this time.

12 I'm inviting the HSRP members and the
13 Office Directors and NOAA leadership to do very
14 short intros. So could you please provide your
15 name, your organization, and job title as we go
16 through the list alphabetically by last name?
17 And we will start with Dr. Qassim Abdullah.

18 MEMBER ABDULLAH: Hello, everyone. My
19 name is Qassim Abdullah. I'm Vice President and
20 Chief Scientist with Woolpert. I'm wearing the
21 hat of academia. I teach at Penn State and UMBC.
22 I'm located in Washington, D.C. area. I report

1 to our office in Arlington, Virginia. I will be
2 looking forward to a full discussion with all of
3 you.

4 CHAIR SAADE: Thanks, Qassim.

5 Next up is Captain Anuj Chopra.

6 MEMBER CHOPRA: Thank you, Ed. Thank
7 you very much. Good morning, good afternoon to
8 all of you. My name is Captain Anuj Chopra. I'm
9 Vice President of Americas for RightShip. I'm
10 privileged to lead the Americas team for the
11 hemisphere. I'm based out of Sugarland, Texas.
12 Thank you.

13 CHAIR SAADE: Thank you. Sean Duffy,
14 you're up.

15 We'll come back to Sean. And next up
16 is Dr. Nicole Elko.

17 Okay. We'll come back to Nicole.
18 Next up is Lindsay Gee.

19 MEMBER GEE: Thanks, Ed. My name is
20 Lindsay Gee. I'm the manager of mapping and
21 science operations for the Ocean Exploration
22 Trust. I'm currently in New Hampshire supporting

1 Exploration Vessel Nautilus. It's offshore
2 Washington coast right now.

3 CHAIR SAADE: Thanks, Lindsay.

4 Ed Kelly. You're muted.

5 MEMBER KELLY: Good afternoon. Now
6 I'm unmuted. My name is Ed Kelly. I'm the
7 Executive Director of the Maritime Association of
8 the Port of New York and New Jersey. We act as a
9 Marine exchange tracking all vessel operations
10 and data, and we represent the advocacy for the
11 commercial and industrial maritime industry in
12 the northeast area. Thank you very much.

13 CHAIR SAADE: Thanks, Ed.

14 Captain Ann Kinner, you're next.

15 MEMBER KINNER: Good morning. I'm
16 Captain Ann Kinner, owner of Seabreeze Books and
17 Charts in San Diego, and I'm also Chair of the
18 San Diego Harbor Safety Committee.

19 CHAIR SAADE: Thanks, Ann.

20 Dave Maune.

21 MEMBER MAUNE: Hi. I'm Dr. Dave Maune
22 with Dewberry Engineers headquartered in Fairfax,

1 Virginia. I'm an Associate Vice President there
2 and specialist in remote sensing.

3 CHAIR SAADE: Thanks, Dave.

4 Captain Anne McIntyre. You might be
5 muted, Anne. Anne, can you hear us? I can see
6 you.

7 MS. DENTLER: Anne, it looks like
8 you're self-muted.

9 CHAIR SAADE: Go ahead, Anne. We'll
10 come back to Anne.

11 Captain Ed Page. I don't see Ed on
12 the list yet.

13 MEMBER PAGE: I'm muted. Okay. Hi,
14 Ed Page. I'm Executive Director of the Marine
15 Exchange of Alaska located in Juneau, Alaska.
16 Thank you.

17 CHAIR SAADE: Thanks, Ed.

18 Julie Thomas.

19 CO-CHAIR THOMAS: All right. Julie
20 Thomas. I'm actually co-chair of the HSRC. I'm
21 retired from the Scripps Institution of
22 Oceanography where I was Program Director of the

1 Southern California Coastal Ocean Observing
2 System and Coastal Data Information Program,
3 CDIP. And I'm located in Encinitas, California,
4 north of San Diego. Thank you and welcome to
5 all.

6 CHAIR SAADE: Thank you, Julie.

7 And Gary Thompson, please.

8 MEMBER THOMPSON: Good afternoon. My
9 name is Gary Thompson. I'm with North Carolina
10 Emergency Management. I'm the Deputy Risk
11 Management Chief and also Chief of the North
12 Carolina Geodetic Survey and I'm located in
13 Raleigh, North Carolina.

14 CHAIR SAADE: Thanks, Gary.

15 So Sal Rassello, if you're online
16 there, could you go ahead and speak?

17 MEMBER RASSELLO: Good morning to
18 everyone, or good afternoon. My name is Sal
19 Rassello. I am the ship's captain and just
20 retired as Nautical Director from Carnival Cruise
21 Lines in Miami. At the moment I am in Croatia,
22 so hi everyone.

1 CHAIR SAADE: Thanks, Sal.

2 Okay. I'm going to go back to Sean
3 and Nicole and Anne and Ed. Ed's here. Ed's
4 okay. If you all could self-mute before you try
5 and speak, please.

6 Sean, you're up.

7 MEMBER DUFFY: I'm here. Okay. Sean
8 Duffy, Big River Coalition, Executive Director, a
9 maritime trade organization based in New Orleans
10 along the Mighty Mississippi River.

11 CHAIR SAADE: Thanks a lot, Sean.

12 Dr. Nicole Elko.

13 MEMBER ELKO: Hi. Good afternoon,
14 everyone. My name is Nicole Elko, and I'm the
15 Science Director of the American Shore and Beach
16 Preservation Association based in Folly Beach
17 just outside of Charleston, South Carolina.

18 CHAIR SAADE: Thanks, Nicole.

19 Captain Anne McIntyre.

20 MEMBER McINTYRE: Hi, yeah. Anne
21 McIntyre. And actually, my bio on the slide
22 there is wrong. I've retired from the Columbia

1 River Pilots, and I am now the Business Director
2 at the San Francisco Bar Pilots and coming to you
3 today from Pier 9 in San Francisco.

4 CHAIR SAADE: Thanks, Anne.

5 I would like to have the four non-
6 voting members of the HSRP and NOS and NOAA
7 leadership do self intros in alphabetical order.
8 So that will be Juliana Blackwell, Rich Edwing,
9 which are analysts, office directors, and Dr.
10 Larry Mayer and Captain Andy Armstrong who serve
11 as the co-directors of NOAA-UNH Joint
12 Hydrographic Center.

13 So, Andy, if you want to go first,
14 please.

15 CAPT ARMSTRONG: Yes. Hello,
16 everybody. I'm Andy Armstrong. I'm the NOAA Co-
17 Director at the NOAA University of New Hampshire
18 Joint Hydrographic Center here in Durham, New
19 Hampshire.

20 CHAIR SAADE: Thanks, Andy.

21 Juliana, please.

22 MS. BLACKWELL: Hello, everybody. I

1 am Juliana Blackwell. I'm the Director of NOAA's
2 National Geodetic Survey, and I'm headquartered
3 out of Silver Spring, Maryland.

4 CHAIR SAADE: And it looks like a nice
5 day.

6 Rich Edwing.

7 MR. EDWING: Hi. Good afternoon,
8 everybody. I'm Rich Edwing. I'm the Director of
9 the Center for Operational Oceanographic Products
10 and Services, also headquartered out of Silver
11 Spring, Maryland.

12 CHAIR SAADE: Thank, Rich.

13 Is Dr. Neil Jacobs online yet? We'll
14 come back to Dr. Jacobs.

15 DR. JACOBS: I'm here. Can you hear
16 me?

17 MEMBER CHOPRA: Great timing. Go
18 ahead, please.

19 DR. JACOBS: Neil Jacobs, Acting NOAA
20 Administrator.

21 CHAIR SAADE: Welcome.

22 Nicole LeBoeuf.

1 MS. LeBOEUF: I'm here. I'm the
2 Acting Assistant Administrative of the National
3 Ocean Service. Happy to be here.

4 CHAIR SAADE: Thanks, Nicole.

5 And Dr. Larry Mayer.

6 DR. MAYER: Weird that I'm never at
7 the end of the alphabetic. But I'm Larry Mayer.
8 I am the UNH Co-Director of the Joint
9 Hydrographic Center of the University of New
10 Hampshire and I'm sitting in Lee, New Hampshire
11 right now.

12 CHAIR SAADE: Okay. Thanks everyone.
13 I guess we are technically a couple minutes early
14 but I'm going to go ahead and hand it over to
15 Shep so he can fill a little void here before we
16 have the official kickoff.

17 Admiral Shep Smith, please take it
18 from here.

19 RDML SMITH: Thank you, Ed. Yeah,
20 Shep Smith. I'm the Director of the Office of
21 Coast Survey at NOAA based also out of Silver
22 Spring, Maryland. Since March I've been working

1 from home in Maryland nearby. And today I'm
2 coming to you from an undisclosed location for
3 this meeting.

4 Chairman Ed Saade, Co-Chair Julie
5 Thomas, NOAA Administrator Neil Jacobs, Assistant
6 Administrator Nicole LeBoeuf, NGS Director
7 Juliana Blackwell, CO-OPS Director Rich Edwing,
8 UNH Joint Hydrographic Center Co-directors Dr.
9 Larry Mayer and Captain Andy Armstrong, HSRP
10 members, Hill staff, stakeholders, partners and
11 colleagues, thank you all for joining us for a
12 condensed two-day -- two half-day virtual
13 meetings for the HSRP.

14 The Hydrographic Services Review Panel
15 is governed by the rules of the Federal Advisory
16 Committee Act. The Federal Advisory Committee
17 Act defines an advisory committee as any
18 committee, board, commission, council,
19 conference, panel, task force, or other similar
20 group that dispenses advice or recommendations to
21 the President of the United States and excludes
22 bodies that also exercise operational functions.

1 They are a provisional bodies and have the
2 advantage of being able to circumvent bureaucracy
3 and collect a range of opinions.

4 In drafting the Federal Advisory
5 Committee Act, legislators wanted to ensure that
6 advice by the various advisory committees should
7 is objective and accessible to the public by
8 formalizing the process for establishing,
9 operating, overseeing, and terminating the
10 committee.

11 In particular, the act restricts the
12 formation of such committees to only those which
13 are deemed essential, limits their powers to
14 provision of advice to officers and agencies in
15 the executive branch of the federal government,
16 and limits the length of term during which any
17 such committee may operate.

18 Further, FACA, the Federal Advisory
19 Committee Act, was an attempt by Congress to
20 curtail the rampant cloakroom discussions that
21 had become prevalent in administrative
22 discussions.

1 These cloakroom discussions are masked
2 under titles like task force, subcommittee, and
3 working group meetings which are less than full
4 FACA meetings and so they do not have to be open
5 to the public. FACA declared that all
6 administrative procedures and hearings were to be
7 public knowledge.

8 I had the privilege of working with
9 Dr. Alan Leonardi from the Office of Ocean
10 Exploration for the past year in developing the
11 National Ocean Mapping Exploration and
12 Characterization Strategy released by the White
13 House in June.

14 Along with Alan and Dr. John Haines
15 from USGS, we now share the NOMEK Council charged
16 with implementing the NOMEK strategy. We're
17 committed to being as inclusive as possible in
18 the development of the implementation plan with
19 input not only from federal agencies, but also
20 from the academic, philanthropic, and commercial
21 sectors and end-user groups.

22 There are two existing federal

1 advisory committees that advise NOAA on
2 hydrographic services, the HSRP, and ocean
3 exploration, the Ocean Exploration Advisory
4 Board. We'll be using these committees as one
5 structure for gathering public input as we
6 develop the implementation plan. And that's one
7 of the agenda items on the meeting today and
8 tomorrow.

9 We've heard from many in the public
10 that we need to gather public -- we need to
11 gather input earlier in the process of developing
12 government policy rather than simply the pro
13 forma public comment period on a completed policy
14 document. We're doing exactly that today, which
15 is why the comment period is so loosely
16 structured.

17 We're not keeping the implementation
18 plan hidden; it doesn't yet exist and will be
19 informed by your comments during this meeting.
20 There will be other opportunities to engage in
21 the next few months, and I'm committed to ensure
22 that the eventual governance structure for the

1 broad NOMECE program will have ongoing forums for
2 discussion of strategy, operational coordination,
3 and maturing and use of new technologies.

4 There's been a parallel effort to
5 develop the Alaska Coastal Mapping Strategy
6 Implementation Plan under the leadership of
7 Nicole LeBoeuf, Juliana Blackwell, and Ashley
8 Chappell. Both of these plans are on the agenda
9 for discussion at this meeting. I look forward
10 to hearing your ideas on how to achieve the bold
11 vision for implementing NOMECE and the ACMS.

12 There will be a public comment period
13 today and tomorrow, as well as dedicated time to
14 hear from the panel members. In addition, we'll
15 have a short update from the Tech Working Group
16 on their work on navigation services and limited
17 visibility.

18 I want to pass on my regrets that all
19 of you could not join me in Hawaii as planned for
20 this meeting. We've already decided to hold the
21 spring meeting virtually as well with the thrice-
22 deferred Hawaii meeting planned for the fall of

1 2021.

2 We decided early on in the pandemic
3 that since we're going to have to do a lot of
4 virtual meetings, that we should take the time to
5 get good at it. I'm proud of the production team
6 that has put this meeting together and I have
7 every confidence that this meeting will be smooth
8 and engaging for all participants.

9 Ed and I intend to make this as
10 convenient and productive as possible. NOAA
11 leadership has been very generous with their time
12 in participating in recent HSRP meetings and this
13 one and I look forward to hearing their
14 perspective in a few minutes.

15 A few administrative notes. This
16 session is being recorded and transcribed. Your
17 individual permission is required for use of
18 audio as it will be retained and disseminated on
19 the meeting website and accessible as a public
20 document. You can withhold this permission by
21 abstaining from speaking or dropping off the
22 webinar.

1 Ethics reminder to members. While
2 serving the HSRP during the two public meetings
3 per year, I want to remind the HSRP members that
4 you serve as a NOAA employee in your personal
5 capacity as a subject matter expert and you do
6 not represent any other group, industry,
7 association, or other entity.

8 Please remember to take off your
9 regular work hat and replace it with your NOAA
10 hat when you provide your questions, comments,
11 and guidance to NOAA and to the administrator.
12 Thank you for your service to strengthening
13 NOAA's hydrographic and navigation services
14 portfolio. We do so appreciate your vision and
15 help.

16 While we normally do introductions to
17 the NOAA staff, due to the condensed nature of
18 this call, we'll include them in the summary
19 report for the meeting. NOS has a variety of
20 staff who can provide subject matter expertise
21 and administrative support. On this webinar,
22 there are approximately 20 additional NOAA staff

1 who follow the work of the HSRP and can assist
2 you throughout the year.

3 This meeting has been a real labor of
4 love for many on the NOAA staff and I would like
5 to take a moment to shout out to in alphabetical
6 order those who have helped put this together.

7 Alexandria Allison, Mike Aslaksen,
8 David Barglow, Glenn Boledovich, Captain Rick
9 Brennan, Christine Burns, Michelle Burt, Ashley
10 Chappell, Melanie Colantuno, Kristen Crosset,
11 Virginia Dentler, Chris DiVeglio, Chrissy Hayes,
12 Lucy Hicks, Tricia Hooper, John Kelly, Nathan
13 Littlejohn, Lynne Mersfelder-Lewis, Laura Rear
14 McLaughlin, John Nyberg, Amanda Phelps, Julia
15 Powell, Galen Scott, Jill Stoddard, Captain EJ
16 Van Den Ameele, Darren Wright, and the others who
17 I may have missed or who are providing ongoing
18 support to the HSRP. Thank you for your
19 teamwork.

20 The goal of this meeting is to discuss
21 the current state of NOS Navigation Services
22 Portfolio projects, provide key updates on ocean

1 mapping such as NOAA's role in developing the two
2 strategies aforementioned, and to initiate a
3 dialogue with the HSRP members on these and other
4 topics, their issue or position papers and
5 recommendations. The HSRP is discussing two
6 position papers on these strategies, and we seek
7 your comments at this most earliest of stages.

8 The HSRP provided us with insightful
9 recommendations on emergency response and
10 artificial intelligence at the last meeting. In
11 regard to conserving time, all the HSRP member
12 and speaker bios are in the advanced materials on
13 the web, so we will dispense with reading speaker
14 bios. You may hear four minute, two minute, and
15 one minute reminders to presenters to help keep
16 the presentations and meeting on time.

17 And with that, I would like to turn
18 this over to Ed Saade, the HSRP Chair.

19 Oh, one more piece of logistics. To
20 the stakeholder staff and others joining the
21 webinar, I encourage your public comments and
22 input, especially on the coastal and ocean

1 mapping strategy.

2 We're allocating a lot of time for
3 this, much more than we usually do because we
4 expect to have public comment. If you have a
5 public comment or question -- I should say we
6 have already received over a dozen public
7 comments, and we have those already captured.

8 In addition, if you've not yet sent in
9 a public comment or question, please type it in
10 to the question tab in your GoToMeeting
11 interface. And from there we will queue it up
12 for recognition during the public comment period,
13 and it will also go into the public record for
14 input into those strategies or otherwise as
15 appropriate.

16 During the public comment period we
17 will recognize some of those who have provided
18 comments in advance to make a brief summary of
19 their remarks during the course of the meeting.

20 And we may have some additional time
21 for additional speakers if you would like to have
22 the floor. We're probably going to be limiting

1 it to just two or three minutes per speaker
2 because we have a lot of people to squeeze into
3 the allotted time.

4 So with that very not-brief
5 introduction, I would like to turn this back over
6 to our chairman, our very-capable chairman Ed
7 Saade. Thanks, Ed.

8 MS. DENTLER: Ed, you're muted.

9 CHAIR SAADE: Sorry. Okay, thanks.

10 As mentioned, I'm Ed Saade. I serve
11 as the HSRP Chair, President of Fugro USA based
12 in Houston, but I'm transmitting from San Diego,
13 California today. I'm very happy and excited to
14 participate in this latest public meeting of the
15 HSRP and the second time around doing it all
16 virtually.

17 As Shep pointed out, I, too, want to
18 thank all the technical and IT staff, and even
19 the software providers, that makes this look so
20 well and work so well. Obviously over the last
21 several months we've got a lot of experience in
22 this.

1 As has been repeated a number of times
2 and in multiple venues, the ocean is having a
3 moment, and whether it's hydrography or coastal
4 initiatives in focus, commerce, fishing, whatever
5 it might be, the blue economy is getting the
6 attention and focus and awareness it deserves.
7 And over the next two days I'm sure we will all
8 be very impressed and educated and informed, so
9 looking forward to all that.

10 Nicole LeBoeuf and Dr. Jacobs, the
11 HSRP panel members, staff and stakeholders, thank
12 you for joining us. We are all operating in this
13 new normal of the COVID-19 impact, but everyone
14 is doing a good job and very productive.

15 I want to recognize the following
16 panel members. Julie Thomas serves as the co-
17 chair. There are three working groups with
18 chairs, and they include Dave Maune and Julie as
19 the chair of the Planning and Engagement Working
20 Group; Ed Page, chair of the Arctic Working
21 Group; Deanne Hargrave and Lindsay Gee, chair of
22 the Technical Working Group.

1 You'll hear from Anuj Chopra and also
2 Qassim Abdullah. More about the Technical
3 Working Group tomorrow. Also all the bios are in
4 the web materials. Thank you for your leadership
5 and your ability to get the job done and great
6 guidance.

7 Dr. Jacobs and Nicole LeBoeuf, I look
8 forward to the next in-person meeting and the
9 positive work we will do together. In the
10 meantime, the HSRP will discuss and hope to
11 provide you and the papers with recommendations
12 as part of the outcome of the meeting. Dave
13 Maune and Julie Thomas and Lindsay Gee will lead
14 us in a discussion of the draft issue papers on
15 the two ocean and coastal mapping strategies
16 along with the NOS leaders.

17 Following up on Rear Admiral Smith's
18 request for comments, I encourage your public
19 comment and input on the two ocean and coastal
20 mapping strategies. It's been really nice
21 participation already with some of the pre-
22 meeting comments, so it's great to see people

1 really engaged.

2 Due to the condensed meeting format,
3 we ask you to provide your comments in writing so
4 we can capture all of them, and then -- I'll, of
5 course, share all of them.

6 Okay. So in moving on to the next
7 phase of the meeting, we're honored to have
8 Nicole LeBoeuf and Dr. Jacobs in attendance.

9 Nicole, I'm turning this over to you
10 for your remarks.

11 Again, her bio is in the web
12 materials.

13 Go ahead, Nicole.

14 MS. LeBOEUF: Thank you Chairman
15 Saade, Admiral Smith, Julie and the rest of the
16 HSRP. Welcome to you, Dr. Jacobs. Thanks to
17 Representative Don Young who I understand will be
18 joining us via video a bit later.

19 Aloha and good afternoon, everyone.
20 Thank you for joining the virtual Hydrographic
21 Services Review Panel meeting. Thank you also to
22 everyone who helped pull it off. Well done.

1 Clearly COVID is impacting our lives and our
2 work, but under any circumstances it's good to be
3 together to discuss matters of importance to all
4 of us.

5 As you might have imagined, I have
6 spent a lot of time thinking about COVID, but
7 also about coastal resilience and the essential
8 role that the National Ocean Service, including,
9 of course, NGS, CO-OPS, and Coast Survey play in
10 ensuring the resilience of our coastal
11 communities, economies, and ecosystems.

12 As a leader, I have also thought a lot
13 about the resilience, both physical and mental,
14 of the entire NOS workforce and our close
15 partners, like many of you, as we serve our
16 nation during this pandemic.

17 I have done what I can to stay in
18 communication and engage with our team and with
19 our leadership to stay checked in, reconnected,
20 and to make sure that everyone knows that they
21 are supported both personally and professionally.
22 We are indeed facing challenging times, and I'm

1 sure your organizations are also dealing with
2 many of the same issues as we are at NOAA.

3 At NOS I'm asking for our folks to be
4 kind and flexible with their colleagues and to
5 remain adaptable and innovative in their work.
6 Through our words and deeds we are striving to
7 cultivate a compassionate, forgiving, yet driven
8 workforce across all that NOS does, and that
9 combination is especially important to me because
10 the changes that are taking place along our
11 coasts are not stopping for COVID.

12 In fact, with our attention drawn to
13 our various supply chain, our contributions to
14 the U.S. blue economy that all of you represent
15 is top of mind for our nation in the last few
16 months. Despite the various challenges of COVID
17 and 2020, everything else, NOAA and NOS are
18 working harder together with folks like you all
19 on the HSRP to promote safety in navigation and
20 to provide essential services to protect life and
21 property no matter the landscape.

22 Before I say a few more words on that,

1 I'd like -- on behalf of NOS I want to thank the
2 panel in advance for your advice and
3 recommendations, and the public for your comments
4 as well. Your input is absolutely critical to
5 improve our services and ensures that our ongoing
6 success is relevant in providing 21st century
7 navigational and other related services.

8 I know that one of the major topics
9 you'll discuss today, as Admiral Smith has
10 already mentioned, and tomorrow, is the National
11 Strategy for Ocean Mapping, exploration
12 characterization, as well as the Alaska Coastal
13 Mapping Strategy.

14 I won't touch on these in any more
15 detail. You will be hearing from Admiral Smith
16 and Juliana Blackwell, and you've heard from
17 Ashley Chappell before. But this work is very
18 important to me and to NOS. We are fully
19 supportive and engaged in these efforts. I do
20 hope you'll provide us with feedback. Your
21 expertise is invaluable.

22 And switching from how awesome you

1 are, HSRP, to how awesome we are -- it's really a
2 fun crowd, right? -- I'd like to take a look at
3 NOS's response to the most recent hurricane in
4 this, another active hurricane season.

5 The most recent hurricanes, Laura and
6 Sally, really remind me of the work of -- our
7 emergency response work, that is, from the Office
8 of Coast Survey, National Geodetic Survey, and
9 CO-OPS, the Center for Operational Oceanographic
10 Products and Services.

11 The National Geodetic Survey was on
12 the scene immediately following both Hurricanes
13 Sally and Laura to collect aerial images in
14 specific areas that were identified by FEMA and
15 other state and federal partners.

16 For CO-OPS the peak water levels
17 during Hurricane Laura measured at our Calcasieu
18 Pass water level station was 9.19 feet above mean
19 higher high water. Now that's not the absolute
20 storm surge, and that was higher still, but this
21 is the second highest water level record at this
22 station behind the record set by Hurricane Ike in

1 2008 which was 10.01 feet above mean higher high
2 water level.

3 Similarly, Hurricane Sally peaks as an
4 observed water level at the CO-OPS station in
5 Pensacola, Florida at 5.6 feet above mean higher
6 high water. This is the third highest water
7 level on record exceeding water level records for
8 Hurricane Katrina at the same station.

9 And as recently viewed this past
10 weekend, we saw the impacts, and are still
11 assessing the impacts of Tropical Storm Beta.
12 But as water levels and CO-OPS stations along the
13 Texas Gulf coast measured between half a foot and
14 two feet above normal high tide levels.

15 As you know, following storm events
16 the Office of Coast Survey is also on the scene
17 to ensure that we can reopen our ports safely and
18 efficiently. For example, the Hydrographic
19 Services Division contracted for rapid survey
20 efforts on a 30-mile stretch of the Calcasieu
21 Ship Channel leading into the Port of Lake
22 Charles.

1 This rapid response was critical to
2 ensuring the reopening of this port for deep
3 draft ships immediately following Laura.
4 Additionally, the Office of Coast Survey's
5 Navigational Response Teams in Stennis,
6 Mississippi and in Fernandina Beach, Florida
7 worked with U.S. Coast Guard to survey Pensacola.
8 This survey work was also essential to reopening
9 that port.

10 A big thank you to CO-OPS and to OCS
11 and to NGS for their important work in these
12 hard-hit regions of the country. And, of course,
13 all being done during a global pandemic. So
14 thank you to everyone.

15 In light of these hazardous
16 conditions, environmental and coastal change and
17 flooding, across NOS we are working hard to
18 improve the suite of services and tools that we
19 provide to our nation to protect and support
20 maritime commerce which is one of the backbones
21 of our U.S. economy. We are looking to shout
22 that fact from the rooftops.

1 Just this summer NOS, NOAA, and the
2 Bureau of Economic Analysis released first of its
3 kind prototype statistics on the marine economy
4 to prove this very point. According to those
5 data, our nation's economy -- our nation's marine
6 economy contributed \$373 billion to our gross
7 domestic product in 2018 and as a sector grew
8 faster than our nation's economy as a whole.

9 Everyone here probably knows that it's
10 nearly impossible for most Americans to go a
11 single day without eating, wearing, or using
12 products that come from or through our ocean and
13 coastal communities.

14 NOS's navigation, observing, and
15 positioning and mapping programs provide
16 underlying data essential to services that
17 support our very way of life. We continue to
18 adapt to the challenges of our time, and we
19 continue to talk about it making sure that
20 Congress and others know what we do.

21 Just a few weeks ago I personally
22 briefed 245 people, 60 of whom were Congressional

1 staff, about the services that we provide at NOS
2 for our nation's coastal resilience. This was a
3 record turnout for a NOAA Congressional briefing.

4 And we are particularly pleased to
5 talk about this as well as the wider NOAA
6 initiatives that improve our up-take of
7 artificial intelligence, unmanned systems, and
8 cloud computing in accomplishing our goals.

9 I want to thank the HSRP for their
10 most recent issue paper on automation and
11 artificial intelligence and post-disaster
12 products and services.

13 This panel's recommendation to improve
14 collaboration with academia and public/private
15 partnerships identify areas for improved faster
16 response times, and consider stakeholder input
17 are vital to improving our success. Thank you.

18 We look forward to continuing to
19 examine our products and services and work with
20 other federal and state agency partners in doing
21 so. In addition to the rapid onset of threats
22 like hurricanes, we also deal with slow-moving

1 chronic threats to maritime safety and navigation
2 such as fog and limited visibility and enclosed
3 ports and waterways, which I understand this
4 group will discuss tomorrow.

5 And this afternoon you'll be hearing
6 from the directors of the Navigation Services
7 Portfolio at NOS including Juliana Blackwell from
8 the National Geodetic Survey who will give you a
9 status update on NGS's coastal mapping
10 activities, and the National Spatial Reference
11 System modernization effort. Rich Edwing of CO-
12 OPS will talk about their plans for expansion of
13 the PORTS program.

14 And Admiral Shep Smith from the Office
15 of Coast Survey will cover the progress report on
16 unmapped waters, the new OCS Strategic Plan, and
17 the technology needed to implement the new ocean
18 mapping strategy that I'm sure you've heard so
19 much about. We will also get an exciting update
20 from Captain Andy Armstrong on the UNH/NOAA Joint
21 Hydrographic Center partnership.

22 In terms of a brief budget update, you

1 may recall that last year Congress enacted NOS's
2 FY '20 appropriation at its highest level yet,
3 \$606 million. As fiscal year 2020 comes to an
4 end, just a couple weeks to go, it is apparent
5 that our FY '21 appropriation will be delayed,
6 and it does appear that we may be on our way to
7 getting a stopgap measure or a continuing
8 resolution at least until December.

9 The House has, however, marked up our
10 FY '21 appropriations bill, and the numbers
11 remain good for NOAA and for NOS including
12 funding the navigation, observing, and
13 positioning programs pretty much at level with
14 last year's appropriations, and some overall
15 modest increases for the rest of NOS. The Senate
16 has yet to mark up FY '21 funding. Not clear if
17 they will or when they'll do it, but stay tuned
18 for more.

19 Our U.S. Marine Transportation
20 Information System infrastructure has plenty of
21 areas that would benefit from job creating and
22 economic investment in precision navigation like

1 activities like hydrographic surveys, shoreline
2 mapping, geodetic modernization, and water level
3 network enhancement. So hopefully we're getting
4 the word out, and Congress and stakeholders like
5 you are aware and can advocate for those
6 programs.

7 With that, I want to thank you again,
8 everyone in attendance. Mahalo nui. I am
9 looking forward to our discussions this afternoon
10 and to a future meeting in person. Thank you.

11 CHAIR SAADE: Thank you, Nicole. I
12 appreciate your remarks.

13 Dr. Jacobs, we're thrilled to have you
14 back for your second meeting to continue the
15 dialogue and contribute strategic and useful
16 ideas to make small improvements for your
17 navigation -- yours and our navigation services
18 portfolio.

19 His bio, as well, is available on the
20 web materials.

21 Over to you, Dr. Jacobs.

22 DR. JACOBS: Thank you. It's great to

1 be here. Big shout out to NOS for the fantastic
2 response with the landfalling storms, Laura and
3 Sally. Seems like we're in a lull now, and I
4 hope it stays that way, but I'm afraid it
5 probably won't.

6 Thank you, Ed, for the introduction.
7 Thanks, Shep. And looking forward to
8 Representative Young's remarks, as well as
9 others. Wish we could be in Hawaii, but
10 unfortunately a virtual meeting is probably the
11 best we can do right now.

12 I think most of you probably have
13 either met me or know me, but when I'm not
14 working at NOAA, my two favorite things to be
15 doing are either surfing or fishing, and
16 obviously maritime navigation services are
17 important in both.

18 Top line message is the work you do
19 really, really matters to us. The work of OCS,
20 CO-OPS, NGS. It's critical to the blue economy
21 which is a top priority at the agency.

22 A lot of these programs not just

1 benefit us but also really, really strengthen our
2 public/private partnerships. I think a lot of
3 this is evidenced in the presidential memo on
4 ocean mapping. Clearly a top priority from the
5 White House all the way down.

6 Really looking forward to joining in
7 on the sessions throughout this afternoon because
8 I think we'll be really digging into a lot of
9 these implementations and various associated
10 strategies.

11 I'm personally excited to talk a
12 little bit about the nearshore bathymetry. I
13 have just been in the process of updating all the
14 maps on my Lowrance. I sold a small boat that I
15 had and got a poling skiff and in the process of
16 updating all the maps had been looking at a lot
17 of the new data. Most of the fishing I do is
18 near shore, but all the maps include a tremendous
19 amount of data. Of course, it was exciting to me
20 to think that I'm downloading data from my own
21 agency's website.

22 But these types of applications are

1 extremely important. And not just necessarily
2 for maritime navigation but the data is also
3 really, really useful for emergency management
4 and conservation. I'll give you a couple
5 examples of that.

6 So just in this last year, I think
7 that with these landfalling storms a lot of
8 people had seen the storm surge forecasts. And
9 that really -- to properly forecast a storm
10 surge, it starts pretty far off shore because a
11 lot of the bathymetry when you get that amount of
12 water pushed in shore really can either spread
13 out or pile up.

14 A lot of this is, of course, a
15 function of the atmospheric weather models
16 producing the track of the storm and the winds,
17 but if we don't understand the bathymetry, we're
18 not going to understand the height and how the
19 storm surge is magnified.

20 This is also true before the swell and
21 the waves. So lot of the wave refraction
22 amplification starts way off shore. We see this

1 with our WAVEWATCH III, with our nearshore
2 models. It's also really relevant for rip
3 current forecasting whether we'll be dealing with
4 rip currents or just a straight longshore
5 current.

6 One of the big challenges going
7 forward is -- and I think that everyone probably
8 saw this with Laura. We nailed the track, but
9 the rapid intensification, particularly when you
10 get within a few hundred miles of the coastline
11 in the Gulf, is always going to be a challenge
12 because we really have to do a better job of
13 understanding what's going on below the surface
14 when it comes to upwelling.

15 And having a good handle on the
16 bathymetry as an input parameter to the models is
17 critical. So a lot of these models are two-way
18 coupled ocean and atmosphere models, and the
19 bathymetry is a boundary condition on the ocean
20 model, so it's incredibly important data that we
21 have there. And the high resolution models we
22 run, the higher resolution input data we're going

1 to need.

2 I know it's also important when we're
3 talking about a lot of the Alaska coastal mapping
4 as well. There's a ton of coastline up there,
5 and we're in the process of trying to map as much
6 of it as we can.

7 I did want to take a quick second to
8 talk a little bit about COVID because that's, of
9 course, why we're all here virtually. I think
10 everyone probably knows resuming the fleet
11 operations is a top priority. We took a pretty
12 big hit as far as lost days at sea. I think I've
13 seen numbers estimated around roughly 400 days at
14 sea, but we're getting things back underway.

15 OMAO has been working really closely
16 with CDC and NIH to really sort of define what
17 the protocols are, how we should operate, what
18 type of environment we can. I know that a lot of
19 the crews have been quarantining themselves even
20 before they get on the ship just to make sure
21 that we're not bringing anyone with an infection
22 onboard.

1 Then we do keep everyone as isolated
2 as possible. OMAO has access to pretty rapid
3 testing, so, not just for our vessels but also
4 with our aircraft which, as you can imagine, they
5 are doing a lot of flights in the storms, and
6 they're in a small contained area.

7 But, fortunately, most of the vessels
8 are starting to get back underway. The Thomas
9 Jefferson departed Norfolk on July 19th. It's
10 working on a hydrographic project off the
11 Virginia/North Carolina coast.

12 Hassler departed August 29th working
13 in the Chesapeake. Rainier got underway on
14 August 4th conducting projects for Coast Survey
15 in Southeast Alaska. Also the Fairweather
16 departed Seattle on September 14th also headed to
17 Southeast Alaska.

18 I can say, and I think a lot of people
19 probably know, we're moving ahead with the
20 procurement of two Class B vessels. We will be
21 releasing probably in the next couple of weeks
22 the FY '21 Fleet Recap Plan. I know that the NOS

1 and OMAO are working on this really hard. I
2 think they may even have a brief together on this
3 later today.

4 I just wanted to again reiterate that
5 the recommendations that everyone provides are
6 incredibly important, and we're definitely
7 listening to what everyone is saying. Really,
8 really appreciate all the thoughtful comments
9 from the April meeting. As Nicole mentioned, we
10 are really looking at a lot of different aspects
11 of public/private partnership, particularly when
12 it comes to advancing AI in various ways to
13 manage data.

14 I know, as I've just been talking
15 about high resolution data, and the more sensors
16 we have deployed and the more areas that we're
17 going to be mapping, actually managing this data
18 and sorting through it and optimizing it are
19 going to require a lot of different techniques,
20 AI being one of them.

21 And, of course, data management is one
22 thing, but data storage is also something that's

1 always going to be a challenge going forward. I
2 would like to mention the NOAA Big Data Program.
3 This is something that a lot of folks in the
4 atmospheric and meteorology community have been
5 tracking for a while.

6 The data that everyone here is
7 collecting and providing is definitely going to
8 be a component of this. Essentially what the Big
9 Data Program is is it's a partnership between
10 NOAA and commercial cloud service providers.

11 And we've -- if you ever talk to
12 anyone in IT and computing at NOAA, the first
13 thing they'll tell you is we don't have enough
14 high-performance computing and we don't have
15 enough storage. There's a lot of data that we
16 have that the public would really love access to.
17 The trick is how to afford the storage and how to
18 get the data into the hands of the public.

19 The cloud service providers absolutely
20 love this idea because while they're not allowed
21 to charge for our data, they have to make that
22 freely available, they can charge for the

1 processing of our data. So by allowing them to
2 host our data for little or no charge, we're
3 driving business to them.

4 So it's a good business model for
5 them, it solves our data storage problem, and it
6 actually allows us to get more data out into the
7 public which I think ultimately will benefit
8 everyone, from emergency managers to the maritime
9 community.

10 I did want to mention a couple other
11 things as we're doing a lot of this new AI and
12 processing of data. One of the cool things that
13 I saw in there was a structure for motion. I
14 know probably in your community, and at least
15 where I saw it in use out in Hawaii, was sort of
16 mapping a lot of these reefs. But it was kind of
17 cool. They actually took the camera, and I got a
18 3-D rendering of myself.

19 So I can't describe it any other way
20 than I look like an action figure in a video
21 game. But it's a really, really cool technology,
22 and it's very similar to the technology that I

1 actually have in my new Lowrance system that
2 allows me to sort of view the bathymetry in three
3 dimensions so very, very cool capability.

4 Also real quick wanted to say --
5 excited about the recent PORTS expansion in Kings
6 Bay, Georgia and Portsmouth, New Hampshire. It's
7 a really big deal for us and really, really
8 appreciate the partnership with everyone here on
9 that.

10 And in general just really excited to
11 see the continuation and evolution of what we're
12 doing here. It's really, really important to the
13 agency. Like I said before, I just can't express
14 how valuable the work everyone here is for the
15 agency.

16 So I'll stop there, but I'm going to
17 be -- I'll be logged in and listening all day, so
18 thank you.

19 CHAIR SAADE: Thanks, Dr. Jacobs.
20 Really great as always to have you join us, and
21 any insights on the data management and sharing,
22 as well as the AI and autonomous tools. All that

1 is really good insight and helps direct the
2 thought process.

3 Also, of course, the update on the
4 COVID impacts and the vessel operations, that's
5 of interest, and it's good to see that there's
6 some positive news of movement and activity.

7 We're going to take a 15-minute break
8 right now, so by my clock then we should all be
9 back at 10 minutes before the hour. All right.
10 Do I have that right? Yeah.

11 RDML SMITH: Hey, Ed. Do we still
12 have the video from Congressman Young?

13 CHAIR SAADE: I'll have to defer
14 to --

15 MS. DENTLER: Yes, it's cued up.

16 RDML SMITH: Okay. So why don't we
17 watch that before the break.

18 CHAIR SAADE: Yeah, let's do that.
19 Thanks.

20 CONGRESSMAN YOUNG: Hello, I am
21 Congressman Don Young. Thank you for inviting me
22 to make this short video. I have been a long-time

1 supporter of NOAA, as you know, and greatly
2 appreciate the work you do to make sure that our
3 oceans are healthy and safe.

4 Healthy oceans are essential to
5 Alaska's economy, as you know, but the mapping is
6 really really really important because we have a
7 lot of things happening in the Arctic now. Along
8 Alaska's coast, the depth of the water, the
9 difference in water as far as -- shipping, the
10 whole thing, and NOAA is going to play a major
11 role in that.

12 We work every time to communicate with
13 your chiefs, and we try to get things done.

14 Actually, we've been successful, this Congress,
15 I'm proud to see that our Integrated Coastal and
16 Ocean Observation System Act passed the House,
17 and I will continue to advocate for final passage
18 of our bill in the Senate or the Senate bill in
19 the House so that the Integrated Ocean Observing
20 System can continue being our eyes and ears on
21 the oceans.

22 There is much work to still be done,

1 as we know. We really are not sure with climate
2 change, the effects upon the fisheries and of
3 course shipping channels. That's where NOAA's
4 also going to play a major role with the Coast
5 Guard.

6 So again, thank you for the short
7 invitation to say hello to you and thank you.
8 Keep working. We will work with you, and we'll
9 see if we can't have the right funds to do the
10 job for Alaska and of course the nation as a
11 whole. God bless.

12 RDML SMITH: A round of applause for
13 Congressman Young.

14 CHAIR SAADE: That was a great
15 addition to --

16 (Simultaneous speaking.)

17 CHAIR SAADE: -- today's meeting.

18 Okay. So I'm glad we got that in.
19 It's great to see the Congressman, and he
20 definitely is a big supporter of NOAA and, of
21 course, all things Alaska.

22 Let's go ahead and take -- it's going

1 to be a 12 minute break, so we can come back at
2 10 minutes before the hour.

3 (Whereupon, the above-entitled matter
4 went off the record at 1:38 p.m. and resumed at
5 1:49 p.m.)

6 CHAIR SAADE: Okay. Welcome back,
7 everyone.

8 We're going to go ahead and continue,
9 and up next, I'm turning this over to Nicole
10 LeBoeuf for the session with the directors.

11 So, Nicole, over to you. Thanks.

12 MEMBER LEBOEUF: I was just rejoining,
13 Ed.

14 CHAIR SAADE: Can you --

15 MEMBER LEBOEUF: And I'm sorry, I was
16 just rejoining. Is there a question on the
17 floor?

18 CHAIR SAADE: No, sorry.

19 It's all set for the next section
20 where you'll be moderating the various
21 presentations of Andy, and Rich, and Juliana.

22 MEMBER LEBOEUF: Oh, got you. All

1 right.

2 CHAIR SAADE: All set to go?

3 MEMBER LEBOEUF: I think so.

4 CHAIR SAADE: Okay. They're all
5 queued up when you're ready.

6 MEMBER LEBOEUF: All right. My
7 apologies. All right. Sorry, excuse me. And
8 welcome back.

9 Thank you for the quick break, and I
10 apologize for being a couple minutes late.

11 We're now ready to hear from our NOS
12 Office directors on opportunities and challenges
13 for NOS's Navigation Services Portfolio.

14 Our speakers that you know quite well
15 will discuss a variety of topics, and I look
16 forward to hearing their updates from each of the
17 offices.

18 I'd like to start with Captain Andy
19 Armstrong, the co-director of the Joint
20 Hydrographic Center and the University of New
21 Hampshire.

22 His full bio, of course, is attached

1 in the material. Andy, take it away.

2 CAPT ARMSTRONG: Thank you, Nicole.

3 So, NOAA and the University of New
4 Hampshire have just begun a new five-year
5 cooperative agreement for the operation of the
6 Joint Hydrographic Center.

7 And I'm going to share with you today
8 the research plan for that new five-year
9 agreement, and since the center is run both by
10 NOAA and the university, I'm speaking today on
11 behalf of myself and Dr. Larry Mayer, the co-
12 director from the University of New Hampshire.

13 Can I have the next slide, please?

14 So, the University of New Hampshire
15 Joint Hydrographic Center has its primary
16 facility in a beautiful, dedicated building on
17 the campus at the University of New Hampshire.

18 And we have a modern waterfront
19 facility at nearby New Castle, New Hampshire, and
20 that waterfront facility's where UNH maintains
21 its research vessel, and where indeed the NOAA
22 Ship Ferdinand Hassler, one of our hydrographic

1 survey vessels, is homeported.

2 So, we're proud of that relationship
3 with NOAA, as well as the research relationship
4 at the center.

5 So, could we have the next slide? So,
6 a little bit about the center.

7 We actually have about 100 people at
8 the center, which includes 14 research and
9 teaching faculty, a number of affiliate faculty
10 members from industry and other academic
11 institutions, as well as from NOAA, staff of
12 research scientists, and other supporting staff,
13 and we actually have 14 NOAA scientists based at
14 the center.

15 Actually, outside of Silver Spring,
16 and Norfolk, and Seattle, one of the biggest
17 groups of NOAA, especially National Ocean Service
18 employees.

19 A significant component of our center
20 is graduate education, and we have 31 graduate
21 students at the center.

22 And in addition to that, we have a

1 number of international fellows who come to the
2 center for a fellowship in ocean mapping, and
3 then return to their home countries, and that is
4 a great institution that's creating a new and
5 effective network of ocean mappers around the
6 world.

7 Next slide, please.

8 A key part of the center is industry
9 partnership, and we at the center derive
10 tremendous value from this partnership.

11 We're able to leverage their contributions,
12 stay in touch with the development in the private
13 sector.

14 We have a pathway for our
15 research-to-operations, and great opportunities
16 for our students.

17 And in return, our industry partners
18 derive, I think, significant value from their
19 relationship with the university.

20 And they have both access to code and
21 to researchers, right to license things, and the
22 ability to collaborate and use our facilities.

1 So, and next slide, please. So, now
2 for the cooperative agreement.

3 Sometimes these terms are kind of
4 arcane, but a cooperative agreement is really
5 just a grant in which the federal government has
6 substantial participation.

7 And then you saw that our substantial
8 participation includes those NOAA scientists on
9 the site working with the university researchers,
10 the presence of the NOAA survey ship at our
11 facility, and a number of other interactions that
12 we maintain.

13 So, this new award was done through a
14 competition. It was just awarded competitively.

15 And so, the funding opportunity was
16 released in March of this year, and then there
17 was a competition, and based on that competition,
18 the University of New Hampshire was selected, and
19 the award was issued last month.

20 So, the new five-year period is
21 actually going to start in January and will run
22 for five years, following that day.

1 So, a little bit about the plan, and
2 the next slide, please.

3 So, based on the opportunity notice
4 from NOAA and the proposal submitted, there's
5 going to be three major programmatic themes for
6 the next five years.

7 The first one will be advance the
8 technology to map U.S. waters, then that'll
9 include a subtheme for both data acquisition and
10 extracting maximum value from the data.

11 A theme to advance technology for
12 digital navigation services, and that'll include
13 both ends of that process, the tools for the
14 navigator, and the tools for the development of
15 electronic charting products.

16 And a third theme, which is kind of
17 hybrid, and it includes a study of acoustic
18 propagation and effects, particularly effects on
19 marine animals, and this is where our education
20 and outreach program resides.

21 I'll talk a little bit about each of
22 those, so the next slide, please.

1 So, in the technology to map the U.S.
2 waters, on the acquisition end, the center will
3 be looking at systems and sensor monitoring
4 technology, real-time quality control of
5 hydrographic surveying and ocean mapping work,
6 and of course, continuing to develop autonomous
7 platforms and autonomous systems for processing
8 and managing data, trying to not only gain
9 benefits in efficiency, but to improve the
10 quality of the data as we collect it.

11 The next slide, please.

12 So, on the value end, we'll continue
13 to work as the center has for many years on
14 efficient data processing.

15 We'll be looking at autonomous
16 processing techniques, cloud, AI, and machine
17 learning technology, looking at developing some
18 new interactive tools and an editing environment.

19 And of course, we'll be doing this on
20 the full range of bathymetric data, including
21 acoustic and lidar data.

22 And then, a little farther down the

1 line, we'll be looking at the visualization and
2 interpretation, and development of products
3 across the full spectrum of ocean mapping.

4 The bathymetry, the object detection,
5 and the water column, and backscatter, and so on.

6 Next slide, please. On the navigation
7 services, I said we'd be looking at automated
8 cartography tools, automated generalization,
9 ideal portrayal of data.

10 We'll be looking at virtual reality
11 primarily as a pathway to augmented reality, and
12 I know the panel is very interested in continuing
13 to operate and to developing technology so that
14 ships can continue to operate in the fog, and we
15 think augmented reality is a means that may allow
16 that.

17 And of course, we'll be looking for
18 improved ways to display weather, currents, and
19 hydrodynamic model outputs on those electronic
20 charting systems in use by both the recreational
21 and professional maritime community.

22 Next slide, please.

1 So, in our third theme, we're going to
2 be looking at the marine soundscape and marine
3 geospatial expertise.

4 And so, we'll continue to work on
5 modeling and majoring the sound field from our
6 hydrographic echo sounders, and trying to
7 understand the impact these sounders have on the
8 ocean soundscape, particularly the effect on
9 marine animal sound production and marine animal
10 behavior.

11 Next, please.

12 So, in that regard, this is from the
13 last period, but I think it's a significant item
14 to note.

15 We've already gotten the Journal of
16 the Acoustical Society of America publication
17 out, and so we're adding to what's known as the
18 sort of best available science in these
19 activities with the studying the effect of 12
20 kilohertz multibeam echo sounders on some beaked
21 whales off Southern California, and demonstrating
22 that there were no changes in their behavior

1 detected in the case of this echo sounder
2 operation over their feeding areas.

3 Next slide, please.

4 Education, of course, is a significant
5 part of what we do.

6 Right now, we're in a blended mode
7 where we're trying to mix some very socially
8 distance hands-on practical training with mostly
9 online classes.

10 And of course, we want to maintain and
11 support student research projects, which are
12 fundamental to both the students' education and
13 to our research.

14 And ultimately, our goal is to
15 graduate capable, forward-thinking hydrographers,
16 and we've done that for many years, and hope to
17 continue that.

18 Okay, next slide.

19 So, finally, you can see a little bit
20 what we've done over the years on our website.

21 The website address is down at the
22 bottom there, and all our progress reports since

1 2001 are posted there.

2 And next slide.

3 This is our latest one as of the end
4 of 2019, so I think you can take a look at that
5 and get a much deeper dive into what's been going
6 on, and hopefully at the next meeting, Larry will
7 begin to be able to present some of the results
8 of our new research efforts.

9 So, thank you very much, Nicole.

10 MEMBER LEBOEUF: Thank you, Andy, and
11 congratulations for all of the hard work that's
12 being done there.

13 We're looking forward to another great
14 five years of this partnership with the
15 University of New Hampshire.

16 Just really amazing everything that's
17 already been done there, and that we're looking
18 forward on.

19 So, let's pass the mic such as it is
20 over to Rich Edwing from CO-OPS, the Center for
21 Operational Oceanographic Partnerships, for his
22 update. Thank you.

1 MR. EDWING: Great. Thank you,
2 Nicole.

3 So, as Nicole mentioned earlier, we're
4 almost to the end of the fiscal year, so I
5 thought it'd be a good time to look back at the
6 accomplishments and talk a little bit about
7 what's coming up next year for future
8 accomplishments.

9 Before I start, I will mention that,
10 you know, we do have a pandemic going on, but I
11 was very impressed and proud of my workforce for
12 everything that did get done this year.

13 I've got a lot of good things to talk
14 to you about today.

15 So, next slide, please. So, as Dr.
16 Jacobs mentioned, we were able to establish two
17 new port system this year.

18 One in Kings Bay, Georgia. Both with
19 the Navy.

20 And the one in Kings Bay is to help
21 nuclear submarines transit safely in and out of
22 ports down there.

1 And up in New Hampshire at the naval
2 base there, it's to, you know, support naval
3 operations transiting in and out of there, as
4 well as they wanted information on coastal
5 hazards, you know, storms, as well as long-term
6 sea level rise.

7 These are ports number 35 and 36 in
8 the growing network of PORTS.

9 Next slide, please.

10 So, you know, we have found that, you
11 know, once you establish a PORTS, you're not
12 necessarily done because if people start using
13 the information and get used to it, and see the
14 benefits, they start adding on more sensors.

15 And so, across the network every year,
16 you know, we're doing a lot of work to, you know,
17 just not maintain sensors, but add additional
18 ones.

19 So, I won't read through the list
20 here.

21 You can see there's a variety of
22 sensors being added on, from wave buoys to

1 current meters.

2 I should mention the wave buoys, we
3 don't actually do that work ourselves. We
4 partner with the Corps of Engineers.

5 They have a wave buoy network called
6 the Coastal Data Information Program, and if they
7 have a buoy that's already operating nearby when
8 we establish a PORTS, we bring that data in and
9 incorporate it, or sometimes the partners will
10 add a buoy on.

11 The last thing I will mention on this
12 slide is that last bullet.

13 We did complete phase 1 of a NOAA
14 Small Business Innovation Research grant to
15 develop a new fog sensor.

16 There was a whole separate webinar on
17 that given to the HSRP, so I won't talk too much
18 about it but suffice it to say, a much less
19 expensive sensor, as well as have a lot greater
20 capabilities than the technology we're using now,
21 so we're looking forward to, you know, completing
22 the work on that.

1 Next slide.

2 This is a big year for us, where we
3 did our last hardcopy Tide and Tidal Current
4 Tables, and, you know, fully transitioned over to
5 digital.

6 That's 150 years of published tables,
7 so it was a little bit of a hard tradition to
8 leave behind, but the digital tables obviously
9 were cost-effective to produce, worked well, you
10 know, integrated with other technology nowadays,
11 and really provides an improved product over the
12 hardcopy tables.

13 We did a couple of surveys in South
14 Texas and New York Harbor, and we updated tidal
15 current predictions there for safe and efficient
16 navigation.

17 And we developed and transitioned to
18 operations a new rapid response buoy.

19 It does currents and then
20 meteorological parameters.

21 We're using it on our own surveys, but
22 it can also be done in cooperation with the

1 Office of Response and Restoration if they're
2 responding to some sort of oil spill or other
3 type of HAZMAT spill, and need that kind of
4 information to support their response.

5 Next slide.

6 We built our NWLON station down in
7 Rockport, Texas.

8 That was destroyed by Hurricane
9 Harvey, and we got some supplemental funds to do
10 that, and that work was completed.

11 We developed an internal integrated
12 modeling and observation plan that I'm excited
13 about because it's giving us a path forward for
14 how to better integrate our modeling and
15 observation products, but then it's also helping
16 us better understand how models rely on
17 observations, and how to really have those two
18 types of information infrastructure work together
19 better.

20 We're continuing a transition to
21 primary water level sensors that are National
22 Water Level Observation Network.

1 We installed 11 this past year, and we
2 transitioned eight stations fully over to the
3 microwave water level.

4 We do a year-long data comparison
5 between microwave and acoustic, and once we're
6 done with that data comparison, then we can
7 remove the acoustic, so, you know, we did that at
8 eight stations.

9 And then, we've been doing a lot of
10 VDatum engaging, both with base funds and
11 supplemental funds.

12 Some of that work did get delayed into
13 next year because of COVID, but we still managed
14 to get a fair amount done using hurricane
15 supplemental funds down in Texas, Louisiana, and
16 Florida.

17 Next slide, please.

18 We've provided scientific support for
19 an organization called the LA 1 Coalition, and
20 they are supporting the elevation of Louisiana
21 Highway 1, which runs from Port Fourchon up into
22 the interior of the state, and that is the only

1 transportation corridor between a major, major
2 seaport for energy imports.

3 And it floods a lot, and it's going to
4 flood more, and we did an analysis which showed
5 the increasing rate of flooding that was going to
6 occur if it wasn't elevated.

7 And the coalition was successful in
8 obtaining \$135,000,000 worth of grant funding to
9 get that highway elevated.

10 And they really gave us a lot of
11 credit.

12 They gave a lot of credit to the
13 scientific analysis that really showed, you know,
14 the impacts of the sea level rise in the area.

15 For a number of years, we've been
16 putting out a High Tide Flooding Report and
17 Outlook, reporting on what did we see in the past
18 year for high tide flooding, and, you know, what
19 does the next year look like?

20 It always gets a lot of media
21 attention.

22 I think, you know, we've had like 40

1 different media outlets call in. Nicole led that
2 call for NOS.

3 And it's a way to be able to talk
4 about, you know, sea level rise, if you will, in
5 a way because people are seeing this high tide
6 flood in their backyards on a daily basis.

7 And then, a few years ago, we rolled
8 out our Coastal Inundation Dashboard, which
9 pulled together our historic, our real-time, and
10 our forecast data into one place, particularly
11 when storms are approaching the coast.

12 And we've come up with a strategic
13 plan on how to continue, and not just enhancing
14 that dashboard for those existing types of data,
15 but also to bring in other sorts of resilience
16 tools, like frequency of inundation, and
17 exceedance of probability, and sea level trends,
18 so you can come into one place and do all of your
19 resilience planning from, you know, near-term a
20 storm hitting us right now, to long-term sea
21 level rise.

22 Next slide. Okay. So, pivoting to

1 '21.

2 We'll be establishing new PORTS in
3 Valdez. That one will be done very soon.

4 It's not one where we're having to put
5 in sensors.

6 The port has already put in sensors
7 using some oil spill funding.

8 Wanted to work with us to get the data
9 out through, you know, using our product
10 generation and getting the quality control that
11 we provide, and things of that nature, and we'll
12 bring in our NWLON station and integrate all the
13 data into PORTS there.

14 I think we have another Navy PORTS
15 coming up in Kitsap, Washington, as well, that we
16 just signed an agreement for, so that should be
17 another one in '21.

18 Again, there'll be a lot of existing
19 PORTS enhancements.

20 I've just listed one here because this
21 PORTS about to be done.

22 We've had to delay it now a couple of

1 times because of all the hurricanes that are
2 coming into the gulf this summer, by adding
3 visibility and current meters to Mobile Bay.

4 Port Moller, NWLON should be
5 reestablished.

6 That would've been reestablished in
7 FY20, but because of COVID, it's a remote
8 location and people weren't allowed to travel
9 there.

10 So, that should be done early this
11 fall.

12 IGLD, which is the International Great
13 Lakes Datum update that's going on -- and that's
14 a seven year effort, and we're kind of in the
15 middle of it -- which is a big field campaign
16 that's going on next year.

17 Really, that's a partnership between
18 CO-OPS and NGS.

19 You know, we're doing kind of the
20 water level data gathering and the GNSS
21 measurements that are needed to bring the water
22 levels and the land elevations together.

1 And we'll be doing more VDatum
2 gauging.

3 Still more going on down in the Gulf
4 of Mexico, but also doing Puerto Rico and then
5 the Virgin Islands, as well.

6 Puerto Rico and the Virgin Islands was
7 delayed from this past year.

8 Next slide.

9 Okay, and then we're going to be, you
10 know, working on those Coastal Inundation
11 Dashboard improvements laid out in that strategic
12 plan, making those improvements.

13 We'll be upgrading our Northern Gulf
14 of Mexico Operational Forecast System model.

15 It's actually merging three models
16 that are kind of covering most of the Gulf Coast.

17 It's going to be expanding it to cover
18 all of the Gulf Coast, and it's going to be going
19 up the Mississippi River up to the head of tide,
20 which was a nature deliverable from our precision
21 navigation project, which you may recall.

22 So, that's a big deal.

1 And not on this slide, but we'll also
2 be bringing in and operating a West Coast model,
3 a large regional offshore model for the West
4 Coast, which will be our first real-time data
5 assimilation model, so that's exciting, as well.

6 That's bringing real-time data and
7 helping improve the output of the model.

8 Oh, it is on the slide. Stop right
9 there.

10 Visibility. I've talked to you about
11 the ability of the Weather Service to provide
12 visibility probability forecast that right now,
13 they can only do in Tampa Bay.

14 It was done there as a demonstration
15 project.

16 We're working with them to get that
17 expanded now to other Weather Forecast Offices,
18 but those forecasts will be coming out through
19 our models, and upgrading the Northern Gulf of
20 Mexico model is one step we needed to do.

21 Well, we should, once we demonstrate
22 it -- and I think we're going to go to Mobile to

1 do that -- once we do it with Mobile, we should
2 be able to do it, you know, many other places
3 along the coast.

4 And finally, PORTS over AIS. You've
5 been hearing about this one for a long time.

6 There's actually been a lot of work
7 going on behind the scenes.

8 Now the Coast Guard's getting ready to
9 test this at a few locations in October.

10 And if that works out, they'll be
11 doing it for, you know, PORTS over AIS all around
12 the country, you know, later in '21 or early '22,
13 I believe.

14 Next slide, which I think was the end.
15 Yeah, there we go.

16 So, thank you. And I don't know if
17 we're taking questions or not, but back to you,
18 Nicole.

19 MEMBER LEBOEUF: Yeah, thanks, Rich.
20 What a great update.

21 Everything from the new Navy PORTS to
22 that photograph of Port Fourchon, and Louisiana

1 1.

2 CO-OPS is definitely providing
3 information essential to decision makers. So,
4 good stuff. Very exciting to hear what you've
5 been up to.

6 All right, so next, let's move over to
7 Juliana Blackwell from the National Geodetic
8 Survey.

9 Juliana, what's going on?

10 MS. BLACKWELL: Good day, everyone.
11 I hope you're having as beautiful weather as I'm
12 having here.

13 It almost feels like I'm in Hawaii.
14 I'm dressed for it, at least.

15 So, hopefully the sun is shining where
16 you are, and you are all well, and continue to be
17 so.

18 I'm happy to be able to provide a few
19 updates today. We can go ahead to the next
20 slide, please.

21 I'll run through what I plan on
22 covering.

1 The first two topics on the delay
2 messaging and the Foundation CORS infrastructure
3 relate to the National Spatial Reference System
4 modernization effort that's been underway for a
5 while now at NGS.

6 The next three topics, emergency
7 response, and hurricane supplemental, and coastal
8 mapping status are involving the National
9 Geodetic Survey's Remote Sensing and Coastal
10 Mapping program.

11 And then, I will round out with an
12 update on VDatum, which is a tri-office effort.

13 NGS, CO-OPS, and NGS collaborating on
14 that tool.

15 And then a brief update on a
16 socioeconomic benefits study that NGS recently
17 completed.

18 So, we'll go to the next slide,
19 please. Okay.

20 So, as I reported at our last HSRP
21 meeting, NGS was getting prepared to officially
22 release the delay of the modernization effort.

1 The modernization effort has been
2 underway for a number of years. We had great
3 success in doing the data collection and getting
4 our projects aligned.

5 We hit some snags the last couple
6 years with a number of difficulties, including
7 some hiring issues, that I think have been
8 resolved and continue to be something that we
9 have to pay attention to.

10 But also with the number of shutdowns
11 that we experience, as well as the current
12 pandemic.

13 It's really just very difficult to
14 keep the operations going with the airborne
15 gravity collection, which is really a huge
16 foundational piece of what the update will do for
17 the nation.

18 So we officially announced the delay
19 in June, and we did this through a number of ways
20 because while we may understand that, it's really
21 important to have our partners, our customers,
22 our stakeholders understand why things are being

1 delayed, and give them our best update on when we
2 think things will all come together.

3 So, some of the outreach efforts that
4 we've been leading, including updates through our
5 NGS news announcements.

6 These are messages that go out to our
7 subscribers.

8 We've updated our webpage.

9 We've had a number of articles and
10 newsletters, some written by NGS employees,
11 others just being picked up from our partners who
12 are helping us communicate the message of the
13 delay.

14 And then through our geodetic advisory
15 network.

16 We have a set of regional advisors who
17 work very closely with those in their areas and
18 provide them just enormous amounts of updates and
19 support throughout the year on a number of
20 topics, including the latest on the modernization
21 effort.

22 One of the activities that I want to

1 highlight is the webinar that we hosted in
2 August, which had more than 400 people on it,
3 which included just -- almost every state,
4 District of Columbia and Puerto Rico.

5 And through that mechanism, as well as
6 through feedback from our advisors and our
7 information center, we've been collecting
8 feedback from our stakeholders.

9 And I'll say that while not everybody
10 is happy that it's being delayed, that most
11 people understand and expected that this would
12 occur.

13 And many of our stakeholders are
14 relieved that they have more time to prepare for
15 this because this is going to be a major update
16 in the geospatial world by bringing geospatial
17 information into the new reference frame and the
18 new datum.

19 So, they were glad that they had time
20 to prepare because this current pandemic is
21 affecting everybody, and we're going to bring
22 them along with us.

1 One of the other sentiments that was
2 shared with us is that when we proposed to our
3 stakeholders through the webinar if they would
4 want us to a phased roll-out and provide some of
5 the products before all of the tools were ready,
6 and the majority of the folks said they would
7 like us to do this all at once.

8 They do not want to have a phased
9 approach.

10 They really want to be able to
11 transform their data and have all the bells and
12 whistles available before the new reference
13 frames and datum are in place.

14 So, we took that to heart.

15 I will say that on the not so happy
16 side, we've had stakeholders who expressed
17 concern that it's really important to have a
18 modernized National Spatial Reference System to
19 support autonomous ground transportation to
20 support drones, to support the technology that is
21 becoming more and more available.

22 And that that is needed sooner rather

1 than later to prepare for this.

2 And we understand that, and we want to
3 provide it as soon as possible, but we're a
4 little hamstrung right now.

5 Some of the other stakeholders that
6 were not as happy are those who are currently
7 underserved, I would say, by the geodetic
8 infrastructure in their areas.

9 In particular, Alaska, and I know
10 we'll have a chance to talk about that a little
11 bit later.

12 So, those who don't have as great of
13 a set of geodetic control in their area are
14 certainly waiting patiently for an update to the
15 national datums through our modernization effort.

16 Next slide, please.

17 The second activity is also related to
18 the National Spatial Reference System
19 modernization effort, and this is the
20 establishment of a set of Foundation CORS in our
21 network.

22 The goal is to have 36 stations of

1 federally operated, high quality, highly reliable
2 stations that are designed for longevity.

3 And these would be the sites that we
4 would work to maintain with our federal partners
5 that would provide the very basic connection to
6 the National Spatial Reference System and support
7 the rest of the partner network as the primary
8 control points.

9 These stations would also be the
10 primary addition to the international global
11 positioning effort that is occurring across the
12 world.

13 So, the highest level, highest quality
14 stations.

15 Currently, we are working with our
16 partners at NASA and the National Science
17 Foundation to bring in some of the sites that
18 they currently have.

19 We were successful this year in
20 getting an agreement with NASA to include 11 of
21 their sites as part of the Foundation CORS
22 network.

1 We also have a number of NGS sites,
2 eight of them in particular, that are currently
3 part of Foundation CORS -- have been established.

4 We are working with the National
5 Science Foundation to try to get an agreement
6 with them to bring another eight stations into
7 the Foundation CORS network.

8 And then lastly, we have plans to
9 construct nine new stations, and we're looking to
10 partner with other federal entities, if possible,
11 to achieve that final set of stations for the
12 backbone of the CORS network and the backbone of
13 the National Spatial Reference System.

14 Next slide, please.

15 So, switching gears a little bit to
16 talk more about our Remote Sensing and Coastal
17 Mapping applications and mission.

18 As has already been mentioned, NGS has
19 responded to a number of hurricanes thus far this
20 season, the first being in support of Hurricane
21 Isaias that occurred in the East Coast.

22 The photos on the left show a before

1 and after image of the same area so that the
2 changes in transportation systems, as well as
3 infrastructure can be seen as you zoom into these
4 images.

5 In later August, we collected imagery
6 in support of the impacts of Hurricane Laura down
7 along the Northern Gulf of Mexico.

8 Images on the right are showing the
9 before canal, the Sabine Neches Canal, and then
10 the lower image showing -- you can see the water
11 hitting up against something.

12 That's a sunken dry dock that was seen
13 through the imagery that we've collected.

14 So obviously, really important to be
15 able to use this imagery to assess the priority
16 ports that we're responsible for at NOS, and also
17 to determine impacts to infrastructure, roads,
18 other transportation systems, and obviously, you
19 know, businesses and people's homes.

20 So, this imagery we continue to
21 collect in support of not only FEMA, but
22 obviously the coastal emergency responders and

1 social management, and a number of other federal
2 agencies, and also supports a lot of NOAA and the
3 National Weather Service's efforts to determine
4 information about flooding and impacts based on
5 the storm surge.

6 So, as Nicole mentioned, in addition
7 to those two hurricanes, we also had a response
8 last week to Hurricane Sally.

9 Those images are available on our
10 website. Every time we do this, we learn more
11 about the process.

12 Certainly we have our challenges now,
13 too, with doing this in this environment with the
14 pandemic.

15 So, we're getting better at it, and
16 getting the data turned around, and making it
17 accessible in different ways.

18 Next slide, please.

19 Just a very brief update on our
20 hurricane supplemental efforts.

21 Over the last couple years, we
22 received funding to acquire additional topobathy

1 lidar aerial imagery and to update the shoreline
2 in areas affected by a number of different
3 hurricanes.

4 I'll just briefly say that we are
5 finalizing the lidar and imagery data sets for
6 Harvey, Irma, and Maria.

7 And that the acquisition is complete
8 for the Hurricane Florence, Michael, and Typhoon
9 Yutu.

10 NOAA expects to continue to perform
11 their quality assurance, quality control on these
12 data sets, and hopefully we'll have all the final
13 data from the 2019 supplemental in-house in 2021.

14 Next slide, please.

15 Briefly, on our coastal mapping
16 effort, our program this year delivered 6.8
17 percent of the national shoreline.

18 We updated the shoreline, 57 of the
19 nation's priority ports. We met our metrics, and
20 exceeded them in some cases.

21 A lot of that has to do with the fact
22 that we had a lot of this imagery already in-

1 house.

2 We're going to be a little bit
3 challenged if we're not able to get out and
4 collect soon to meet similar metrics for next
5 year.

6 So, we'll just have to wait and see
7 what happens with travel restriction and how that
8 has impacted us.

9 And one other thing I want to
10 highlight is this year, we've moved forward with
11 the procurement of an upgraded topobathy lidar
12 system and an updated camera system.

13 These will enable us to stay up with
14 technology, as well as improve the processes and
15 specifications for how data collection will be
16 done in the future.

17 Next slide, please.

18 Very briefly, on the VDatum side,
19 again, this is a collaborative effort between
20 Coast Survey, CO-OPS, and NGS.

21 We worked together on this navigation
22 service product that allows users to transform

1 spatial data between datums, including tidal,
2 orthometric, and ellipsoidal vertical datum.

3 This year, we released two different
4 -- we had two different releases, 4.1 and 4.11,
5 and incorporated things such as enhancements to
6 support ITRF 2014, some of the GEOID models that
7 were produced recently by NGS, and also the first
8 ever incorporation of spatially varying
9 uncertainties for the New York/Long Island Bight
10 regional models.

11 I think I've mentioned this in the
12 past, but we're also working with the exploratory
13 models for Alaska, and we expect that we will be
14 able to get a West Coast regional model updated
15 in FY22.

16 And lastly, with our supplemental
17 work, we are also collecting foundational
18 geodetic and water level data to help improve the
19 future models in those areas the next time
20 they're up for renewal.

21 And the next slide, next and last
22 slide.

1 I just briefly want to mention a
2 recent socioeconomic benefit study that was
3 completed.

4 The NGS Aeronautical Survey Program,
5 something that we don't talk a lot about here at
6 the HSRP, but we do support land, water, and air
7 positioning.

8 We do a lot of the quality control of
9 airport surveys that are conducted by third-party
10 surveyors in support of the FAA.

11 So, we did a benefit study on this to
12 determine what the value is of that to the
13 nation, and the study resulted in an estimate of
14 between 3,000,000,000 and \$13,000,000,000 over
15 the next decade in support of the work that we do
16 in support of keeping the National Airspace
17 System safe, and in support of the Federal
18 Aviation Administration.

19 We've done a number of other
20 socioeconomic studies in the past, and I just
21 listed those in case you want to take a look at
22 them.

1 And with that, that is my last update.
2 Thank you very much.

3 MEMBER LEBOEUF: Juliana, thank you.
4 That is also a lot. You've got a lot going on.

5 I appreciate everything you all have
6 been able to do throughout the season and
7 throughout COVID.

8 So, last but not least, of course,
9 let's pass the mic to Admiral Shep Smith as the
10 Office of Coast Survey's director.

11 Admiral Smith?

12 RDML SMITH: Thank you, Nicole. And
13 happy to bat clean-up on this great set of
14 presentations.

15 I'm struck, as Rich pointed out
16 earlier, at how much we've gotten done despite
17 COVID, and I think the same is true at Coast
18 Survey.

19 There are things we didn't do, and
20 maybe that's why we had the attention span to get
21 to all the things that we did.

22 So, I'm going to take a similar

1 approach as the other directors, but I'm going to
2 really kind of focus a lens on how we're aligning
3 Coast Survey -- given the conversation we're
4 about to have with NOMECS, how we're aligning
5 Coast Survey's activities with the NOMECS
6 strategy, and a few activities that are relevant
7 to that.

8 So first, we have a long awaited, what
9 we were calling for a while our ocean mapping
10 plan.

11 We delayed its release in order to
12 have it be released in the context of the NOMECS
13 strategy, and we're pleased with the amount of
14 natural alignment we already had.

15 But this document is out and
16 available. We published it in July.

17 But it really describes sort of a new
18 take on how we're driving our ocean mapping
19 program, our hydrography program, how we're
20 prioritizing things, how we're balancing the
21 needs for various different types of surveys, and
22 most importantly, sort of how we're partnering

1 with the larger ocean mapping community to ensure
2 that all of our work has the maximum public
3 impact.

4 It's divided into two goals. The
5 first is very narrowly on navigation needs, so
6 optimize the safety, and efficiency, utility of
7 the nation's marine highway infrastructure.

8 So, this is all of our shipping routes
9 we want, and, you know, everything from inside
10 the ports, all the way through to the major
11 global transit survey.

12 So, that encompasses our work for
13 improved services under precision navigation for
14 high resolution bathymetry.

15 We're partnering really well with the
16 U.S. Army Corps of Engineers to do that to a very
17 high standard in our ports.

18 The second is the mapping the ocean
19 more generally.

20 Now, this to be sure has navigation
21 impact, but it is not narrowly targeted in the
22 way that we would for a port or a route, say, but

1 it is generally charting the coastal waters in
2 the United States, and all the way out to the
3 U.S. EEZ.

4 This also happens to align completely
5 with the NOMECS strategy as released by the White
6 House in July.

7 Under that goal, we have several
8 activities that really help us align and partner
9 with others for that part of the framework, and
10 we'll be hearing more about that later.

11 Next slide, please.

12 A huge part of this effort for both
13 NOMECS and our own strategy is to make our data
14 useful and usable and acceptable.

15 (Audio interference)

16 RDML SMITH: Is our effort to build,
17 not an archive where all of the bathymetry
18 collected over the years can be found in order
19 for users to compile it in their own way, but
20 really an operational database where you can just
21 point your users at a bathymetric service and
22 have access to the latest bathymetry.

1 Now, to be sure, this is certainly the
2 most ambitious we've ever done, and it really
3 differs from the way that other bathymetric
4 compilations have been done in the past in two
5 important ways.

6 One is that it's not at a fixed
7 resolution, where we have high resolution data
8 all the way down to a half meter in some areas.

9 That is preserved and available in the
10 database.

11 Second, it is continuously updated.

12 So, the U.S. Army Corps of Engineers
13 does surveys in port areas, sometimes quite
14 frequently, and they distribute their data
15 through a U.S. Army Corps of Engineers eHydro
16 database.

17 We scrape that database daily and
18 update the master database.

19 Similarly, we're pulling the NOAA
20 lidar and the JALBTCX lidar from the Digital
21 Coast archives, we're pulling data from NCEI, and
22 as we discover new external data sources, we're

1 helping to bring those into the public domain,
2 and helping, and pulling it all together.

3 And then lastly, there's a global
4 effort -- well, I think we may hear from Vicki
5 Ferrini in the public comment period -- the
6 Global Multi-Resolution Terrain model, GMRT, was
7 through a compilation mostly of the deeper part
8 of the ocean.

9 And we're linking in a seamless
10 partnership with Vicki Ferrini at Lamont-Doherty.

11 So anyway, this is very exciting. You
12 can see the Army Corps' data there is in red.

13 It's a significant contributor for
14 navigation safety.

15 As a percentage of the whole ocean,
16 it's not very big, but we're very pleased that
17 it's a well-integrated part of our system.

18 Right now, we are doing this in
19 phases.

20 This is the first phase for just the
21 Northeast, New York to the Canadian border.

22 And the next region that we're taking

1 on is the Gulf of Mexico.

2 But we anticipate being able to, you
3 know, march through the U.S. coast, around the
4 U.S. coast in the next few years and get this
5 fully compiled and put it into full maintenance.

6 This is critical internally for our
7 charting program.

8 As you've heard, we're updating all of
9 our charts, a whole new scheme of charts,
10 rebuilding all of our charts from scratch.

11 We simply cannot afford to go chart by
12 chart and go back and pull historic data.

13 We have to have the bathymetry readily
14 available.

15 And so, this is enabling not only for
16 us, but also as a service more broadly.

17 It has big implications for our
18 ability to more rapidly and rigorously update all
19 of our modeling efforts, from the tsunami runup
20 models to coastal hydrodynamic models for HABS
21 and navigation, and storm surge models for
22 coastal resilience.

1 And so, this is an exciting piece of
2 geospatial infrastructure that we'll be serving
3 on.

4 Next slide, please. Just some
5 examples.

6 This is, you know, on the left there
7 is all the different sources all put together.

8 It is rule-based, but they're complex
9 rules.

10 It would be really much easier if the
11 best data was always the most recent, but it
12 isn't always the case.

13 We have very flexible algorithms to
14 allow us to be able to understand and choose the
15 most appropriate and most probable seafloor in
16 order to knit together a seamless model like you
17 see on the right.

18 Next slide, please.

19 We are continuing to build our
20 interagency partnerships.

21 These are other federal agencies, and
22 this doesn't even include all of the partnerships

1 we have within NOAA for doing bathymetry and
2 seabed mapping at sea.

3 But we do have agreements in place
4 with these three agencies that we've renewed in
5 the last year, where we can be an execution arm
6 for them, bringing our capabilities, our capacity
7 -- not only our in-house capability and capacity,
8 but also what we can bring through our contract
9 and our other partnerships to bear on behalf of
10 the entire federal government.

11 We've had a couple of really good
12 examples in recent months.

13 Barry Arm, up in Alaska, is an area
14 that was recently exposed by receding glaciers,
15 and the assessment by USGS was that it was very
16 dangerous.

17 As a geohazard, there's a high
18 probability of a landslide causing a tsunami
19 within Prince William Sound, which has a long
20 history of devastating tsunamis.

21 And so, we were able to get that done
22 by a contract.

1 And similarly, in the last few years,
2 we've just finished up a multi-year project in
3 the Channel Islands with both NOAA programs and
4 interagency.

5 Next slide, please.

6 So in addition, so outside the federal
7 government, we have academic partnerships with
8 the University of New Hampshire regarding --
9 we've already heard about that -- the University
10 of Southern Mississippi, and the University of
11 South Florida.

12 We'll be hearing more about those in
13 years to come.

14 But this really brings us a level of
15 capability and reach into the academic community
16 for deeper research, and trying out some bleeding
17 edge technology, and that sort of thing that
18 complements what we can do in-house to our
19 contractors.

20 Our big hydrographic contracts were
21 renewed this past year, and we're very pleased.

22 I think this is the strongest group of

1 contractors that we've ever had, and, you know,
2 all these companies bring something a little bit
3 different, you know, not only with sort of
4 geographic spread, but, you know, differences in
5 capabilities and expertise and equipment.

6 And it really helps us to be able to
7 solve pretty much any problem you would imagine
8 in the ocean mapping realm, and to do it at
9 scale.

10 You know, one of the things that I
11 like to say is that, you know, through these
12 contracts, we could year over year double our
13 OPTEMPO funds available, and I think that's
14 pretty unusual for that level of nimbleness for a
15 federal program.

16 And we often do maybe not quite
17 double, but have significant bumps as a result of
18 supplementals after hurricanes.

19 Next slide, please. This is just some
20 examples.

21 We're not really going to be talking
22 about unmanned systems very much, but I know the

1 panel is very interested in it.

2 These are all activities from the last
3 year in unmanned systems, you know, associated in
4 some way with Coast Survey.

5 A lot of these are our contractors, so
6 through our contracts and working with our
7 contractors, we've been able to find projects and
8 apply really the cutting edge technology to
9 problems -- really varied mapping problems around
10 the coast.

11 We've had, you know, unmanned systems
12 operations in Alaska and Florida, Great Lakes,
13 you know, off of the Chesapeake Bay, and
14 elsewhere.

15 So this is really one of the main ways
16 that we are engaging industry in the technology
17 sector on this, and I'm really proud of how far
18 the hydrographic community has come in the last
19 few years in maturing this technology.

20 Well, let me just say, I think we're
21 at the pivot point now where some of these
22 technologies are mature enough that we could take

1 them to scale, right?

2 A big slug of money invested in some
3 of these technologies right now would be a good
4 investment.

5 I wouldn't have said that a few years
6 ago because some of them were still pretty
7 immature, but there's some really good stuff out
8 there.

9 You know, obviously we have pictures
10 of little -- I used to say little yellow boats,
11 but clearly they're orange and red and all that,
12 and gray, and all the colors of the rainbow now.

13 But, you know, the tricky part is not
14 making a boat that can drive around in the water,
15 the tricky part is making it do hydrography.

16 And we're really investing heavily
17 through our university partnerships and our own
18 work, and working with the commercial sector on
19 trying to really improve that, too, so that
20 they're not just remote controlled, but that
21 they're truly autonomous.

22 Next slide, please.

1 And that's all I've got, Nicole. I'll
2 turn the gavel back to you.

3 Oh, wait, can I make one more point
4 before I turn --

5 MEMBER LEBOEUF: Of course.

6 RDML SMITH: And that is now, on the
7 unmanned system then, in general, if we go back
8 to the NOMEK strategy, the milestones we've put
9 out in the NOMEK strategy are simply not possible
10 using today's technology.

11 This isn't just a question of throwing
12 money at the problem until we're done.

13 We simply cannot do particularly the
14 shallow half, or the shallow two thirds of the
15 problem, which is 40 meters and shallower.

16 We simply cannot do it with today's
17 technology.

18 And it'll only be through the
19 continued investment in those types of systems
20 from the previous slide, as well as artificial
21 intelligence and new communication systems, and
22 other types of advanced sensor technology that we

1 will be able to get to the point where we could
2 have a plan where we could actually achieve that
3 full ocean mapping goal.

4 So, we're going to continue to invest
5 in this.

6 I hope that any investment that the
7 federal government makes broadly will contain a
8 significant portion for technology investment in
9 the early years, as well.

10 But that's my last point, Nicole.

11 Back to you.

12 MEMBER LEBOEUF: Thank you, Shep. You
13 know, I feel like I want to almost retitile this
14 session because of making the most of and in
15 spite of COVID.

16 You all have done an amazing amount of
17 work, innovative work, and really in ways that we
18 could not have done without this situation.

19 So, congratulations to everyone. It's
20 very impressive.

21 Thank you all for your attention, and
22 to the NOS Office directors that were here today,

1 and to all of their invaluable work.

2 We are -- continue to produce top
3 quality work despite the challenges, like I said,
4 in spite of -- and yeah, it's amazing.

5 With that, let's pass it back to
6 Chairman Saade, and let's give this the rest of
7 our day.

8 CHAIR SAADE: Okay, thanks. As Nicole
9 said, that's great stuff. It's always really
10 nice to see the big leaps forward on the
11 technologies.

12 I'll defer to Lynne real quick.
13 Should we do some Q&A, or should we take a break?

14 MS. MERSFELDER-LEWIS: Q&A. HSRP, ask
15 away.

16 RDML SMITH: So, just to clarify, this
17 part of the Q&A is for the panel members only.

18 We'll get to public comment in a
19 little while.

20 PARTICIPANT: Right.

21 CHAIR SAADE: Okay. So, with that, do
22 we have any questions from any members of the

1 HSRP on these past several presentations?

2 Julie? Julie Thomas raised her hand.

3 CO-CHAIR THOMAS: Am I unmuted? Yes,
4 I am. Okay.

5 No, Shep, can you clarify a little bit
6 more that less than 40 meters?

7 I know that's a really difficult part
8 of the nearshore.

9 Are there agencies, groups, academia,
10 technologies that are actually currently being
11 addressed to measure that part of the shoreline,
12 or have people just kind of written it off and
13 thought, oh my gosh, not now?

14 RDML SMITH: Well, I mean, my program
15 mostly spends its time in that space because
16 that's the navigation-relevant part of the coast.

17 And so, shallow water multibeam
18 clearly works, but it's very laborious in that
19 depth of water.

20 Bathymetric lidar works really well
21 when the water is like it is right behind me here
22 in my video, but that's, you know, not often in

1 the estuaries and a lot of --

2 (Simultaneous speaking.)

3 RDML SMITH: You know, I think the
4 messaging on the 40 meters has been a little bit
5 awkward.

6 We wanted to have a significant
7 milestone by 2030, but we've recognized that that
8 milestone could not complete everything.

9 But we didn't want to define the scope
10 of the entire problem to be only do the easy
11 part, and the part that only meets some societal
12 needs, right?

13 Navigation out of our sanctuaries and
14 marine protected areas, coastal modeling,
15 habitats.

16 There's a lot of really valuable
17 reasons to have the mapping in the shallower
18 water, that fades away as the water gets deeper.

19 And so, recognizing all of those
20 really valuable societal benefits, we wanted to
21 keep the overall goal to be if it's water, map
22 it, right? The whole thing.

1 But, to give ourselves a little bit
2 more time, not only because it was going to take
3 longer, but because we recognize that that region
4 would benefit from a technology surge.

5 Disproportionately benefit from a
6 technology surge in future years.

7 We could imagine that with a not
8 reasonable amount of money, but an imaginable
9 amount of money, we could do the 40 meters and
10 deeper by 2030.

11 CO-CHAIR THOMAS: Okay.

12 RDML SMITH: We couldn't make the same
13 argument for the 40 and shallower.

14 CO-CHAIR THOMAS: Right. Okay,
15 thanks.

16 CHAIR SAADE: Anyone else have a
17 question?

18 CO-CHAIR THOMAS: I'll go one more if
19 no one else has anything.

20 CHAIR SAADE: Yeah, go ahead, Julie.

21 CO-CHAIR THOMAS: I was interested --
22 I think it was Rich, you mentioned PORTS over

1 AIS.

2 This is actually fantastic. I mean,
3 I think a lot of people have been working a long
4 time on that.

5 So, since you're bringing in the CDIP
6 wave buoys there and integrating them into the
7 PORTS system, do you know, are the waves also
8 going to be over AIS as part of the PORTS there,
9 or will they not be included?

10 And you might not know the answer to
11 this, but I was just curious.

12 MR. EDWING: Yeah, so Julie, this is
13 Rich. I believe they will be, but let me just
14 double check and get back to you on that. But I
15 believe the answer is yes.

16 CO-CHAIR THOMAS: And, you know what
17 would be really helpful, Rich, is maybe to have -
18 - you can just email me -- but if I could have a
19 contact person in CO-OPS or PORTS who is working
20 on that?

21 It would be great because we also are
22 doing the parallel work to try to get our wave

1 buoys over AIS.

2 We have wave buoys in ports, in
3 harbors where there are not NOAA PORTS system.

4 So, it would be really great to try to
5 collaborate with what you're doing there, and
6 make that expansive into the wave data, also.

7 Thank you.

8 MR. EDWING: Sure. I'll be glad to
9 provide some contact information.

10 But really, at this point, all the
11 work's being done on the Coast Guard side. Yeah,
12 we kind of --

13 CO-CHAIR THOMAS: Oh, okay.

14 MR. EDWING: You know, we kind of
15 completed what we needed to do years ago.

16 But they needed to make changes to
17 their IT system and do some other things, but
18 I'll get you some contact information so you can,
19 you know, ask whatever questions you would like.

20 CO-CHAIR THOMAS: Okay, great.

21 Thanks.

22 MR. EDWING: Sure.

1 CHAIR SAADE: Okay. We're going to
2 take another short -- or Nicole, do you have a
3 question?

4 MEMBER ELKO: If we have time, I'd
5 like to ask a quick one.

6 CHAIR SAADE: Sure, go ahead.

7 MEMBER ELKO: Okay, thanks. So, I'm
8 new to the HSRP.

9 I haven't seen all of you in person
10 yet, and I'm looking forward to working with you,
11 so I don't really have a great feel for the
12 dynamics of the group because this is, you know,
13 how I know you so far.

14 So, I did really appreciate the
15 comments from Shep about the collaborations that
16 are going on, and relative to Julie's question
17 about, you know, the coastal zone, which is the
18 zone I live in and work in, there's so many
19 agencies in there, right?

20 There are all these interagency groups
21 popping up right now to work on coastal topics.

22 And if in future briefings, it would

1 be really helpful for us, I think, to understand
2 a little bit more about how you're collaborating
3 with other agencies, and how you're building on
4 those capabilities to avoid duplication of
5 efforts, and just increase the odds that the new
6 capabilities that are developed will endure.

7 CHAIR SAADE: That's a really good
8 point, and we're going to have a considerable
9 amount of time later on today for various topics,
10 and we can all give you some background on that,
11 as well as get your opinions on that.

12 But yeah, I think I can speak for
13 everybody, we're gung-ho on all that, on
14 collaboration and making sure we track it.

15 Okay, thanks. We'll break right now
16 and be back at the top of the hour, so take about
17 five minutes, and see you soon.

18 (Whereupon, the above-entitled matter
19 went off the record at 2:55 p.m. and
20 resumed at 3:05 p.m.)

21 CHAIR SAADE: Okay. We are, we have
22 a couple of more questions that we're going to

1 take care of from that last session and then
2 Kelly if you want to go first.

3 MEMBER KELLY: I was just trying to
4 actually find out technically how to raise a
5 question.

6 CHAIR SAADE: It worked.

7 MEMBER KELLY: It worked right then,
8 but it's not the correct way to do it. I have a
9 comment, but that can wait until later when we're
10 doing our summary.

11 I'm just trying to skip technical as
12 to if there is a question to be asked, how do we
13 actually raise our hand and get recognized.

14 CHAIR SAADE: All right.

15 RDML SMITH: Thanks, Ed. I think Phil
16 had one too, Ed.

17 CHAIR SAADE: Okay, we'll come back to
18 you on that, Ed. We'll have a formal statement
19 on that in just a little bit and I'll go to Sal
20 for right now for question on the last session.

21 MEMBER RASSELLO: Hello. Okay. Yeah,
22 I have a question for Admiral Smith. They've got

1 these I guess at 40 meters depth. And regarding
2 the precise navigation, we're going to develop,
3 what is the scope of the 40 meters and not 30
4 meters since the ECDIS reads over 30 meters
5 inland?

6 I just try to understand the number,
7 you know, 40 meters versus 30 meters would be
8 probably more appropriate for the precise
9 navigation.

10 RDML SMITH: Yeah, that's a good
11 point. I do want to just clarify that the intent
12 is not that we're going to stop doing navigation
13 surveys in less than 30, 40 meters of water.

14 That course, is ineffective, but nor
15 do we expect, in fact, the OPTEMPO to increase in
16 shallow water as well, but that we don't, we'll
17 not finish before 2030.

18 So the, and this is, you know, the
19 number that was, it's a round number, frankly,
20 taken from a wide variety of context.

21 And it happened to align with a level
22 of effort study that we had done where that was a

1 sort of a one-third of the effort is deeper than
2 40 meters and that was why we, that was why we
3 chose that.

4 But I agree with you that the
5 navigation depths are all shallower than that.

6 CHAIR SAADE: Okay, Sal? Okay. So
7 don't go anywhere, Shep, because all I'm going to
8 do is say I'm turning it over to you for ocean
9 and coastal mapping strategies.

10 RDML SMITH: Okay, so this is
11 introducing what I, this is a repeat of a webinar
12 that we did with the panel members. I mean
13 there's really a summary of a, of the strategy
14 that was developed and published back in June and
15 the hope is that this is, this and the part that
16 Juliana will be describing for the Alaska Coastal
17 Mapping Strategy and the Standard Ocean Mapping
18 Protocol will all be, provide some food for
19 thought.

20 And maybe inspire some comments from
21 both the members and the public. And so, we did
22 ask the HSRP to consider making recommendations

1 to NOAA on the implementation plans that we'll
2 follow, the NOMEAC and Alaska Coastal Mapping
3 Strategies.

4 So this is an ask from NOAA to the
5 panel. In addition, we're using the public
6 nature of this meeting to be one of a number of
7 touchpoints that the NOMEAC counsel will be making
8 to gather public input in the early stages of
9 developing the strategy.

10 Next slide please. So going back to
11 last November, the President issued a policy
12 memorandum saying that the, Presidential
13 Memorandum saying it's a policy of the United
14 States to act boldly to safeguard our future
15 prosperity, health and national security through
16 Ocean Mapping exploration and characterization.

17 This is a really exciting development.
18 I don't remember the President ever talking about
19 ocean mapping as directly as this and certainly
20 not flagging, as you know, the links to national,
21 to economic prosperity and national security
22 calls, et cetera.

1 So the, and at the same time, the
2 completing mapping for Alaska and the Alaskan
3 Arctic, or what we have post lag as part of that
4 Presidential Memorandum back in November.

5 Between November and June, we
6 developed and vetted through a protracted
7 interagency process a National Strategy which is
8 still pretty high level and that was published in
9 June.

10 And then the next phase is coming up
11 with an implementation plan which is really,
12 okay, how are we going to do this? And as I said
13 at the beginning, there's been quite a lot of
14 discussion from a lot of different parts of the
15 ocean mapping community that they would like to
16 have visibility and a voice into this process.

17 And this public session is one piece
18 of providing that voice. And we'll let you know
19 some other ones coming up. So NOMECA is the
20 National Strategy for Mapping, Flooring and
21 Characterizing so NOMECA.

22 The United States Exclusive Economic

1 Zone and just to be clear, this does include the
2 Great Lakes and does include the state waters and
3 so it's a bit of a shorthand that strict
4 geographers would quibble about that terminology,
5 but the intent is to be inclusive.

6 We have an implementation plan. the
7 first draft of which is due December 8th to the
8 Ocean Science and Technology Committee with all
9 kinds of different agencies represented.

10 We from the very beginning, we have
11 been committed to being very inclusive within the
12 constraints of the law on developing this
13 strategy with input from the public and from our
14 philanthropic, academic and commercial partners
15 and so I hope we will hear from you all today.

16 Next slide. So goals, there's five
17 goals in the NOMECS strategy. The first is really
18 about a governance. Really how are we going to
19 coordinate not only across interagency, but also
20 the other sectors and really the big part of that
21 is establishing the NOMECS counsel.

22 As Dr. Alan Leonardi, Dr. John Haines

1 from the USCS and I co-chair that counsel and
2 that has just now been stood up. And our first
3 order of business is to develop this
4 implementation plan.

5 Goal two is really the heart of it if
6 you're into mapping which is simply to map the
7 U.S. EEZ. The first stage of that is to sort of
8 define what sort of a standard set of protocols
9 for what we would do together so that if we did
10 something and USGS did something and someone
11 wanted to let, to make an allowance and a
12 commercial tender that we would all be talking
13 about a similar set of ocean mapping activities.

14 And so that it will fit together into
15 a seamless set of services eventually. Second is
16 to coordinate and execute the campaigns to map
17 the United States EEZ.

18 We envision this to be done regionally
19 and for regional mapping efforts there's a lot of
20 disparate geographies in the U.S. coasts and the
21 stakeholders and those with capabilities in each
22 of those regions are pretty disparate as well.

1 And so while that has not happened
2 yet, we do envision a regional flavor to that.
3 The third is to make the data usable and
4 available.

5 I showed you one example of that with
6 the National Bathymetric Source a few minutes
7 ago, but that really only covers bathymetry. It
8 does not cover seabed backscatter or water column
9 data or any physical oceanography sub-bottom, et
10 cetera, et cetera that would be part of a, you
11 know, a Standard Ocean Mapping Protocol. So
12 those are still open questions as to what extent
13 we can and can't, and can make those data more
14 readily available.

15 Next slide. Goal three is to, is
16 exploration and characterization. This really is
17 the focus here, so just a quick definition check
18 here. The characterization -- exploration is
19 about activities where there is less known.
20 Characterization is observations and in excess of
21 what might need to be done for basic mapping for
22 a particular application.

1 So I could give all kinds of examples,
2 but I don't want to get hung up on it. We sort
3 of were giving the sort focus to that to the OEAB
4 for their consideration.

5 So we've sort of de-emphasizing it for
6 the conversation here. Although it is part and
7 parcel of the whole effort. Goal four is about
8 the technologies.

9 And we chose these verbs very
10 carefully to develop and mature. It's this is,
11 these are active roles we need to take. We can't
12 just use the latest technology because we are
13 this sector and it won't be developed if we, if
14 it's not for us.

15 And so we need to be, take an active
16 role in developing and maturing those new
17 technologies. The, you know, that's you can
18 imagine how it will work.

19 We need to identify the needs and
20 support the development of those of the
21 technology to meet those needs and then support
22 partnerships with organizations that are working

1 on that.

2 And there's a lot of different ways
3 that that can be implemented and I look forward
4 to your thoughts on that. And then, last is a
5 partnership goal to build partnerships beyond the
6 federal agencies and maximize opportunities for
7 non-federal participation.

8 And also to inspire and involve the
9 public. And this is not just in this sort of in
10 the NASA Wow! way, this is, you know, also to
11 ensure that we're meeting the needs of the
12 public.

13 And that the applications that we
14 might derive from these activities are, the needs
15 are being met by the larger program.

16 Next slide. So here I'm going to turn
17 it over to Paul Turner from the Interagency
18 Working Group on Ocean and Coastal Mapping who
19 will describe the process for where we are with
20 Standard Ocean Mapping Protocol. Go ahead, Paul.

21 MR. TURNER: Thank you, Admiral, and
22 good afternoon everyone. I'm Paul Turner and I

1 work with Ashley Chappell with Integrated Ocean
2 and Coastal Mapping program with NOAA's off the
3 coast survey.

4 And I'll be giving you an update on
5 the Standard Ocean Mapping Protocol currently in
6 draft with the interagency working group, Ocean
7 and Coastal Mapping along with contributing
8 subject matter experts from the various science
9 federal agencies.

10 And we're working towards drafting the
11 SOMP as we've come to call it. The Standard
12 Ocean Mapping Protocol which is in support of
13 goal 2, the NOMECS strategy, Subsection 2.1 which
14 basically states develop a standard ocean mapping
15 protocol.

16 And within this, we are intending to
17 establish baselines and national data standards
18 to guide participants from federal, state and
19 non-government and ocean mapping data
20 acquisitions and processing.

21 Protocol will provide recommendations
22 and standards, specifications and best practices.

1 We intend to improve communication, reduce costs
2 and prevent unnecessary and redundant work.

3 The protocol is also intended to serve
4 as a guide for all partners in the ocean mapping
5 world which also includes exploration and
6 characterization to ensure the widest use of data
7 that's available.

8 The protocol will, at a minimum,
9 include seven primary features which are data
10 management and data stewardship, bathymetry data
11 from the following sources of multibeam, single
12 beam, sonar and lidar systems, seabed
13 backscatter, water column data, sub-bottom
14 profiling, magnetometer data and side scan sonar
15 imaging.

16 We're going to follow and include
17 national data standards within the protocol that
18 align with Geospatial Data Act of 2018.

19 And one big goal that we're, you know,
20 looking to include within those is to ensure the
21 widest access and use of all of these data
22 sources that are acquired to maximize data

1 stewardship and minimize duplication.

2 Next slide please. And to promote our
3 protocol that we're drafting or still in the
4 initial phase. They've really been working on
5 this just over the last couple of months, so
6 during the summer.

7 That interagency working group will be
8 holding a virtual symposium on October 6th and
9 7th. I have some of the details here outlined in
10 the slide.

11 But the purpose of the symposium: to
12 enable non-federal sea quarters to learn about
13 our protocol and provide an opportunity for
14 comment on it.

15 There's a link on the slide for the
16 symposium registration which provides brief
17 summaries for each of the seven primary
18 components.

19 We'll be facilitating lightning talks
20 which are based on submitted topics of interest
21 from the registration process. And we'll also be
22 holding roundtable discussions for each of the

1 seven primary chapters or features to gain
2 feedback, input and comments from the audience.

3 We know the academic world and the
4 private sector have a lot to share and we welcome
5 their input and look forward to including their
6 feedback on the protocol going forward as we
7 begin to draft it in the next few months.

8 Effectively, the purpose of us holding
9 this event is to enable the non-federal
10 stakeholder to hear and learn about the standard
11 Ocean Mapping Protocol and to provide an
12 opportunity for inclusion, further input.

13 That kind of brings me to the end of
14 my slides. Thank you for your time and I look
15 forward to any questions or follow-up.

16 RDML SMITH: Thank you. I'll turn
17 this over Juliana for her to walk us through the
18 rest of this.

19 MEMBER ABDULLAH: Is there a question
20 now, Ed?

21 CHAIR SAADE: I was going to turn it
22 over to Juliana, but should we go ahead and take

1 questions?

2 MS. MERSFELDER-LEWIS: Hi, you guys.
3 No, I would say wait until the end for all the
4 questions. Sorry about that.

5 CHAIR SAADE: That okay. No problem.
6 We'll get back to you, Qassim. Well, Juliana, if
7 you could go ahead and take the lead on the
8 Alaska Coastal Mapping please.

9 MS. BLACKWELL: Certainly. I have
10 four slides so we'll get through this pretty
11 quickly. I basically just wanted to go through
12 what the goals and objectives are within the
13 goals of the Alaska Coastal Mapping Strategy.

14 But let me just start out by saying
15 that we were charged with completing the strategy
16 for mapping the Arctic and sub-Arctic shoreline,
17 the near shore and also end of shoreline.

18 And really the charge is to make sure
19 that we are coordinating with the State of Alaska
20 and the Alaska Mapping Executive Committee.

21 NOAA's been involved in the Alaska
22 Mapping Executive Committee since its inception

1 and I am pleased to say that we are now Co-Chair
2 of that group and have been working very closely
3 with our federal partners and the state partners
4 to do a lot of the ongoing work in Alaska on the
5 coastal mapping side and the other geospatial
6 data sets that have been focused on.

7 So the four goals of the Alaska
8 Coastal Mapping Strategy are here before you.
9 You know, again, first and foremost, building on
10 existing mapping partnerships.

11 There are a number of them and we want
12 to make that we, if there aren't folks involved,
13 we want to make sure that we get them involved,
14 but we want to use what we already have in
15 existence.

16 We are definitely under a tight
17 deadline to get this strategy in place and also
18 the implementation plan in place and making use
19 of what we have available.

20 The second goal, expand the data
21 collection to deliver the priority products that
22 stakeholders require. What are those things that

1 people want most and will benefit the most?

2 Third goal, leverage innovation in
3 mapping technology development. I should
4 mention, you know, we need to continue to push
5 this. We need to have new technology that we can
6 capitalize on for these efforts.

7 And then the fourth goal, you know,
8 the importance of communication and strategic
9 communication to promote engagement, to include
10 stakeholders, and to promote the engagement of
11 those stakeholders.

12 Next slide, please. So the strategy
13 itself is rather short and what it does is it
14 goes through and identifies specific objectives
15 under each of the goals.

16 So under the first goal, let's see
17 here, the four objectives, one is to establish a
18 team and that has been completed as you see at
19 the bottom of the screen here.

20 NOAA proposed the creation of a
21 coastal mapping technical subcommittee under the
22 AMEC, the Alaska Mapping Executive Committee, and

1 that was approved and stood up.

2 And now they are working hard on the
3 coordination and development of this Alaskan
4 Coastal Mapping Implementation Plan. So we've
5 got that one going.

6 The second objective is to refine the
7 mapping priorities of our stakeholders and think
8 about the cost and the data standards that are
9 required.

10 Third, and very important, resource
11 it. We can have a plan, but we need to be able
12 to resource the implementation of that plan.

13 And fourth, integrate with other
14 complementary priority mapping themes. Nothing
15 is in and of itself. It's all part of a bigger
16 system so we want to make sure where those touch
17 points are and make sure that we're integrating
18 the needs, and the needs and connections with
19 other data sets.

20 Next slide, please. Under the second
21 goal, objectives include having an agile plan and
22 a campaign because we know, just like with 2020,

1 things happen.

2 We've got to be able to be versatile
3 and have Plans B, C, and D ready in our back
4 pockets so that when things go a different way
5 than we planned, that we're able to make progress
6 on things.

7 So we want to be able to execute an
8 agile plan. Second objective under this goal is
9 to make sure that we have the foundation
10 necessary by upgrading the National Spatial
11 Reference System components to support the
12 mapping data acquisition.

13 As I mentioned in my presentation
14 earlier, foundation cores and the NOAA Cores
15 Network, to make sure that there are GNSS
16 stations that are available and that we have the
17 proper models.

18 And we have an updated NSRS in Alaska
19 so that this information is being layered on top
20 of something that is the most accurate and the
21 most relevant in today's world and using today's
22 technology.

1 And then third, to produce and
2 disseminate the data sets and products from this
3 mapping plan. So we want to make sure that
4 collecting the data is one thing, but what are we
5 disseminating out of that and how is that going
6 to be used?

7 Next slide, please. So for goal
8 three, the two sub-objectives under that are to
9 upgrade the Alaska climatology tool for smart
10 application of satellite/airborne lidar.

11 You know, we're determining, you know,
12 what the water quality clarity is so that we can
13 utilize that for surveying purposes and improve
14 that tool so that it better serves us in this
15 effort.

16 Secondly, monitor and test new
17 technologies for acquisition efficiency. We need
18 to do that throughout our operational needs, so
19 nothing new here.

20 But then the coastal side is same as
21 with the ocean side, how do we develop, monitor
22 and test these technologies. And then the last

1 goal of the strategy is again focusing on the
2 communication and promoting stakeholder
3 engagement.

4 So for strengthening the
5 communications, growing the participation, we've
6 can only have a better product. We get the buy
7 in, get people's input and look for ways that we
8 can work together to implement this strategy and
9 to use online tools and as we're doing now and
10 technologies to communicate plans and
11 performance.

12 So it's not just about sharing
13 information, but monitoring how we're doing with
14 things and being able to share that with a broad
15 range of stakeholders.

16 So that was my last slide, but a
17 couple of other comments I would just like to add
18 onto. As far as stakeholder engagement, I know
19 that there is a tentative date for an Alaska
20 Coastal Mapping Summit. I think November 5th is
21 the current date that's being looked at.

22 We want to have something that we can

1 invite others to from the public, from the state,
2 from other federal entities, tribal, and make
3 sure that we are casting a wide net and getting
4 input through this Alaska Coastal Mapping Summit.

5 We're still working on that. Our plan
6 is similar to the NOMEK plan, is to have a draft
7 available for public comment by December 8th. So
8 we've got a lot of work to do and a short amount
9 of time, but I will also say that there is a
10 great team in place.

11 There was already wonderful
12 participation by a number of federal and state
13 entities on AMEC and the Coastal Subcommittee
14 that's been created has a huge partnership, huge
15 participation by both federal and state entities.

16 They've been meeting regularly and I
17 think I can say at this point, they are really
18 just rolling up their sleeves and getting started
19 in the writing component of the implementation
20 plan.

21 So the last thing I'll mention is that
22 the, I know the HSRP, several of the panel

1 members have been very involved in developing
2 recommendations in the form of a white paper to
3 present and to discuss later today and tomorrow
4 about these strategies.

5 And I applaud you for all of the
6 effort that you put into this work thus far. I'm
7 looking forward to the discussion about your
8 recommendations. And, you've done a terrific job
9 in getting those pulled together and I hope that
10 what this leads to is an opportunity to utilize
11 your work within the implementation plan.

12 Because again, the rating team is just
13 really, really just getting started so your input
14 is very timely. Again, whatever is written and
15 whatever we get communicated in the next couple
16 of days, we would love to be able to pull that in
17 and hope that you'll share with us your approval
18 to bring that information into the implementation
19 plan as we talk about it in the coastal
20 subcommittee and with other partners.

21 And I think with that, that is all I
22 wanted to say for now. I know we've got a lot of

1 conversation ahead of us so I'll end my update.

2 Thank you very much, Ed.

3 CHAIR SAADE: Thanks a lot, Juliana.

4 We've got a couple of questions lined up. Do you
5 want to go first, Captain?

6 MEMBER QASSIM: Yeah. Thank you, Ed.

7 I have a couple. One for Paul and one for
8 Juliana. Juliana, that comment is not directly
9 related to this, but about your comment about the
10 postponement of 2022.

11 I would not feel bad about it, I think
12 your guys did a great job in the last seven,
13 eight years of preparing us and we waited all
14 this time, we can wait another year or two.

15 It's totally understandable. I don't
16 see anybody really going to be hurting from this
17 delay a year or two or three. So keep up the
18 good work. Thank you very much. Yeah.

19 MS. BLACKWELL: Thank you, Captain.

20 MEMBER ABDULLAH: And for Paul, I
21 really appreciate all the work of Shep and
22 everybody on this project. And you will see in

1 our response of HSRP, we are focusing on the
2 importance of everybody speaking the same
3 language, you know.

4 So I'm glad you brought up, you know,
5 the protocol and the importance of developing
6 that protocol and we hope, in a similar plan, to
7 make interagency things, but one thing I want to
8 emphasize, I have said to the last few weeks, you
9 know, and I talked to Ashley and everybody,
10 trying to get hold of a national standard for
11 coastal mapping, you know, ocean mapping.

12 I couldn't find anything in the form
13 of a standard, you know. The protocol is great
14 and the SOMP and everything important, but as the
15 opportunity for us to think also about it's good
16 to be within that protocol, we refer to the
17 national standard, the U.S. national standard for
18 coastal mapping and hydrographic surveying for
19 something.

20 I got held up by hydrographic survey
21 specification and the developer which is great
22 for project. NOAA tasks a contractor or they do

1 it themselves.

2 But that's all not standard. I mean
3 standard has different definition and it would be
4 nice so everybody uses it with our Corps of
5 Engineer, NOAA, you know, we have them all sign
6 on it and everybody use it in the future when we
7 do surveys.

8 The, because the technology now, I
9 mean our vision for the technology now collect it
10 once, use it many, you know.

11 So having a standard where all agency
12 collect data, collected in one way, that's where
13 we going to make the most impact of this
14 strategy, you know.

15 We don't waste resources, no two
16 agencies go to the same coastline and fly it
17 twice or scan it twice or sound it twice. So
18 it's important to have a standard every -- where
19 we match a coordinate according to that and we
20 don't duplicate efforts.

21 When NOAA collect Alaska, Corp of
22 Engineer and JALBTCX shouldn't go and collect the

1 same coast line because we already did it and
2 vice versa. So that's all my comment. Thank
3 you, Ed.

4 CHAIR SAADE: Good stuff, Captain.
5 Larry, you're up.

6 DR. MAYER: Sure. I have a question
7 for Admiral Smith in the NOMEK Goal 2 about
8 coordination, execution of mapping campaigns.
9 You mentioned the potential of taking a regional
10 approach.

11 And I'm wondering what mechanism is
12 envisioned that could take advantage of all the
13 possible assets. In a sense it's a twist on kind
14 of the other direction of customs questions.

15 For when we have such a huge task and
16 there are many, many assets out there. There are
17 federal assets, state assets, academic assets,
18 private sector, co-interactive organizations.

19 Have you thought about what mechanism
20 could potentially coordinate amongst all of those
21 different assets to truly get a coordinated
22 program going?

1 RDML SMITH: Well, sir, I think that
2 is the question that sort of underlies the whole
3 thing and I'm hoping to hear your ideas first on
4 what that looks like.

5 We really have cast about for what
6 another part, another example of how this is done
7 in another sector. We really haven't found one
8 that is, you know, that really does that really
9 well.

10 And so, I think we're going to have to
11 invent it. And I think part of the reason that
12 we do want to think regionally at least for
13 priorities and designing campaigns is that we'll
14 never get the Artic people to get or see interest
15 in the Great Lakes. Right? And the Gulf of
16 Mexico and vice versa. Right?

17 So we would just waste a lot of time
18 talking. If we had everybody in the room, we
19 would never be able to get to the level of detail
20 to be able to do anything meaningful regionally
21 and to really think these things through.

22 DR. MAYER: But you might have an

1 artic vessel that's setting from the artic to the
2 Antarctic that can do a lot on the way.

3 RDML SMITH: Sure. Sure, and
4 obviously there are organizations like mine that
5 have national scope, right. And we would need to
6 be involved everywhere.

7 But I think there's a, you know, a lot
8 of this comes down to money in the end and we're
9 really trying to build as many as much
10 flexibility into how we can use, you know,
11 resources to get this done.

12 So I know one of the things that I've
13 always regretted is it's very difficult to just
14 add a little bit on to an existing research
15 cruise that is already, already has or has
16 already done all of the logistics, the machinery
17 works, the people are there, all they want to do
18 is buy three more days.

19 And that is the way that we're
20 structured for an environmental compliance and
21 Federal Acquisition Regulations and everything
22 else. There are a lot of barriers in place.

1 So we're looking at how to erode some
2 of those barriers so that we can take advantage
3 of opportunistic efficiencies. And, but I think
4 this sort of needs to sit on a foundation of
5 stable capability and capacity in both the
6 government, commercial and academic fleets and
7 the philanthropic.

8 And there's plenty of work to do.
9 Right now, there's not enough money to go around,
10 but I'm hoping that the longer as this
11 conversation goes on that we'll be able to get
12 the scope right.

13 DR. MAYER: All right. Thanks.

14 CHAIR SAADE: Okay, Sean Duffy's up
15 next. Sean, you might be muted.

16 MEMBER DUFFY: Hello, Ed.

17 CHAIR SAADE: There you are. Go ahead
18 please.

19 MEMBER DUFFY: All right. So really
20 great, you know, panel today. A couple of times
21 things came up that I wanted to comment on, but I
22 figured I'd save them for the end.

1 And first all, being in the Gulf Coast
2 region I would have to thank what I always call
3 the NOAA Swiss Army knife.

4 We've had multiple benefits and calls
5 with NOAA National Weather Service as each system
6 has approached and had to take efforts to shut
7 down the Mississippi River for navigation.

8 Luckily, and I hate to even say it,
9 but for us the storms went different ways, but
10 we've had a, you know, very active season.

11 A lot of impact and I think I'll come
12 back and, Shep, in some ways just touched on what
13 I wanted to get to, but I remember from the
14 Presidential Directive that there was a
15 questioning about appropriations and being
16 consistent and as we heard some of the discussion
17 about increase in PORTS sensors.

18 Unfortunately, local impact means we
19 have challenges funding the sensors we have on
20 the Mississippi River and I know that throughout
21 the program, that's happened in other areas.

22 And I just want to look back at the,

1 you know, the statement that I say a lot is, you
2 know, is full funding floats all boats and I'm
3 wondering if, you know, there and I know some of
4 this is managed in programs that have already
5 been run and a lot of great work has been done,
6 there's a lot of partnership.

7 But in the end, I think it's the
8 funding, consistent level of funding, increased
9 level of funding. Without a budget increase
10 doing more at some point this becomes impossible
11 even with the public-private partnership.

12 And I just wonder if some of the
13 increases will fund this and come back to those
14 questions related to what having the authority is
15 great, but sometimes without the appropriations,
16 you can't get there.

17 CHAIR SAADE: Okay. That's basically
18 a statement or you looking for an answer?

19 MEMBER DUFFY: If there's an update on
20 where funding will come and I heard, you know, we
21 have the potential for a CR and stopgap measures,
22 but what can be done with the directive in ocean

1 mapping without increased funding?

2 RMDL SMITH: I'll take that and in a
3 public forum, this is, I need to tread this
4 ground carefully. But the way it has been
5 described to me and it makes sense is that well,
6 you know, we had this vision last, you know, last
7 November of a strategy in July, we have an
8 implementation plan in December.

9 It's really only when we have an
10 implementation plan where we know who needs to do
11 what, can we think about funding anything.
12 Otherwise, we're just kind of throwing money at a
13 problem rather than investing in a
14 well-considered implementation plan.

15 So I, you know, I hear you and so
16 that's sort of the way I see this playing out,
17 is, you know, the implementation plan is the
18 roadmap for investment.

19 And so we want to put the building
20 blocks in there upon which we can scale a program
21 to the size we envision for, to meet these goals.

22 MEMBER DUFFY: I appreciate the

1 complexity of that answer. Thank you.

2 CHAIR SAADE: Okay, we have time for
3 one more question from Lindsay and then we, and
4 then Shep's going to moderate our public comment
5 period. So go ahead, Lindsay.

6 CO-CHAIR THOMAS: Lindsay, you're
7 self-muted.

8 MEMBER GEE: I'm off. I'm up now.
9 Sorry about that. I'm technology challenged.
10 It's a comment and a question for Shep I guess.

11 As we all, obviously as Ed said, the
12 ocean's having a moment and we fully support that
13 and I think the way I see Shep embrace this is
14 great and I'm waiting for the officers' coast
15 survey to be turned into the ocean and coast
16 survey.

17 But I just had some concern I guess
18 and question, I guess of how he's going to
19 balance -- we talked about the under 40 meters
20 and then the over 40 meters and that technology
21 and we'll support that acceleration of the, you
22 know, under 40 meters.

1 It will be in parallel, but you'll see
2 it accelerating under 40-meter areas in the
3 future after we've kind of got the deep stuff
4 done, but still doing it in parallel.

5 And it seems from the Coast survey
6 perspective, you're planning to be involved
7 obviously, in the deeper water and I just wonder
8 how you balance that up and just not keep that
9 real momentum you've had in the shallow water
10 going under 40 meters?

11 RDML SMITH: A great question Lindsay
12 and I, in the public comments that we've already
13 received and things that I've heard from our
14 stakeholders on the side is they are, there's a
15 real concern, particularly navigation interest,
16 but others as well, that you know if we all march
17 to deep water that the shallow water applications
18 will be neglected.

19 And so I do want to sort of clarify
20 that it is not the intent of the strategy and
21 certainly is not my intent to redirect the
22 resources that we have already, that we already

1 use for shallow water work in partnership with
2 others and for strictly navigation purposes to
3 deep water.

4 But that we have a scalable capability
5 and capacity where we could add additional
6 activities on top of our foundational activities
7 that would allow us to do more and then we could
8 do some of that in deeper water over the course
9 of the coming decade.

10 So it's not, I don't think that was a
11 judgment on anyone's part that the deeper water
12 was more important. In fact, most judgment is
13 the opposite.

14 But that it is easier and we can build
15 momentum for the program and that we can take
16 advantage, just the proportionally in shallow
17 water from technology advancements in the coming
18 years. I don't know what, does that sort of
19 answer the question?

20 MEMBER GEE: It did. It probably
21 answers the question and we're the same, we want
22 to lead the hard bit for you guys, but in

1 realistically, if you can get more reasonable so
2 then you can top up your foundational funding
3 anyway, why would you put that into the deep
4 water and not just put more money into the
5 shallow water I guess would be the question that
6 I would consider, but --

7 RDML SMITH: It depends on what the
8 note states that was attached to the money.
9 Oftentimes there's a little note that comes with
10 the money that says what the intent is, so.

11 MEMBER GEE: Right.

12 RDML SMITH: If it's pretty broad, I
13 expect a good balance between shallower and
14 deeper, in the context of regional campaigns with
15 the goal of getting it all done.

16 And I think that's the bottom line is
17 that the plans have to envision the completion.
18 And we're trying to get away from the little
19 postage stamps. You know, because that just will
20 never add up to done when summed together over
21 decades.

22 MEMBER GEE: Okay.

1 CHAIR SAADE: So Ed, is this now
2 public comment or we going to general H and sub-B
3 comment for the strategy and service?

4 MEMBER KELLY: No. I jumped the gun
5 by about an hour so you guys can go on from
6 there.

7 CHAIR SAADE: Okay.

8 MEMBER GEE: I did have one other
9 comment, well comment and question I guess with
10 regarding the, like the focuses on mapping is a
11 great word, but it's an unfortunate word because
12 it's a product, you know.

13 And people understand mapping, but
14 they also misunderstand it. And it's been
15 mentioned about the different parameters that are
16 going to be observed and really, we're talking
17 about kind of the acquisition and then use of the
18 data.

19 And I think one of the areas that's
20 difficult to manage in that and you know we have
21 the bathy gap analysis that's being held up, you
22 know, to say well here's where our gaps are. And

1 that's kind of concerning.

2 It's great if there's a gap because
3 that's easy. One of the problems is it is just a
4 holding at NCI which is raw data and it has no
5 quality assessment.

6 So in the areas it shows as having
7 data, it can be a problem and I give an example
8 of that.

9 Where work done at the Nautilus Ocean
10 Exploration Trust is working off the west coast
11 this year, we are actually exploring areas with
12 the Sanctuary and OER off the west coast in deep
13 water.

14 But in accordance with the bathy gap
15 analysis, you know, it's done. But it's not done
16 in preparation for the exploration that we're
17 talking about and so there is an interagency
18 group that we work with to find what's really
19 required for the exploration.

20 I think that's a key aspect we kind of
21 say, well, you know, the foundation is the map,
22 but in a way, we haven't really defined, I think

1 it's important for implementation to clearly
2 define what we mean by that.

3 And that's kind of what's the data,
4 what's the account, how we're going to distribute
5 it.

6 And it seems like it almost needs to
7 wait for the OER to kind of, all the same, well
8 here's how we're going to characterize it and
9 then it's like, okay, this is what we need to
10 characterize it.

11 So that was something I think we fully
12 support. We want to get it mapped and it's like,
13 okay, what do we really mean by and that and how
14 are we going to get that done?

15 How are we going to present that? And
16 you mentioned, you know, the backscattered
17 national bathymetric force and I think combined
18 with geometry is great, but your backscattering
19 and sub-bottom and how do we really say we're
20 done, like, even by 2030?

21 It's a question for, I guess, maybe
22 Shep and also Paul Turner.

1 RDML SMITH: I don't want to reply to
2 every comment because it will take up half the
3 time, but I do, Lindsay, I think that's a really
4 important point. And the definition of done
5 that's in that gap analysis is very crude.

6 It's tied sort of to the Seabed 2030
7 model which is just do we have anything? And it
8 does not mean that it is sufficient for any
9 particular purpose.

10 In fact, a lot of it is insufficient
11 for navigation, for instance, but we have
12 something. So I think it's a really important
13 point going forward, that we need to document, we
14 need to have a -- we might need to update that
15 definition of what done means for NOMECC that, but
16 here's just one little cautionary note that is,
17 if we define it, if we set that bar too high and
18 then we do a gap analysis based on that criteria,
19 we will have, our gap analysis will show zero
20 percent done.

21 And I don't think that that's a really
22 sellable place to start this program because I

1 think we need to give enough credence to the data
2 that we already have. So I think there's a
3 balance in there somewhere.

4 MEMBER GEE: Yes, it's almost like you
5 talked about regional kind of campaigns, it's
6 almost regional definition of what's required in
7 each area I suppose as in the shallow versus deep
8 in the Pacific versus the Gulf of Mexico and
9 depending on conditions.

10 Maybe that is one of the areas that
11 helps define what parameters you need to say as
12 the minimum set under this federal program for
13 mapping, for the exploration, what is the minimum
14 set of your parameters?

15 It might not be across the whole EEZ,
16 but it's going to be different at different
17 places and it's just I think that's the
18 experience we've had depending on where your,
19 kind of, exploring.

20 Those that are leading the exploration
21 kind of need different parameters so I think
22 that's an area that implementation needs to think

1 about. Thanks.

2 CHAIR SAADE: Okay. I'm going to
3 interrupt here because you're going to be back on
4 in just a couple of minutes, Lindsay.

5 MEMBER GEE: Okay.

6 CHAIR SAADE: In another role. And
7 then thanks for all of that. Juliana, I'm sorry.
8 Nicole has a couple of comments.

9 MS. LEBOEUF: Yes, thanks, Ed. Just
10 real quickly and to reinforce a lot of Shep's --
11 or replies there, you to Sean's question and
12 Lindsay to your comments, these are exactly why
13 we need to HSRP to provide us with input on these
14 plans.

15 Whether it has to do with the
16 different definitions of done or the definitions
17 of the verbs of mapping, characterization, order
18 of operation, all of these comments that you
19 raised are part of or have been a part of our
20 internal discussions on the development of these
21 plans and the rollout of the plan.

22 The good news, of course, as Shep

1 mentioned at the beginning is that we have a
2 Presidential Memorandum on the work that we do
3 and it's drawn a lot of attention toward it.

4 It has encouraged and, in some cases,
5 kind of forced conversations that need to happen,
6 but we need your input on the refinement of these
7 areas of work and helping us to prioritize these
8 based on our, you know, initial work at it.

9 We do recognize the difference as Shep
10 pointed out, between the shallow water work and
11 the deep water work. There are different
12 purposes and objectives and costs per unit
13 effort, et cetera.

14 And having these plans and having your
15 info on them will allow us to have more
16 sophisticated conversations with stakeholders and
17 with appropriators and with other about how to
18 prioritize these items.

19 So we welcome that, but it is a lot
20 work and a lot of discourse, but we do welcome
21 that and just, you know, very pleased to hear
22 your comments and your questions.

1 Sean, because we don't have new money
2 pouring in at this moment, but we are having
3 conversations and we can point to this memo, we
4 can point to these documents and hopefully we can
5 point to your input and say this is what people
6 care about.

7 CHAIR SAADE: Okay, good. Lindsay,
8 stay on. And Dave Maune and Julie Thomas, if you
9 could join. We'll have a little mini panel here
10 to continue discussions regarding Alaska and
11 NOMEK.

12 So now, Lindsay, you can ask your
13 questions of yourself.

14 MEMBER GEE: Good. I guess I did have
15 one comment so I was going to have another
16 comment and then for Paul and I know there's and
17 we just keep hearing it, and I acknowledge that
18 there is obvious outreach for involvement of the
19 community from industry, academia and, you know,
20 nongovernment and those to be involved.

21 I'm still interested to know if
22 particularly for the SOMP, which is kind of

1 developing a community standard and it's not,
2 seems like it's not allocating funding and I
3 wonder why there can't be other nongovernment
4 people involved in the development of that and
5 sitting alongside and having kind of ownership.

6 And I don't personally want to be
7 involved in that, but I think it seems like there
8 is a lot of expertise outside the government in
9 developing protocols and they're already in place
10 in different areas.

11 And is there no way that there can be
12 that group that's not potentially like an
13 advisory board that's formally appointed like
14 ours that can sit alongside that group in the
15 development that then can develop the SOMP.

16 But I'm not sure who that question or
17 comment is for, but.

18 MR. TURNER: Lindsay, I think you were
19 asking me initially, but maybe perhaps the
20 Admiral could weigh in, but you're right, there
21 is no additional funding for the SOMP or the
22 protocol.

1 And we have, there has been some
2 discussion as to how to best involve the
3 nonfederal side and that has yet to be
4 determined. We're still in a very initial phase
5 of drafting that protocol.

6 In fact, we haven't even begun to
7 write it yet. We were waiting to hear all the
8 input and feedback from the symposium that's
9 coming up in two weeks before we begin to
10 actually draft anything.

11 So there's still time to potentially
12 include another review cycle from the non -- you
13 know, the nonfederal side.

14 MEMBER GEE: Thanks.

15 CHAIR SAADE: Julie, you want to take
16 the lead on this and --

17 CO-CHAIR THOMAS: Sure.

18 CHAIR SAADE: Okay.

19 CO-CHAIR THOMAS: I'll have a comment
20 first. And you know, I feel a little hesitant
21 about even saying this because I've been out of
22 touch with the mapping things now for a few

1 years, but it was really frustrating when we were
2 flying lidar in California doing a lot of mapping
3 on the California coast.

4 As far as even the quality control
5 checks were so different between who was
6 performing the mapping and, you know, we, so this
7 is where I'm going with this. Is that we
8 actually did QARTOD for the physical parameters
9 and biogeochemical parameters in 2001.

10 We met at NDBC and it was feds and
11 academia, private partnership and we formed this
12 group for the Quality Control of Real Time Data
13 and we actually didn't specify resolutions
14 because that does depend on the region.

15 It depends on the instrument, but we
16 at least established what quality control
17 measures would be looked at and therefore wave
18 data, current data as it goes through the federal
19 pane getting out to the National Weather Service
20 at least it allowed nonfed partners to
21 contribute.

22 And you know that the quality control

1 is all at the same level. And that has been our
2 effort since 2001, 19 years we're still working
3 on some of the parameters, but it was a way of
4 bringing together fed and nonfed partners.

5 And we actually got the manufactures
6 at the table for each perimeter waves, currents,
7 wind, et cetera. We got the manufacturers there.

8 Nortek, Teledyne RDI, Datawell, we got
9 them in the same room and said okay, what are the
10 minimum criteria for the quality control that you
11 need?

12 So like I say, maybe this is being
13 done at the mapping level, but it seems like it's
14 still kind of all over the place and I think that
15 standardization is so important, otherwise you
16 have no interoperability, you have no way to
17 really tell what's been collected. So that's my
18 input here.

19 Who else wants to talk? Anybody else
20 have questions, comments?

21 MEMBER ABDULLAH: I guess, Julie, I
22 can add a little bit to your, I mean I think the

1 concern that Admiral Shep brought is a valid
2 concern. How are we going to do it?

3 And I think the strategy is very clear
4 actually in the five goals. In goal five, it
5 says both public and private partnership to map,
6 explore and characterize the U.S. EEZ.

7 And goal number two, coordinate and
8 execute campaign to map U.S. EEZ including
9 aggregating the agencies involved in mapping.

10 I think it's going to take a village.
11 We don't want -- I don't want NOAA to feel this
12 is on their shoulders only. I think there is
13 private-public agency, I mean, they need to sit
14 on the table with equally weighted exchange,
15 brainstorm.

16 Divide, you know, divide and conquer.
17 You focus on the below 40, I focus and we bring,
18 we pool the money, the resources, everybody has
19 chunk little bit here.

20 Without that dialogue and openness and
21 honestly about it, I think it will be very
22 difficult for anybody to execute this strategy.

1 The only way to bring it is to bring that right
2 people around the table whoever they are, whether
3 other agency, other company, private and things
4 like that.

5 So I'm just emphasizing what the
6 strategy says and switching us to build that
7 public-private, academia, agency and to get the
8 resources. Don't do it alone. Thank you.

9 CO-CHAIR THOMAS: Okay.

10 MEMBER MAUNE: This is Dave. Julie,
11 you mentioned quality control procedures and in
12 the topographic arena, we've had very
13 well-established procedures for relative accuracy
14 between overlapping flight lines and procedures
15 for testing the absolute vertical accuracy of
16 points from topographic lidar.

17 When it comes to bathymetric lidar, it
18 gets more complicated because it's very difficult
19 to have good control points out in the middle of
20 the ocean.

21 You can to a certain shallow waters
22 where you can get out there or off the ends of

1 docks and things to measure the depth of the
2 water and to put in absolute control points from
3 the bottom of the ocean floor, but that only
4 works in shallow water.

5 I may as well continue here in talking
6 about the Alaska Coastal Mapping Strategy.
7 That's one of the two topics raised by the
8 Presidential Memorandum.

9 Members of the HSRP may recall that a
10 year ago we were talking about developing an HSRP
11 issue paper on the Alaska Coastal Mapping
12 Strategy.

13 At that time, we did not know that a
14 Presidential Memorandum was going to come out on
15 this particular topic. I knew that an Alaska
16 Coastal Mapping Strategy was in progress of being
17 developed by people working with the AMEC.

18 And so they went to work when they got
19 the Presidential Memorandum coming up with the
20 strategy that was addressed this summer and now
21 the HSRP, rather than having a two-page issue
22 paper, we saw that the issues were much more

1 complicated than what we could put on two pages.

2 And so we put together a 20-something
3 page, very comprehensive paper on addressing the
4 various goals and objectives of the Alaska
5 Coastal Mapping Strategy.

6 We got a lot of input from HSRP
7 members. I think nine different members
8 contributed to a paper that I think we're going
9 to discuss tomorrow, but we're certainly excited
10 about the Alaska Coastal Mapping Strategy and
11 felt that the HSRP can be influential in
12 influencing the implementation plan that's to be
13 developed by December of this year.

14 CO-CHAIR THOMAS: Great. Thank you,
15 Dave. Yes, that is a good interjection to what
16 we're going to be discussing tomorrow.

17 So we could do a couple of things
18 here, I guess. I know that Qassim has a few
19 comments that he wants to make. I think we have
20 some time. So, Ed, if that's okay, maybe we go
21 ahead and have Qassim.

22 Qassim, did you want to talk a little

1 bit about the overall view of general mapping?

2 MEMBER ABDULLAH: Absolutely. I just
3 want to highlight the situation of COVID-19 and
4 how the federal agencies are performing greatly.

5 I mean, I think they've been pushing
6 forward with all these coastal mapping, whether
7 NOAA, NGS definitely, USGS, Corps of Engineer,
8 JALBTCX, I mean, there is so many going on
9 whether in Alaska or in the Pacific.

10 In the last eight, nine months there
11 is a tremendous amount of work done in that
12 partnership, that's the partnership we're trying
13 to build between, you know, private and public
14 because none of them can do what they're doing
15 without the others and I think this is proving
16 during this difficult time of COVID that is
17 serving everybody.

18 So we just, I just want to give shout
19 out to the federal agency helping the industry
20 pushing work to them and to the private industry
21 who completing it through this difficult time.

22 Mobilizing people to the field and

1 collecting data and the processing data so as
2 kudos to both of them. That's all I need to say,
3 Julie. Thank you.

4 CO-CHAIR THOMAS: Okay. Great. And
5 I think we're going to take time to actually go
6 through each HSRP member right now and just let's
7 talk about the Alaska Mapping since Dave has
8 already introduced that one.

9 We have received several comments back
10 on the Alaska Mapping. I know that Qassim has
11 given us some, Nicole, Ann read through it, so
12 there are really different ones.

13 And so I was just wondering, let's
14 see, I'm just going to go alphabetical down the
15 list. We're going to, so this is focused on the
16 Alaska one now.

17 I think you've all had it in your
18 package and I think you've had a chance to read
19 it. Ed Saade, did you have any further comments
20 on that?

21 CHAIR SAADE: No. I'm okay on that.

22 CO-CHAIR THOMAS: Okay. And Qassim,

1 did you have anything further?

2 MEMBER ABDULLAH: I'm fine, thank you,
3 Julie.

4 CO-CHAIR THOMAS: Anuj? Oh, I guess
5 we need to unmute the panel for this one. If you
6 don't mind.

7 MS. DENTLER: Yes, he's unmuted.

8 CO-CHAIR THOMAS: Okay. Anuj, are you
9 there? Are you still muted or we'll come back?
10 Sean?

11 MEMBER DUFFY: Hey, Julie. So I would
12 just say that, you know, this is of course,
13 outside of my area, being in New Orleans, but you
14 know, I was able to help with the paper.

15 I've seen a lot of improvements and,
16 you know, this is where like together everyone
17 achieves more, my TEAM acronym, and happy to have
18 contributed with some language.

19 But beyond that, I think it's very
20 well done and I appreciate all Dave did to get us
21 to this point.

22 CO-CHAIR THOMAS: Great. Anuj, I see

1 you on now. Are you there?

2 MEMBER CHOPRA: Yes. Thank you. My
3 apology for my electronic challenges, but all
4 good. Now I think for me it was a learning
5 experience.

6 I thought it's really amazing to see
7 so much being done in this COVID environment by
8 the NOAA team so they, congratulations to them.

9 All of us are challenged. We
10 understand the challenges we have. On specific
11 to the NOMEK policy and the Alaska Coastal
12 Mapping Strategy, I think as much as we can
13 participate as a group and support them, I think
14 that's the way to go. That's what I'm -- that
15 would be my focus. Thank you.

16 CO-CHAIR THOMAS: Okay. Thanks.
17 Thanks, Anuj. Nicole, did you have any further
18 comments on the Alaska?

19 MEMBER ELKO: Sure. I would just like
20 to say that it was really helpful to hear from
21 Juliana. The overview, you know, when you read
22 them, it's one thing, but getting it from the

1 source like that was extremely helpful.

2 So thank you for that. And, you know,
3 from my perspective as a representative of a
4 national NGO that focus on shores and beaches, I
5 think a lot about engaging stakeholders.

6 You know our specific stakeholders are
7 the coastal communities of the U.S., so I love
8 the fact that the Alaska study didn't wait until
9 the last bullet to say engage stakeholders which
10 is what often happens with these. You know
11 building on partnerships was the very first
12 thing, so kudos on that.

13 And I did have a question if there's
14 time regarding the subcommittee that was formed
15 under AMEC. It was mentioned that state and
16 federal agencies are starting to work together on
17 that to begin drafting and I just wondered if
18 there is representation beyond that, if it's
19 allowed or are there stakeholders, is industry
20 in?

21 I'm sure there's, there are community
22 members involved.

1 CO-CHAIR THOMAS: Dave, do you know
2 about that or Juliana or Shep?

3 MEMBER MAUNE: I would recommend that
4 she contact Ashley Chappell because Ashley is
5 working with the people in Alaska on that.

6 And I know they are seeking input from
7 a lot of people and so if you need the email
8 address for Ashley Chappell, I can send that you,
9 Nicole.

10 CO-CHAIR THOMAS: That's right.
11 Ashley couldn't make this meeting, but, oh,
12 Juliana might know.

13 MS. BLACKWELL: Yes, Ashley is the
14 Co-Chair, one of the Co-Chairs for the Coastal
15 Subcommittee under AMEC, and again the group is
16 working with a counterpart within the State of
17 Alaska also as well as having representation on
18 the subcommittee from Alaska.

19 They're also working it from their
20 Geospatial Council perspective and trying to
21 engage other locals, travel, native Alaskans.

22 And I can't speak to the private

1 sector component to it, but I think that's one of
2 the reasons why they want to make sure at least
3 that there is an opportunity through the Coastal
4 Mapping Summit.

5 And there may be other venues that
6 are, where the net is case wider and I think as
7 Dave mentioned, you know, Ashley is really the
8 focal point for coordinating this effort from the
9 NOAA perspective.

10 And we can certainly follow up with
11 you with some more details shortly.

12 MEMBER ELKO: Great. Thanks.

13 MEMBER MAUNE: This is Dave again.

14 Juliana mentioned the Alaska Coastal Mapping
15 Summit, she said it's scheduled, I think, for
16 November 5th.

17 I've been to the last two summits and
18 it really is a wonderful opportunity for people
19 from every place to throw in their ideas and to
20 interact and to collaborate on how to solve this
21 problem together.

22 So I strongly encourage everybody to

1 sign up to participate in that summit when it
2 comes out.

3 MS. BLACKWELL: We'll definitely let
4 you know.

5 CO-CHAIR THOMAS: Great. Thank you.
6 Okay, I'm going to continue to go around and then
7 we'll come back to you, Dave, to get kind of a
8 high-level overview of your paper here. Lindsay?

9 MEMBER GEE: Julie, I'm sorry. I have
10 no further comment on the Alaska Strategy. It's
11 a great job, Dave, thanks.

12 CO-CHAIR THOMAS: Okay. Thank you,
13 Lindsay. Ed Kelly?

14 MEMBER KELLY: No, I think the
15 Alaska's really working well and I'm really
16 impressed to see the public-private involvement
17 in this.

18 I think that's something that HSRP has
19 been promoting for years. Nicole had, you know,
20 mentioned that she's brand new to this, but this
21 is my eighth year and I just realized this is
22 probably my last, you know, meeting and dammit, I

1 never did get to Hawaii. You promised me that
2 and that's how I got onto this thing in the first
3 place. So I'm kind of disappointed with the
4 whole thing, but, you know, I've really been
5 impressed again.

6 Everybody is beating it to death, but
7 COVID has really moved the goal posts this year
8 and I'm very impressed to hear all the progress
9 that has been made despite COVID both internally
10 and with the vast expansion here into the public-
11 private and that's again bringing us back.

12 I'm glad that we kind of keyed off
13 with blue economy. That's kind of what I think
14 we're all about. It's cleaner, safer. There's
15 extensive societal benefits. We mention a lot of
16 money. I think the economic impact from what
17 we've seen from the commercial activity and the
18 ports activity, I wouldn't doubt it's even bigger
19 than that.

20 And coastal resiliency is really
21 coming under the spotlight so I'm really glad to
22 see how we're approaching this and I think a lot

1 of this progress and the perspective of how we're
2 approaching some of these is really coming on
3 target with these latest two pieces.

4 Perhaps, you know, Alaska will be the
5 beneficiary of increased technology, better
6 public-private interface, data sharing so
7 hopefully we're coming where, you know, we're
8 moving these projects faster and better.

9 And I'm just very happy with it. I
10 think the Alaska paper is kind of the evolution
11 of what we've been working on for these past few
12 years so I'm very pleased with it.

13 CO-CHAIR THOMAS: Great. Thanks, Ed,
14 for your comments. Ann?

15 MEMBER KINNER: Yes, is this thing on?
16 I had to go a headphone.

17 CO-CHAIR THOMAS: It's good.

18 MEMBER KINNER: I'm hoping you can
19 hear me. Okay. No, the Alaska thing to me is of
20 particular interest because something that I saw,
21 and I think it was in a Harbor Safety Committee
22 Summit, where there was an AIS image showing the

1 amount of traffic that is operating in and around
2 the Alaska Coast, particularly the north side.
3 And to be able to really provide good charting
4 for navigation safety up there is really
5 important.

6 And as far as the blue economy, I know
7 from the people that I deal with who are buying
8 charts and want to be able to navigate safely up
9 there, that it's critical that we give them the
10 best possible information so they can continue to
11 do what they're doing, whether it's fishing or
12 exploration or just general shipping.

13 So I like the way the paper's gone and
14 we can talk about it more tomorrow, but I'm
15 really glad to see the focus on Alaska.

16 CO-CHAIR THOMAS: Okay. Thank you.
17 Let's see, Dave, I'll skip over you. Anne
18 McIntyre?

19 MEMBER McINTYRE: Okay. I think I'm
20 unmuted. You know again, this is not my area of
21 expertise, so I'm just going to say I'll say what
22 Ed Kelly said, everything that he said was just

1 great. And just again what just struck me about
2 everything this morning is how fast technology is
3 moving. And it's just so impressive how everybody
4 is embracing it.

5 CO-CHAIR THOMAS: Okay. Great. Thank
6 you. Ed Page? You're muted. You're muted.

7 MEMBER PAGE: Am I still muted? I'm
8 unmuted?

9 CO-CHAIR THOMAS: Good.

10 MEMBER PAGE: I'm good. Okay, well,
11 I'm feeling love. From everyone talking about
12 Alaska, this is pretty neat. So I appreciate
13 that.

14 Evidently the President read our
15 policy memo last year when we talked about more
16 charting in Alaska, so I'm glad he read our HSRP
17 policy memo which is really being implemented on
18 at a grand scale.

19 It's still the last maritime frontier
20 and there is increased shipping activity, so
21 clearly looking at this area and trying to get it
22 on par with the rest of the United States

1 probably makes some sense, at least from a very
2 selfish perspective from my end, but
3 nevertheless.

4 So I think the paper is very
5 comprehensive and very good and it's a good game
6 plan to tackle some of the challenges of you know
7 charting Alaska, prioritizing and vetting ideas,
8 and providing local input.

9 It's a very challenging region
10 maritime wise as far as we had a tanker run
11 aground a year ago or so that ran aground and the
12 last charting was like 1900.

13 So you know, things like that and we
14 have earthquakes and other things that kind of
15 change the topography, et cetera, so it's good to
16 see it happening.

17 So I'm pleased with what we've got
18 developing here --

19 CO-CHAIR THOMAS: Great.

20 MEMBER PAGE: -- and all the energy and
21 attention so. Glad everybody else loves Alaska.

22 CO-CHAIR THOMAS: Okay. Gary?

1 MEMBER THOMPSON: I think most of the
2 topic has been covered. I like the public-
3 private partnership discussion and I especially
4 like the comment about collecting the data once
5 and use it for multiple applications.

6 CO-CHAIR THOMAS: Right. Okay, Dave,
7 I know that you've received some outside comments
8 also and maybe you want to just give kind of a
9 brief overview of this paper for the public
10 comments portion of it.

11 MS. DENTLER: Excuse me, Julie. We
12 also want to ask Sal if he has anything.

13 CO-CHAIR THOMAS: Oh, did I skip Sal.
14 Oh my gosh sorry, Sal. I apologize.

15 MEMBER RASSELLO: It's okay. I think
16 that the Alaska project is a great work. I think
17 it's achievable due to the fact that there is a
18 lot of interest from the public and private
19 sectors and also because there's not much COVID
20 over there.

21 So I think we are at a good point with
22 that project. And also, because it's already

1 started, I think it was 40 percent of any map so
2 we already have a base to work on. Just to do a
3 better job of that.

4 CO-CHAIR THOMAS: Great. Thank you,
5 Sal. Okay, shall we go back to Dave, or Juliana?

6 MS. BLACKWELL: Julie, if I could just
7 follow up on some of the earlier comments. I'm
8 getting some feedback from Mike Aslaksen who
9 wants me to point out information regarding your
10 comment about lidar.

11 I believe it was from the efforts in
12 the California area from a few years ago. Mike
13 is mentioning that a lot of the issue have been
14 resolved through this National Coastal Mapping
15 Strategy and, in particular, looking at things
16 about total propagated uncertainty for lidar and
17 so basically identifying what all the different
18 error sources and what those accuracies'
19 estimates are when you consider the platform, you
20 consider the sensor that's being used, you
21 consider your GPS error, you consider all the
22 different pieces so bringing that all together

1 and studying that, and making sure that there's a
2 better understanding of what the total propagated
3 errors -- uncertainties are and then also
4 aligning the requirements with terrestrial
5 standards and things that are being done on land,
6 such as the 3DEP effort.

7 So I know it gets pretty technical and
8 it's probably something that we can discuss off
9 line or have a follow-up discussion on to get
10 more into the weeds on the technical aspects of
11 this.

12 And so maybe that is something that
13 comes out of the discussion that we're having
14 today and following on tomorrow, but definitely
15 wanted to make sure that we can bring the right
16 people together to have these more technical
17 updates on what's happening in that world of
18 collecting data with lidar along the coast.

19 Thank you.

20 CAPT ARMSTRONG: Julie, this Andy, and
21 I don't have anything to say at this point, but I
22 wonder if Larry Mayer might.

1 CO-CHAIR THOMAS: I was going to get
2 to you two actually. I just turned the page and
3 I saw your names there. So sorry.

4 CAPT ARMSTRONG: Thank you.

5 CO-CHAIR THOMAS: Larry?

6 DR. MAYER: I'm coming on here.

7 CO-CHAIR THOMAS: All right.

8 DR. MAYER: No, I think the Alaska
9 strategy has really come together really nicely
10 so I'm pleased with that. I don't know if we're
11 commenting about the NOMEK and everything else
12 too or that we're focusing just on --

13 CO-CHAIR THOMAS: Let's just do Alaska
14 right now. One at a time.

15 DR. MAYER: Yes. I think Alaska's
16 been covered well and I'm very pleased with
17 what's evolved.

18 CO-CHAIR THOMAS: Okay. And, you
19 know, before we turn it back to Dave for the
20 outside comments, I mean, there is Juliana, and
21 Rich and Shep, of course, if you have any
22 comments on this then you're more than welcome

1 too. And Nicole and Dr. Jacobs if there's
2 anything that you want to comment on this? Don't
3 hear any comments. Okay.

4 MS. LEBOEUF: Nothing else from me,
5 Julie. Thank you.

6 CO-CHAIR THOMAS: Okay, Nicole. Thank
7 you.

8 MS. LEBOEUF: It takes a moment.

9 CO-CHAIR THOMAS: I know, I know. I'm
10 not quite sure how to do this efficiently here.
11 I guess we can go to each person. Rich, do you
12 have anything?

13 MR. EDWING: Nothing. I'm here.

14 CO-CHAIR THOMAS: Okay. Great.
15 Thanks. And, Shep, do you have anything?

16 RDML SMITH: Just on the Alaska
17 Coastal Mapping Strategy. I think the focus
18 quite rightly is on what we can get remotely
19 sensed for the first pass and to get it really
20 locked down with, you know, tidal and geodetic
21 datum control.

22 But I think it's worth keeping an eye

1 on the extent to which the navigation needs in
2 nearshore will be met. In many places where
3 bathy lidar will not be, won't provide meaningful
4 coverage offshore.

5 And so I think we need to keep an eye
6 on that as we go forward.

7 CO-CHAIR THOMAS: Okay. Thank you.
8 Juliana, did you have anything further about,
9 particularly about the Alaska one?

10 MS. BLACKWELL: Nope. I'm all good
11 thank you.

12 CO-CHAIR THOMAS: Okay. And Dr.
13 Jacobs are you still on?

14 DR. JACOBS: I'm here.

15 CO-CHAIR THOMAS: Okay.

16 DR. JACOBS: Nothing from me. This,
17 all of this feedback is really good to hear and
18 very helpful.

19 CO-CHAIR THOMAS: Great. Thank you.
20 I'm going to turn it over to you, Dave.

21 Do you want to give a real overview of
22 the paper and also when we may be mentioned

1 public comments that you've gotten for it?

2 MEMBER MAUNE: Okay. How much time do
3 I have? Is this a one-minute thing or a
4 10-minute thing?

5 CO-CHAIR THOMAS: I think it's about
6 a five-minute thing.

7 MEMBER MAUNE: About a five-minute
8 thing. Okay.

9 MS. MERSFELDER-LEWIS: You guys, you
10 have about 10 minutes. You can just do that, if
11 you want to go a little bit less if you want to
12 have any questions.

13 CO-CHAIR THOMAS: Five to 10 minutes.

14 MEMBER MAUNE: That's fine. We
15 started on this a year ago with the HSRP issue
16 paper on the Alaska Coastal Mapping Strategy and
17 then I mentioned a little bit ago that a lot
18 changed since the Presidential Memorandum.

19 And now our two-page issue paper has
20 gotten to be 20-something pages long, but it got
21 to be six pages longer because I discovered that
22 our own Dr. Larry Mayer did a National Research

1 Council study on this back in 2004.

2 And I just had to include his
3 recommendations there because he was dead on 16
4 years ago. And, I'm sorry Larry that it's taken
5 us 16 years to get this far, but I appreciated
6 seeing your comments.

7 DR. MAYER: I was only 12 at the time,
8 too.

9 MEMBER MAUNE: And I am pleased that
10 11 of the HSRP members contributed something that
11 I was able to incorporate into the study and then
12 we received some outside comments.

13 Particularly, I wanted to mention
14 Molly McCammon from the Alaska Ocean Observing
15 System. She gave me some recommendations and I
16 got a recommendation from the Alaska Water Level
17 Watch and so we have incorporated all of those
18 recommendations.

19 We're focusing a lot on the need to
20 establish vertical datums in Alaska where they
21 are missing. The VDatum transform tool doesn't
22 work other than Southeast Alaska and we need

1 GRAV-D finished up there.

2 But a lot of this is necessary because
3 right now we don't know when high tide is and
4 when low tide is for a lot of Alaska.

5 And to obtain this data efficiently,
6 we need to acquire topobathymetric lidar at low
7 tide when most of the water is out of the way and
8 so we can actually map the exposed bathy surface.

9 And then we need to collect near shore
10 bathymetry from manned or unmanned surface
11 vessels with sonar when it's at high tide.

12 And so, a lot of this needs
13 information on when is high tide and when is low
14 tide at various portions of Alaska so that's a
15 main part of our focus on priorities.

16 We have several dozen recommendations
17 here on each of the -- there are 11 objectives in
18 this strategy that came from NOAA and we made
19 comments on many of those.

20 I don't think I want to go through all
21 of these individually. They have been out there
22 for members to review for the last few weeks.

1 We've had several HSRP working group
2 meetings in which we've gone over this so this
3 has been fine tuned up to today. We've actually
4 had three different versions of the latest paper
5 changes today.

6 Three changes today with info we got
7 just today so we're ready to talk about this
8 tomorrow and to have further discussions if you
9 want to go into greater details.

10 But I really wanted to thank everybody
11 that contributed to this. Particularly Qassim
12 Abdullah and Gary Thompson. Because the three of
13 us have experience in coastal mapping and it was
14 logical for the three of us to work together to
15 try to develop this Alaska Coastal Mapping
16 Strategy.

17 I know that Qassim, Gary, and I are
18 proud of this strategy and I've heard nothing but
19 favorable feedback from everybody else that has
20 reviewed it.

21 And so I just want to thank everybody
22 who contributed to this paper and say it was a

1 group effort and I think it's, we're going to
2 have some good recommendations going forward.

3 CO-CHAIR THOMAS: I agree, Dave.
4 Really nice seeing everybody come together on it
5 and you've done a great job of incorporating all
6 of the comments and getting a diverse group
7 coming together there.

8 So let's see, I think, that is, we
9 will just, we won't start the NOMEK right now.
10 Lynne, is that correct? Oh, Juliana has one.
11 Yes?

12 MS. MERSFELDER-LEWIS: You guys could
13 have another comment for six more minutes?

14 CO-CHAIR THOMAS: Okay. All right.
15 Anyone else? Let's do Juliana here.

16 MS. BLACKWELL: I'll take a minute.

17 CO-CHAIR THOMAS: Thank you.

18 MS. BLACKWELL: I just wanted to make
19 sure everybody is aware that the Alaska Coastal
20 Mapping Strategy is an interagency strategy.

21 So while NOAA is certainly prevalent
22 in it, we are, it is something that was put

1 together with our partners, not something that is
2 just truly a NOAA strategy and I think Dave
3 referenced that.

4 And I appreciate you, Dave. Referring
5 it to NOAA's work on it, but it is something that
6 I just want to make sure that we incorporate the
7 fact that it is interagency.

8 MEMBER MAUNE: You're right. Thank
9 you.

10 MS. BLACKWELL: Let's see, trying to
11 think if there was anything else. Anyway, maybe
12 this is a follow up to that and what I mentioned
13 earlier is, you know, I know that there's a lot
14 of great detail in the white paper. And it is a
15 lot longer than the strategy itself and we're
16 hoping that the information that's in the white
17 paper, that HSRP, when you're ready, that we're
18 able to use that information in total in the
19 implementation plan and share that with the other
20 entities that are a part of this Coastal
21 Subcommittee so that they are able to reference
22 it and work together with us and coming up with

1 the implementation plan.

2 So I don't know if that's clear or
3 not, but we want to be able to take this that,
4 what you're talking about and bring it back to
5 the subcommittee for further discussion and
6 consideration for the implementation plan.

7 And I'm pretty sure that it's going to
8 be well received, but just want to let y'all know
9 that it's a multiple step process for us.

10 MEMBER MAUNE: Certainly. That is our
11 intent.

12 MS. BLACKWELL: Okay. Thank you.

13 CO-CHAIR THOMAS: Okay. Are there any
14 other questions? Qassim?

15 MEMBER ABDULLAH: Julie, just a quick
16 comment about the Alaska HSRP response. I
17 definitely want to thank Dave. Dave has a lot of
18 passion for Alaska. He started it really way
19 before this strategy came, but we just work with
20 him on modifying it to serve both, you know, as a
21 response to the strategy implementation we
22 requested to.

1 But Dave, your leadership on that
2 brought us together. Thank you very much.

3 MEMBER MAUNE: Thank you.

4 CO-CHAIR THOMAS: Okay. You okay with
5 that? Anyone else have a question or comment?
6 Okay. Ed, I'm going to turn it back over to you.

7 I think that tomorrow, as a panel,
8 we'll probably approve this, whatever we need to
9 do for this Alaska paper going forward. So why
10 don't I turn it back over to you right now.

11 MS. MERSFELDER-LEWIS: Hey you guys,
12 this is Lynne and I just wanted to make a
13 clarification as to the alternate DFO just to say
14 we really appreciate Dave Maune's checking in and
15 doing due diligence to make sure that his, what I
16 look at as very much a research paper, was
17 accurate and that he did an amazing job doing
18 that.

19 And any member can reach out to
20 anybody to make sure your work is accurate and
21 correct and we really appreciate that you did
22 that, Dave.

1 MEMBER MAUNE: Thank you.

2 CO-CHAIR THOMAS: I think we all
3 appreciate Dave's input here. It was -- it's a
4 tremendous job and I think it will be a nice
5 paper to submit with our letters of
6 recommendation to Dr. Jacobs, so looking forward
7 to that. Okay, Ed, back to you.

8 CHAIR SAADE: Thanks. Thanks
9 everyone. Lynne, can we start the public period
10 yet or do we need to wait until 4:45?

11 MS. MERSFELDER-LEWIS: I think you can
12 start it. I just want to double, triple check
13 that anybody else has other comments to make
14 before we go into public comment period.

15 Because we're just, we and we have
16 just two minutes maybe because we actually were
17 going to start it at 4:35.

18 I wanted to let you guys know we have
19 at least eight or nine comments if we don't get
20 all of them today, we'll get through them
21 tomorrow.

22 If we have additional comments, we can

1 also do them tomorrow. Christine Burns is
2 showing you the additional comments that came in
3 on this afternoon as you guys were speaking.

4 The initial comments that we had asked
5 for in advance, up to sometime even this morning
6 are already up on the web. We will update the
7 list on the web as well with these so anybody can
8 see them.

9 CHAIR SAADE: Okay, Lynne, if we can
10 go ahead and start, I'd recommend we go ahead and
11 start, Lynne.

12 MS. MERSFELDER-LEWIS: Please do. If
13 you want to turn it over to Shep.

14 CHAIR SAADE: Okay, Shep. If you want
15 to go ahead and moderate the public commentary
16 please.

17 RDML SMITH: Great, will do. Thanks,
18 Ed, and thank you to the whole panel. A lot of
19 really great discussion, observations in that
20 last session, and there's going to be a lot of
21 great notes for us to unpack and use to guide us
22 going forward.

1 I'm very pleased with the level of
2 participation we've had from the public so far
3 for this and the comments just keep pouring in.
4 I thought the way we could do this, we only have
5 half an hour, and I would love to be able to give
6 the floor to everyone. But what I would like to
7 do is quickly summarize some of the comments that
8 we've gotten to date just to catch everybody up.
9 And then we've talked to five or so, a number of
10 the commenters have asked to make a short summary
11 version of their longer comment to us here. And
12 so we will shift to that afterward.

13 But let me just very quickly, and I'm
14 not going to, this is not comprehensive if I
15 don't talk about your comment, don't feel left
16 out. There's a whole, this will all be part of
17 the public record but just some of the themes,
18 some comments on SOMP and the value of
19 groundtruthing, the questions about the role of
20 HSRP with respect to these strategies.

21 And maybe I'll just make a quick
22 comment on that one and that the HSRP advises the

1 NOAA administrator on a wide variety of topics,
2 and NOAA has a role, these programs have a role
3 in these strategies and, therefore, that's the
4 role that the HSRP plays. It's advising the NOAA
5 components of the strategies, but nothing grander
6 than that, there's a whole lot of other
7 organizational structure.

8 Another comment on how to get the data
9 and this was, you know, really points to the
10 usable and accessible part of the strategy, like
11 in the list of viewers and how you can get at it
12 without being a PhD GIS whiz.

13 A couple of people commented on the
14 fact that this isn't going to go much of anywhere
15 if it doesn't come with some money eventually.

16 Another comment that there are,
17 particularly during COVID, we have this
18 opportunity because a lot of vessels are idle,
19 they're underutilized, and that mapping is
20 something that can be done with zero people, and
21 therefore will be the appropriate type of
22 activity to be done during COVID.

1 A couple of offers of some relevant
2 technology with satellite-derived bathymetry.
3 Cautionary note on making sure that we have the
4 requisite accuracy and resolution to make this
5 truly valuable.

6 Another comment about the need to
7 better include private industry, academia, and
8 nongovernmental organizations in the planning
9 process, and all the way through both now and in
10 the future.

11 Had an offer from the US Power
12 Squadrons to use their network to help with
13 shallow water bathymetry.

14 There's a suggestion that we think
15 about creating different types of contract
16 vehicles to be able to do smaller contracts
17 closer to shore where the logistics are a little
18 bit easier.

19 We had another cautionary note that we
20 need to be sure that somebody is responsible for
21 this thing because if it's just a big, if it's
22 nobody's, the quote is "If it's everyone's

1 business, it's no one's business." Somebody
2 needs to kind of own this thing if we want to get
3 it done.

4 Had a comment, particularly about
5 NOAA's navigation services and how they are so
6 critical to the blue economy and to the national
7 spatial infrastructure, and while this is all
8 great, we need to be sure that we are not
9 distracting ourselves from the core long-term
10 responsibilities that these programs have.

11 We have a comment about the importance
12 of bathymetry and topography for modeling, an
13 update on some new technology being used in
14 Alaska for water modeling, I'm sorry, water
15 measurements, and et cetera, et cetera. It keeps
16 going on.

17 So anyway, I think that's a little bit
18 of a flavor of it. I think I would like to shift
19 now to recognizing some of the commenters for
20 brief comments. I think we've got seven, eight,
21 we got up to ten. Well, we've got nine lined up.
22 And so we have about, just a little less than 30

1 minutes now because I used some of it. So maybe
2 think in terms of something like three minutes.

3 And so first up is Dr. Joseph Zhang,
4 and maybe you can introduce yourself before you
5 make your comments. Thank you, Dr. Zhang.

6 Dr. ZHANG: Thank you. Thank you Dr.
7 Smith and thank you, everybody. Can you all hear
8 me okay? Okay. So I am Joseph Zhang. I'm a
9 professor from Virginia Institute of Marine
10 Science. So I've been doing coastal modeling for
11 20 plus years. So I just want to give my support
12 to the important work that you all are doing. I
13 think there's a general consensus in the modeling
14 community, especially in nearshore modeling
15 community, how important the bathy-topo
16 information is.

17 And after 20 years, we are still
18 facing some critical large gaps in terms of
19 nearshore bathymetry in particular. So I give an
20 example. Recently we finished a few marsh
21 related disparities, and we were using the best
22 highest resolution information available from

1 NOAA, from USGS. So, by the way, I think the OCS
2 did a fantastic job in compiling all those kind
3 of high-resolution information.

4 But we are doing this study in the
5 Chesapeake Bay, and what we found is for the
6 tributaries and subtributaries, some of the
7 bathymetry information is really old, 50 plus
8 years.

9 So what we did eventually is, and we
10 found that the lots of channels and lots of
11 creeks are broken, and so we had to send our own
12 field crew to resurvey the data. And five years
13 ago when you talk this kind of inaccurate
14 information to surveyors, they will tell you, oh,
15 models, you know, cannot take this kind of
16 high-resolution, high-accuracy data. You know,
17 so even if we gave you, you cannot make full use
18 of that.

19 But I think that has passed and the
20 modeling technology has really caught up. And I
21 can tell you unequivocally now, you know, we can
22 actually make full use of the high-resolution and

1 high-accuracy information.

2 And the way I'm mostly interested in
3 this kind of, from watershed all the way to the
4 oceans, is kind of seamless modeling technology.
5 So what we really need is this kind of seamless
6 bathy-topo information with consistent reference
7 to the vertical datum.

8 So I think in terms of accuracy, I
9 think it's really very, very important, and we
10 have published a number of papers that
11 demonstrate how sensitive the results, really
12 this body of results with respect to the accuracy
13 of vertical datum. So we came up with estimate
14 of 1 centimeter is really needed. That's if you
15 cannot do this for the entire 0 to 40 meters, I
16 would say from 0 to 10 meters, give us this kind
17 of accuracy; that would be hugely appreciated.
18 Thank you.

19 RDML SMITH: All right. Thank you
20 very much Dr. Zhang. I appreciate it, and I'm
21 really glad to hear that about the modeling
22 community being ready for the next level of

1 resolution. Thank you. Our next commenter, a
2 dear old friend and colleague, Guy Noll from
3 Esri.

4 MR. NOLL: Hi. Hello everyone. Today
5 I'm trying to represent some sectors that I don't
6 necessarily get into all that much. In
7 particular, I really appreciate work that Dave
8 Maune put in on the Alaska Mapping Program
9 outline, and I think it's well on its way to
10 being a very successful program.

11 There were a couple comments that I
12 wanted to make about that in particular,
13 specifically the work that's already been done
14 with USGS. Esri is part of this for the
15 Ecological Coastal Units and that began a few
16 years ago now, a couple years ago and has a
17 global reach with global partners outside the
18 U.S. as well. That's based on Landsat imagery.
19 And so it's only a resolution of about 30 meters
20 but that would be a good start towards a
21 baseline, if you will.

22 And then we recently begun work on a

1 Sentinel-2 vector extraction program using
2 machine learning. And I submitted an image that
3 is here. This is from northeast United States.
4 It's not perfect, and obviously it has picked up
5 some things that shouldn't be picked up and
6 probably left off a couple of things that have
7 been left off. But this is from August, and
8 we're continuing to refine the process. And I
9 think that we will get a very good baseline.

10 So my point in showing this is
11 actually that although the common problem in the
12 past has been how do you establish a full map of
13 Alaska; it's such a large costal area with
14 challenges in weather and tides, the datum, et
15 cetera.

16 Now that we have the machine learning
17 computational perspective, I think we should also
18 be thinking about how do you see trends over
19 time, not just that baseline effort but also the
20 changes over time. And then highlight those
21 changes so that people can do something about
22 them, whether that's local stakeholders using

1 mobile devices or unmanned aerial systems to
2 update certain aspects or perhaps having ports to
3 provide their own information and own that, maybe
4 through the CMTS or the MARAD. They could
5 provide those updates that then become part of a
6 national database, similar to your bathy
7 database, Shep. Thank you.

8 RDML SMITH: Thank you, Guy. That's
9 very exciting. The machine learn is really
10 another really great example of how machine
11 learning needs to be a critical part of how we
12 design these programs from the beginning.
13 Because as you point out, one of the things we're
14 looking for is change. And if we can do things
15 in an automated way, it's going to make that go
16 much more accurately and smoothly and with wide
17 scope. So thank you, and it's good to see you.
18 Thank you for joining us.

19 Next up is Helen Brohl from the
20 Committee on the Marine Transportation System. I
21 will also note that Helen is an HSRP veteran
22 herself. So go ahead Helen.

1 MS. BROHL: Thank you so much,
2 Admiral. Thank you Chairman Saade, Admiral, and
3 members of the HSRP. I really appreciate the
4 opportunity to submit a written statement and
5 just provide a very short overview at this time.

6 I'm Helen Brohl. I'm the Executive
7 Director of the U.S. Committee on the Marine
8 Transportation System, or CMTS. I'd like to give
9 a shout out to Mr. Noll for even mentioning the
10 CMTS. I appreciate that.

11 I just want to make note of the fact
12 that the CMTS has certainly monitored the efforts
13 that are going on with NOMEAC and with the arctic
14 coastal mapping strategy, and we are certainly
15 very supportive. Many of our member agencies, in
16 particular NOAA, have been very engaged in the
17 development of those. We have certainly been
18 monitoring and appreciate the effort to consider
19 all of our mapping and charting needs within the
20 United States. I'd like to emphasize two points,
21 however.

22 One is that while the work of the

1 NOMEAC and the arctic group is very complementary
2 to the work of the National Ocean Service,
3 charting and mapping, the co-op work, Geodetic,
4 it is not yet clear how those initiatives will be
5 implemented fully. And to that end, we hope that
6 you'll consider while remembering or emphasizing
7 that the foundational programs that the Marine
8 Transportation System relies upon, again, those
9 from the Office of Coast Survey, co-ops,
10 Geodetic, the NOS programs are hugely important
11 to the Marine Transportation System to navigate
12 safely and securely through our waterways.

13 I also want to emphasize that the work
14 that is going on with those programs is
15 interagency. Other agencies, including Coast
16 Guard, Army Corps of Engineers, the NGA are
17 engaged in providing real-time navigation
18 services to industry. But in doing so, they're
19 working very collaboratively to try to bring the
20 United States to, dare I say, the 21st century
21 plus in providing the best information, the most
22 discoverable information, and real-time

1 information, again for navigation services.

2 So to the extent that as you consider
3 these new initiatives which, of course, are
4 important, we also appreciate that you do not
5 throw the baby out with the bathwater so to
6 speak, and remember that that those foundational
7 programs are also extremely important.

8 That's it for me. Thank you so much.
9 I'm happy to answer any questions.

10 RDML SMITH: Okay, thank you, Helen.
11 I appreciate it. I appreciate your comment and
12 thank you for your service to the HSRP.

13 Okay, next we have another HSRP
14 veteran very recently, Joyce Miller. And I don't
15 know how you use your organizational affiliation
16 these days, Joyce, so I will let you introduce
17 yourself.

18 MS. MILLER: Hi, I'm Joyce Miller.
19 I'm a retired hydrographer and deep water mapper.
20 And two things, my last meeting in Juneau, thank
21 goodness we got AIS, the PORTS information on
22 AIS. That's a real accomplishment for the HSRP,

1 I think.

2 And a comment to Paul, look at the IHO
3 standards as a starting place, at least, rather
4 than don't reinvent any wheels. Those are two
5 sort of sideways comments.

6 I've been involved in Integrated Ocean
7 and Coastal Mapping since 2002, I attended my
8 first meeting. In that time, ships have gotten
9 multibeam and many of them have sat idle even
10 after the Integrated Ocean and Coastal Mapping
11 Act was passed in 2009.

12 The comments that Larry and Sean made
13 about funding are really the point of my paper or
14 the comments I made. Ships have really sat idle
15 because there was no funding for deep water
16 mapping. We've got the multibeam, we've got the
17 equipment, we've got a whole new band of
18 surveyors, and in this COVID crisis, many of the
19 academic ships are underutilized or idle. And
20 there's mapping that could be done. If you look
21 at the U.S. bathymetry coverage and gap analysis,
22 there's mapping that could be done within the

1 range of medical facilities that we could at
2 least get a start on filling the gaps that are
3 near enough to be reachable in this COVID time.

4 So, again, we've had an integrated
5 ocean and coastal mapping group. They talked
6 about standards. We talked about a national
7 plan. We can plan for another two decades, but
8 if we don't have funding for mapping, and I'm
9 totally in support of greater than 40 meters
10 because it's doable, then we're not going to get
11 anything done. That's my comments, and it's good
12 to see everybody. I am in Hawaii.

13 RDML SMITH: All right. Thank you,
14 Joyce. I appreciate it. Thanks for your
15 comments. Next up we have Dr. Vicki Ferrini from
16 Lamont-Doherty Earth Observatory who also serves
17 as, I don't know what the right title is, she
18 heads one of the regional data assembly centers
19 for the Seabed 2030 global ocean mapping effort.
20 Go ahead, Vicki.

21 DR. FERRINI: Thank you. So I'm going
22 to submit a written comment but echoing a lot of

1 what was stated earlier, I really sit in the
2 NSF-funded space. And echoing what Joyce said,
3 recognizing the huge investment that's been made
4 in the UNOLS suite and its capabilities for
5 mapping as well as data management and data
6 synthesis efforts and also best practices for
7 data acquisition.

8 Really most of what we're doing,
9 besides the basic data management, but the data
10 curation and the best practices, are very much
11 geared towards the deep water. And so I am very
12 encouraged by the opportunity to work more
13 closely across the silos that exist so that we
14 can share knowledge and approaches.

15 And then just very briefly in the
16 space of GMRT, the Global Multi-Resolution
17 Topography Synthesis, we've been evolving over
18 the past few years because we recognize that more
19 data is being acquired than we can keep up with,
20 right. So we're presently more than 50% of the
21 UNOLS data, or academic data that has gone into
22 the NOAA archives has been integrated and

1 processed for GMRT. Most of that data goes in
2 raw. We're trying to make our tools
3 distributable so that people can use them,
4 whether it be academics that are out collecting
5 data or other mapping groups that might be
6 processing data routinely as part of their
7 standard operating procedures.

8 And what we found in our years of
9 trying to build this global synthesis is that
10 it's really helpful, particularly when you're
11 working with transit data, which is important for
12 filling some of the gaps, to look at the data in
13 the context of other existing already processed
14 data.

15 And so that's what we are evolving our
16 tools to do so we can distribute it out on ships,
17 to other researchers, even to potentially engage
18 students to engage in this process, which is a
19 kind of citizen science to help us build these
20 data compilations and make them more acceptable
21 to the public.

22 So I think that's all I have to say.

1 Thank you for the opportunity.

2 RDML SMITH: Thank you, Vicki. I
3 really appreciate it. And thank you for all you
4 do for ocean mapping and appreciate you joining
5 us today. Next up we have Molly McCammon. Is
6 Molly --

7 MS. MCCAMMON: Yes.

8 RDML SMITH: -- ready and available?

9 MS. MCCAMMON: Yes. I have my web cam
10 on, but it's not showing up for some reason.

11 RDML SMITH: Okay.

12 MS. MCCAMMON: But can you hear me
13 okay?

14 RDML SMITH: I can.

15 MS. MCCAMMON: Okay, great. Well,
16 thank you so much. First of all, I just want to
17 thank the committee and Dave for his work on the
18 Alaska mapping strategy. This was an
19 opportunistic effort because when the executive
20 order came out a year ago, the state, NOAA, USGS,
21 and Alaska Ocean Observing System had already
22 been working for the prior year developing a

1 strategy for developing priorities for coastal
2 mapping, so it is really opportune that the
3 executive order came up.

4 So we really appreciate Dave's work on
5 it. We appreciate his reaching out to us and
6 asking for input. And also for being very
7 patient for us getting our input at the last
8 minute and incorporating that. So thank you.

9 I did want to note that, you know, the
10 whole issue of coastal hazards when AOOs first go
11 involved in this was in 2012 when we did a
12 workshop with USGS, Fish and Wildlife Service,
13 the state, numerous landscape conservation
14 cooperatives that Fish and Wildlife Service was
15 doing and trying to see what the whole play was.

16 And there are lots of different
17 components with coastal hazards. There's the sea
18 ice component, there's the bathymetry and
19 charting, there's water level, there's
20 permafrost, there's some coastal mapping, there's
21 vertical data, so there's all these pieces and
22 how do we all kind of play together and what is

1 our various niches in there. And that's when
2 AOS really kicked off the water level
3 observations as kind of our piece of it.

4 And since that time, with support from
5 the National Weather Service Alaska Regional
6 office, we've devoted quite a bit of funding and
7 time in highlighting the GNSS reflectometry
8 stations. And we have one active one in St.
9 Michael now it's the UNAVCO site. We have one
10 going into Utqiagvik, and we have another, but it
11 was delayed. It was supposed to go in this
12 summer but was delayed due to COVID travel
13 restrictions. And now we have another one that
14 will go in somewhere on the west coast of Alaska
15 as well. So we will have three GNSS sites that
16 are AOS supported.

17 And I just wanted to note the reason
18 the Weather Service came to us was because we
19 were able to pool money from multiple sources
20 over multiple fiscal years. And so I just want
21 to emphasize that the IOOS Regional Associations
22 can really be looked at for a testbed for these

1 kinds of opportunities in the future.

2 And again, I want to thank the
3 committee and Dave for his work on the mapping
4 strategy.

5 RDML SMITH: All right. Thank you
6 very much, Molly. I appreciate you and
7 appreciate your comments and joining us. Next
8 up, we have Dr. Bob McConnaughey from Alaska
9 Fisheries Science Center. Hi, Bob.

10 DR. MCCONNAUGHEY: Hi. Good afternoon
11 everybody. Let me mention that I'm a fisheries
12 biologist with NMFS, and my particular specialty
13 is habitat science.

14 So some of the earlier discussion
15 today addressed regional prioritization
16 challenge. I guess, with my question, I'd like
17 to try and take the conversation into thinking
18 maybe one level higher.

19 So recently, I had the good fortune to
20 lead the NMFS team for Alaska, where we were
21 identifying and prioritizing areas for mapping
22 under NOMECS. And to do this, we surveyed all of

1 our scientists and managers at the Science Center
2 in the regional office and compiled that
3 information. And as you can imagine, we wound
4 up, the result was a pretty complicated mix of
5 requirements and justifications. And that's, if
6 you will, just for Alaska fisheries.

7 So my question then is, is that
8 presidential memorandum identifies multiple
9 societal needs: things like security, minerals,
10 navigation, and everybody's favorite, fisheries,
11 and some others probably, and all this from a
12 national perspective. So I'm wondering how these
13 different needs, meaning not so much regions and
14 sites but higher-level needs, how they will be or
15 can be prioritize and translated into an
16 operational sequence. In other words, I mean,
17 how do we consider the relative importance of
18 security, minerals, navigation, fish, and others.
19 Thank you.

20 RDML SMITH: All right. Thank you
21 very much, Bob. Appreciate your comments. Thank
22 you for joining us. Next up we have Denis Hains.

1 Is that all right? Did I get that right?

2 MR. HAINS: Yes.

3 RDML SMITH: Denis Hains, the former
4 head of the Canadian Hydrographic Service and now
5 on his own. Denis, I appreciate you joining us
6 today and for your comments on the site as well
7 and appreciate your willingness to make a public
8 comment. Go ahead, please.

9 MR. HAINS: Yes, it's going to be
10 pretty short. You can read my comments here, so
11 I just want to thank NOAA for this very
12 transparent process and open allowing for input.

13 So my comments are more really to the
14 framing that you mentioned in your presentation
15 that there are two oceans and the Great Lakes
16 were included, but as a Northerner coming from
17 Canada, I think the Great Lakes should be spelled
18 out and also three oceans rather than two ocean
19 to include, of course, the Arctic Ocean, which is
20 a challenging one as you all know.

21 Second element of what I wanted to
22 provide as a kind of overarching concept and

1 scoping is the multinational impacts of NOMEAC.
2 Clearly, most of the work is going to be done in
3 U.S. territorial waters, and that's great, but I
4 think it is essential to name the collaboration
5 that will take place because I'm assuming it's
6 going to take place with neighboring countries
7 such as, of course, Canada, Mexico, Russia, the
8 Caribbean countries, I'm assuming, and all
9 others.

10 I think it is important that this is
11 framed into your documentation either under the
12 governance piece that you mentioned under Goal
13 1.1 or possibly under the Goal 5 that you
14 mentioned as well in terms of going beyond the
15 partnership of the basic.

16 But that's all I wanted to mention
17 this afternoon. Thank you.

18 RDML SMITH: Well, thank you, Denis.
19 Appreciate your comment and glad you were able to
20 join us and certainly take your words of wisdom
21 to heart. Thank you.

22 And last on our planned list is Eric

1 Fischer from Geoscience Solutions. Eric, are you
2 on?

3 MR. FISCHER: Can you hear me?

4 RDML SMITH: Yes, we got you.

5 MR. FISCHER: Okay. I submitted a
6 couple of questions. I wasn't sure which one we
7 were looking at on the sheets.

8 RDML SMITH: Well, really, you can
9 make whatever comment you'd like. We really
10 don't have a lot of time to respond to them right
11 now, but whatever you'd like to use your time
12 for. Thank you.

13 MR. FISCHER: Okay, thanks. So just
14 looking at the broader picture, there's a lot of
15 BOEM activity permitted going on on the east
16 coast right now as well as historic activity in
17 the Gulf of Mexico. I wasn't sure if you guys
18 were looking at integrating with that data to
19 make the requirement for BOEM data to be
20 submitted to this mapping plan. I think there
21 would be a lot of value in that. The
22 requirements there are pretty high where we're

1 required to do (audio interference) as well as
2 with the infrastructure going in place (audio
3 interference) are you working with those
4 operators to install different CO-OPS or CORS
5 stations on those structures to provide a network
6 for positioning offshore reference? There used
7 to be several of these in the Gulf of Mexico, and
8 I've used them years ago, and they were really
9 nice as far as a lot of impact that can happen
10 there.

11 And my last question was around
12 National Marine Fisheries permitting. Is there
13 any discussion around permitting requirements and
14 how that might affect opportunistic surveys?

15 Thanks.

16 RDML SMITH: Yes, we could talk for
17 hours on those questions, but really great, I
18 particularly appreciate you raising the subject
19 of the BOEM data and the environmental compliance
20 requirements because those are two big issues
21 that we have been talking about in interagency
22 discussions, and I am glad that they are on the

1 record here, and I appreciate you raising them.
2 And thank you for joining us.

3 So that is all the speakers we have
4 lined up for the public comment period today. We
5 will have another public comment period tomorrow.
6 Appreciate everybody's really great, concise
7 comments, and I look forward to doing some more
8 of this tomorrow. So keep sending in written
9 comments, and we can work with you from there if
10 you think that it would be helpful to make a
11 public comment as well.

12 And so with that I'll turn the chair,
13 turn the floor back over to our chairman, Ed
14 Saade. Take it away, Ed.

15 CHAIR SAADE: There we go. Okay. All
16 right, thanks. That was a great session.
17 Fantastic that there's so many participants both
18 with the panel and certainly with the guests and
19 the public. That's what it's all about.

20 So we're going to get into the wrap-up
21 mode here. I'm going to step through the panel
22 and request some wrap-up ideas and comments.

1 We've got the better part of a half an hour here.
2 It's going to be everybody that has had a chance
3 to speak today formally and anything you want to
4 do to wrap up, and again, we have more time
5 tomorrow too if we don't cover everything. So
6 Gary Thompson, let's start with you.

7 MEMBER THOMPSON: All right. So I'm
8 always waiting because I'm a T to be the end, so
9 --

10 CHAIR SAADE: I know. You can thank
11 Lynne for flipping the order there.

12 MEMBER THOMPSON: That's all right.
13 So great session today. A lot of brilliant,
14 great information. I want to thank Dave for your
15 leadership on the paper. You've done a great
16 job, and I was glad I could participate.

17 But I think we just need to keep
18 looking to use existing technology but also new
19 technology that can help us map in these
20 environments that are critical to the
21 infrastructure, critical to Alaska, any part of
22 the country. So I'm always looking forward and

1 always like to use new technology when I can when
2 it's proven technology.

3 CHAIR SAADE: Okay, thanks. Julie
4 Thomas. You're muted. Julie, you're muted.

5 CO-CHAIR THOMAS: Got it. Can you
6 hear me now? Maybe I can just say ditto on what
7 Gary said. I agree totally, and I'm also
8 continually amazed during the director's reports
9 about how much was -- or how much people have
10 been able to do during COVID and these
11 challenging times.

12 And maybe I'll just make one more
13 comment to the panel because tomorrow we're going
14 to be talking about the letter to the
15 administrator, Dr. Jacobs, and Sean's going to be
16 leading that discussion. But just a reminder
17 that if you have any suggestions, we will be
18 wanting suggestions as far as what to include in
19 there, particularly topics that have really
20 struck a chord with you or something of interest.
21 So, you know, if you could just jot down things
22 that you want to make sure we include in that

1 letter, that would be great. Okay. I think
2 that's it for me.

3 CHAIR SAADE: Thanks, Julie. Captain
4 Sal.

5 MEMBER RASSELLO: Hey, can you hear
6 me?

7 CHAIR SAADE: Yes.

8 MEMBER RASSELLO: Okay, yes. I think
9 it's great work today. It is very late over
10 here. So I'm going to say that for these two
11 projects, prioritization and the coordination is
12 of paramount importance due to the environment we
13 are in with this COVID. So that will dictate our
14 step forward, although I am very optimistic on
15 what strategies we are taking and looking forward
16 to continuing working with you guys.

17 CHAIR SAADE: Great. Thanks a lot,
18 Sal. Ed Page.

19 MEMBER PAGE: Yes. I'm particularly
20 encouraged by the use of AIS to disseminate PORTS
21 information. That was an issue that was a logjam
22 for some time. And then at our meeting two years

1 ago we were in Juneau, that's when the head of
2 Waterways Management for the Coast Guard
3 headquarters, Admiral Gallaudet, kind of hammered
4 out this and agreed they needed to move forward
5 on applying the Coast Guard goals to support
6 NOAA's dissemination information, so I think
7 that's encouraging. And it starts with the ports
8 but even if you notice some areas or your Coast
9 Pilot have information, any information or even
10 precision navigation information that can be
11 better sent via, you know, AIS digitally versus
12 voice, is a positive sign, more clarity and
13 better access.

14 So other weather information has been
15 a great way of applying the AIS transmission of
16 data. I see that when I go to Canada. I see a
17 lot of AIS sites transmitting information to
18 vessels. I see it overseas. We were a little
19 slow on the uptake on that one, so I'm glad we
20 are finally moving on it. And, of course, the
21 Coast Guard owns the infrastructure but NOAA had
22 to be able to convince them that's the best

1 interest to make that available and start using
2 it to pull an application of other parts of the
3 world.

4 So that's a good step forward, and I'm
5 pleased to see that. Everything else, of course,
6 to chart in. I can't say much more about how
7 much effort has been put towards Alaska. I got
8 to be quiet now. I don't want to monopolize
9 everything, so I'll be quiet. Thank you.

10 CHAIR SAADE: I mean, you're a
11 congressmen. Okay. Captain Anne McIntyre.

12 MEMBER MCINTYRE: I think I'm unmuted.

13 CHAIR SAADE: Yes, you're good.

14 MEMBER MCINTYRE: Great. Okay. Yes,
15 I just wanted to just kind of touch on something
16 that Admiral Smith said earlier today when he had
17 the slide up with all the little autonomous
18 vessels out there. And it was that he said three
19 years ago I wouldn't have felt comfortable moving
20 forward with the technology, but today I do. And
21 it was just in general a comment about how
22 exponentially technology is growing and

1 impacting, you know, everything under the purview
2 of what we advise on. And I just wanted to
3 comment on that. It just really struck me and,
4 again in the time of COVID when we are all having
5 to make these big technological shifts just to do
6 our job, it's amazing to me how quickly things
7 are changing, and also just how much opportunity
8 is put forth along those same lines.

9 CHAIR SAADE: Thanks, Anne. Dave
10 Maune.

11 MEMBER MAUNE: Yes, I have three
12 topics. First of all, several people mentioned
13 things dealing with the environmental factors,
14 fisheries, that sort of thing. We are in the
15 middle of the 3D Nation Elevation Requirements
16 and Benefits study, and Ashley Chappell is
17 heading it up from those perspective, and it will
18 be interesting to see what the results of that
19 have to say about the benefits of elevation data
20 for satisfying over a thousand different
21 mission-critical activities.

22 The second point I wanted to raise is

1 Admiral Smith talked about these emerging
2 technologies, and I will be anxious to hear
3 everything I can about the lessons being learned
4 from the ongoing Saildrone project in Arctic
5 Alaska. I know you're working there hard last
6 year and this year, I believe, and I will be
7 anxious to see how well that works out because
8 that Saildrone goes out for weeks at a time by
9 itself. It's just operated from Mission Control.
10 And so I'm pleased to learn more, I will be
11 pleased to learn more about what its capabilities
12 and limitations are. That's all I have. Thank
13 you.

14 CHAIR SAADE: Thanks, Dave. Captain
15 Ann Kinner.

16 MEMBER KINNER: Yeah. A couple of
17 quick comments. I think it was something in
18 Juliana Blackwell's comments about, the comment
19 was made about doing things right as opposed to
20 doing things quickly. And it struck a chord with
21 me because I've said for years, you cannot have a
22 deadline on a boat. The minute you do, you have

1 a problem. So it needs to be done right, and if
2 it takes longer to do that, so be it.

3 I will be looking forward to tomorrow
4 to talking about NOMEAC, particularly about
5 interactions with other agencies, and there was a
6 certain amount of that in the Alaska paper as
7 well. But I know there are a lot of people out
8 there looking at the bottom of the ocean. And
9 it's going to be interesting to find out how many
10 of them are talking to each other and how we can
11 share that information and maybe get through the
12 deep water part with less expense so then we have
13 money to spend on the shallow water part. That's
14 it.

15 CHAIR SAADE: Thank you. Ed Kelly.

16 MEMBER KELLY: Yeah. I continue to be
17 amazed over the eight-year period and especially
18 even at an accelerating rate of calculus here how
19 quickly the technology is becoming frequent, more
20 available and more people are working out there.
21 I, again, go back to the maxim: measure it once,
22 use it a thousand times.

1 And just in this public comment, we
2 have more opportunities to hear private
3 enterprise coming up with what appear to be
4 quality data acquisition and use systems that we
5 have to find ways to have NOAA and other
6 governmental agencies work to assimilate and
7 accumulate and to integrate and use that data so
8 that the pace of our exploration for mapping,
9 safety, et cetera can keep pace with the rate of
10 technology that's emerging here.

11 The only thing I am disappointed with
12 is that by now I thought Rich Edwing would've had
13 a much better COVID beard, and I'm a little bit
14 disappointed in that, but other than that, this
15 is a good meeting.

16 CHAIR SAADE: Thanks a lot, Ed.
17 Lindsay Gee. You might be muted, Lindsay.

18 MEMBER GEE: Yeah, I'm muted. Sorry.
19 I'm hopefully there now. You know, and again, I
20 said before that I think we're seeing, as Ed
21 said, we're seeing an ocean moment, and I really,
22 it's exciting to see that. I echo again about

1 this being discussed by a number about the
2 benefits of public-private partnerships, and I
3 think Ed just described how there's so much
4 happening in the private areas and nongovernment
5 areas with technology particularly that we need
6 to be able to make sure that that's fully
7 utilized and it's efficiently utilized in any
8 partnerships we move forward.

9 I think in the technology point of
10 view, it's great. As you know, I kind of like to
11 see the technology applied and all those things,
12 and hopefully we will talk more about that
13 tomorrow on the NOMECE discussions.

14 I think we're seeing a
15 trigger in some of these things too. We hope
16 they come forward from, kind of that initial
17 thought of there's some use of the technology,
18 but maybe the COVID situation is going to be a
19 bit of a trigger for this, and I think we're
20 seeing that a little bit.

21 From a personal experience right now,
22 you know, we've had Bob Ballard talk about

1 telepresence in the '80s. We didn't have the
2 technology to allow us to do that. And it was,
3 kind of, we did it with people ashore when we
4 kind of could, but right now we are being forced
5 to do it.

6 And, you know, cruises are using that
7 fully. And so hopefully, that trigger of COVID
8 has some benefit in that it allows other
9 technologies to be really used more when people
10 are just be thinking they might use them, now
11 they can truly embrace them and move forward.
12 Thank you.

13 CHAIR SAADE: Thanks, Lindsay. Dr.
14 Nicole Elko.

15 MEMBER ELKO: Thank you. Thanks all
16 the organizers today. This has been a great
17 session. I feel like everyone was really
18 engaged, and I really appreciated the
19 conversations.

20 I'm looking forward to the
21 conversations tomorrow about NOMECC because for a
22 number of reasons that have already been brought

1 up, specifically interagency coordination and
2 kind of this concept of integrating the rapidly
3 emerging new technologies into the mapping
4 strategies, right.

5 And we've said that a number of times
6 now, but how do we do it, right? This isn't
7 something NOAA has necessarily embraced fully in
8 the past, and it seems to me that, you know,
9 starting, it seems to me that we're going about
10 it the right way, right? Developing the
11 protocols and standards first is key because that
12 kind of sets the bar of, you know, how deep in
13 the new technology or low-cost sensors or citizen
14 science or wherever we're going, we can go.

15 But, you know, so I think that's the
16 million dollar question and it's developing the
17 protocols and striking that balance in your data
18 standards and kind of that, like, new technology
19 sensor cost advantage to be more efficient.

20 So, again, just looking forward to
21 talking about that tomorrow. I hope we can find
22 a way to recommend some of those in the plan

1 because if we don't, by the time it comes out, we
2 might be addressing, you know, yesterday's needs
3 today. I'd like for us to avoid that. Thank
4 you.

5 CHAIR SAADE: Thank you. Sean Duffy.

6 MEMBER DUFFY: Yes, thank you Mr.
7 Chairman. So as Julie referenced, tomorrow I
8 will be working to try to capture ideas for the
9 response letter, and I will use that as kind of a
10 segue into something that I will, I've mentioned
11 before on some of the subcommittees but what I
12 would call making sense of sensors, where we have
13 some different readings in some of the sensors,
14 and I'm sure it happens in other places. And it
15 was really good to hear Dr. LeBoeuf, and she had
16 a great point about having a presidential
17 directive.

18 And, you know, something we say a lot
19 is, never waste a good emergency, so while we
20 have the attention at that level pushing the
21 efforts to deliver not only just papers and
22 continue on all the NOMEAC and the different white

1 papers but that we have a lot going within this
2 group and hopefully I can take comments tomorrow
3 and at least start a draft for the response
4 letter. And with that, I will sign off. Thank
5 you.

6 CHAIR SAADE: Thanks, Sean. Captain
7 Anuj Chopra.

8 MEMBER CHOPRA: Hi. Good afternoon.
9 Thank you, Ed. First, I know I mentioned it
10 earlier, again I'm really amazed at the amount
11 that's been achieved by the NOAA leadership in
12 these COVID times. I'm excited about the
13 public-private partnership and the way that's
14 moving as has been proposed.

15 Appreciate the leveraging of
16 technology as already mentioned by everybody
17 else. I think this is the age of AI, and we use
18 it and to our best advantage. Looking forward to
19 tomorrow. Excited for tomorrow and looking
20 forward to getting to some good conclusions by
21 the close of business tomorrow. So thank you.
22 Thank you for this opportunity.

1 CHAIR SAADE: And Dr. Qassim Abdullah.

2 MEMBER ABDULLAH: Thank you very much,
3 Ed. And it was a great meeting, absolutely. And
4 I echo what Anuj said about the progress of NOAA
5 and other federal agency achieved during this
6 difficult time. Keep it up guys, great. We are
7 proud of you definitely.

8 I just would like to emphasize on NOAA
9 the interagency working group, I think it is a
10 great idea. But I just want to see more tangible
11 cooperation because from experience, I think
12 different agency collecting coastline data with
13 different specification, and I thought when they
14 sit around the table in this interagency this
15 should be hashed down so they agree what to
16 collect, so just an observation. I could be
17 wrong about it. But I think it's a great
18 opportunity for all these federal agency to
19 comment but to support what has been talked
20 about.

21 As for private academia partnership,
22 to please have a seat for them on the table. You

1 know, because giving them five minutes for
2 lightning talk at the public comment is really,
3 historically public comment doesn't change cooked
4 policies, let me tell you that. I mean, very
5 little, if it does anything to change anything
6 because things are already, you know, on the
7 paper. People are excited about what they put.
8 To have somebody comment and change that, it is
9 very difficult, the human being nature, you know.
10 So if you really want participation, and we have
11 a lot of intelligence in the academia and the
12 private, there is so much capability that can
13 serve the NOAA and other federal agency, just
14 give them a seat on the table to contribute.

15 And lastly, I just want to emphasize
16 wish that we can after this meeting, we take a
17 serious step on what I proposed before to Paul
18 and maybe Ashley on the depth element of national
19 standards. I'm not talking about practical. I'm
20 not talking about the project specification. I'm
21 talking about national standard for coastal
22 mapping and hydrographic surveying. And I would

1 love to entertain that idea and give idea or
2 participate in the development.

3 Dave was with me. We developed the
4 National Center of Mapping for ASPRS. It is
5 worldwide used, worldwide now. We can do the
6 same thing. We can lend our experience to NOAA
7 and the interagency of the coastal mapping.
8 Thank you very much.

9 CHAIR SAADE: Thanks, Qassim. Okay.
10 We're going to shift over to the directors and
11 leadership. Let's start off with Dr. Larry Mayer.

12 DR. MAYER: Well, thank you. I guess
13 I'm going to start by piling on with comments on
14 how much has been accomplished by the officers.
15 It really is amazing in this time to see what
16 they've done, and it's really encouraging.

17 I will focus my comments on the NOMECC,
18 and hopefully we will be able to come back to it
19 tomorrow. I've certainly paid a lot of attention
20 to it. It is near and dear to my heart, and I
21 don't use the word great a lot I suspect. I
22 think it represents a really great challenge.

1 But like great challenges, it also offers great
2 opportunities, and I think NOAA has made a really
3 great start in addressing it. And it is a start
4 that has been filled with lots of, I'll say great
5 intentions, just keep using the word great. But
6 it's a huge task, and it really is going to take
7 all hands on deck to get it done.

8 And I know technology is going to come
9 to our aid and hopefully we're in the midst of
10 that at the university in trying to push those
11 technologies. But my biggest fear is that unless
12 we find the mechanism, it's really an issue of
13 finding a mechanism that will truly allow the
14 engagement, collaboration, and cooperation of all
15 the sectors we've talked about: private
16 industry, philanthropy, academia, federal
17 agencies, state, and local people. It's going to
18 take everybody to get the job done.

19 Unless we find that mechanism, we can
20 let a great opportunity slip through our hands.
21 We may see a great opportunity slip through our
22 hands, and so I'm hoping tomorrow we can come

1 back and maybe have some time to start
2 brainstorming about are there mechanisms out
3 there that can really coordinate across all those
4 different sectors. That's it. Thank you.

5 CHAIR SAADE: Thanks, Larry. Rich
6 Edwing. You're muted, Rich.

7 MR. EDWING: There we go. I have to
8 push two buttons. That's very hard, you know. So
9 anyway, as I said, a very good meeting. I
10 appreciate the, you know, recognition we've
11 gotten from the panel members for the great work,
12 you know, not just my office but co-serving and
13 just being able to get done this year despite the
14 pandemic.

15 You know, my office is not as
16 centrally involved in the NOMEK and Alaska
17 strategies really, just very peripherally to
18 NOMEK, but certainly we do have some role up in
19 Alaska. As Shep mentioned, there are places that
20 really don't have, you know, tidal datums. We
21 can't use VDatum, so we've been really involved
22 with the Alaska Water Level Watch and other

1 groups that are looking to, you know, be able to
2 get more work done up there with water levels.
3 So just stay tuned, I guess.

4 And for Ed Kelly, Ed, I actually
5 couldn't get back this morning because, you know,
6 I do work for the government. I didn't want to
7 look too shaggy. You know, I could have gone for
8 a General James Longstreet kind of look there
9 but, so, thanks, Ed. All right. Thank you.

10 CHAIR SAADE: Great. Thank you.

11 Juliana, you're up next.

12 MS. BLACKWELL: Okay. I'd like to
13 thank the panel members for their continued
14 engagement on these topics between the meetings.
15 I think you all owe yourselves a pat on the back
16 and a round of applause from us here at NOAA for
17 all the work that you've been doing in between.
18 And so all the working groups that have been
19 meeting and discussing these topics and coming up
20 with recommendations, it's because of the work
21 that you've put into it, and we really appreciate
22 you taking this seriously and providing your

1 professional input to the work that we're doing
2 and the challenges that we all face together.

3 I think that you should also be, as
4 part of that, proud of yourselves for putting
5 together the white paper on the Alaska Coastal
6 Mapping Strategy and getting out in front of the
7 development of the implementation plan. And I
8 realize that that might not be all the industry
9 input that you would like to see, but I believe
10 you are representing your sectors well and your
11 areas of expertise in providing the input through
12 that white paper. So I thank you for your
13 engagement. Thanks.

14 CHAIR SAADE: Thanks, Juliana.
15 Captain Andy Armstrong?

16 CAPT. ARMSTRONG: Yeah, I managed to
17 get those two buttons pushed, Ed. So I think
18 most everything has been said. I'd like to add a
19 comment recognizing the really good public input
20 we had. I think there was some really helpful
21 statements from the public commenters this time,
22 and I hope we will have a chance to follow-up on

1 some of those.

2 And also I want to thank Ed and Julie
3 for doing such a great job of leading us through
4 the meeting today.

5 CHAIR SAADE: Thank you, Andy. Nicole.

6 MS. LEBOEUF: Thank you, Ed. Thank
7 you, everyone. I've said this before, and I will
8 say it again. I've worked for a lot of federal
9 advisory committees over my 25-year career. The
10 HSRP is the gold standard. You all are engaged,
11 expert in what you do, and willing to share your
12 feedback with us in so many ways, so thank you
13 for that.

14 I also would be remiss by not
15 mentioning this, it's end of the year performance
16 evaluation for Shep and Rich and Juliana. So
17 they appreciate all of the compliments.

18 I would pile on further but because
19 I'm at the head of NOAA, I feel like I'm gloating
20 at this point. I'm so proud and so impressed
21 with the team. We've been in touch all year, and
22 I know how hard it has been for all of them to,

1 not just get through COVID and do their mission,
2 but transform their mission in so many ways to be
3 as productive as they have been. It has just
4 been really kind of a big awful glass of
5 lemonade, but we will take it and thank you for
6 your praise on that.

7 I can pile on on the technology stuff,
8 but it's not just technology and Dr. Jacobs might
9 reiterate some of this. It is the incorporation
10 of technology, but it is being also nimble in our
11 data assimilation and processing and providing
12 access to others to do the same so that we can
13 really be keeping pace with the coastal change
14 that is accelerating and we know this. So really
15 look forward to going into this era with all of
16 you and appreciate your engagement immensely.
17 And hopefully we will get a few takers for the
18 wrap-up in just a little while. Thank you, Ed.

19 CHAIR SAADE: Thanks, Nicole. Dr.
20 Jacobs.

21 DR. JACOBS: Yes, I just wanted to say
22 I appreciate the chance to speak earlier. Lots

1 of good discussion on new technology with UxS and
2 other sampling. I really want to emphasize there
3 was some discussion on the quality control and
4 the metadata. I think as we go forward and we
5 have more different type of observing systems
6 that this is going to be the more critical as
7 well as data management.

8 Great points on the interagency
9 coordination. I think that streamlining that
10 process and trying to reduce any redundancy while
11 we're doing it is going to be really, really
12 helpful and, of course, the ties back to coastal
13 resilience and fisheries and any other aspects
14 that we can utilize a lot of this stuff across
15 the agency, I think there's a lot of additional
16 value there that we haven't even dug into yet.

17 But lots of good questions from the
18 community. Great to see the feedback and support
19 for data acquisition for nearshore modeling.
20 And, in general, just really, really appreciate
21 everyone's understanding of all the challenges
22 we've had this year with COVID. I just can't say

1 enough how proud I am of the agency for
2 everything that they've been able to pull off
3 this year and how everyone has been able to adapt
4 to the new way of doing things. So kudos to my
5 own team there. I'm proud of you.

6 CHAIR SAADE: Great stuff. Thanks,
7 Dr. Jacobs. In the interest of time, I'm going to
8 hold my comments until tomorrow, I think, because
9 there are so many good points to make. Rear
10 Admiral Smith, would you like to wrap up for us?

11 RDML SMITH: Yes, I would, very
12 briefly. Ditto to, you know, all the thank yous
13 that have been made so far. And two more, one is
14 that, you know, I really think the inspiration is
15 contagious here, and that, you know, the
16 dedication of the panel has inspired the programs
17 to engage more and to raise the sort of level of
18 this review and there's something really
19 important.

20 NOAA leadership has both seen that
21 inspiration and also provide their own
22 inspirations that helps us keep going. And I

1 think the public today, we saw a level of public
2 engagement with this panel that we have not seen
3 as much in the past either. And that, you know,
4 all four of those parties really are inspiring
5 each other, and I can't wait to take that same
6 level of inspiration and apply it to some of the
7 really big challenges that we have coming up,
8 including NOMEK implementation, Alaska coastal
9 mapping strategy, et cetera.

10 And then the only other thing was just
11 a huge shout out to the folks behind the scenes.
12 I don't know whether any of you have ever been
13 involved in theater before but the showrunners,
14 you know, they have a separate radio system
15 that's like this whole other drama that's
16 happening that's not on the stage. And so I've
17 had one ear to the chat that's going that's
18 keeping the run-of-show running smoothly and
19 those folks, all the folks I mentioned earlier,
20 have really been really executing in a brilliant
21 way for us today, and it makes it all look pretty
22 smooth. And so thank you to all of them.

1 CHAIR SAADE: I second that, Shep.
2 And so it's really great to be able to have all
3 that support in the background keeping it all
4 running smoothly, you know. Great job by
5 everyone. So just --

6 MS. MERSFELDER-LEWIS: Could you
7 mention tomorrow's start time and that we would
8 love more comments.

9 CHAIR SAADE: Okay. The start time
10 tomorrow is right at 1 o'clock. We won't have
11 that 15 minute ramp-up, correct? So we will get
12 started at one and I'll just wrap up.

13 As most of you know, I'm always a big
14 advocate of the fact that great things get
15 invented in NOAA and working with the government
16 on these different parts of NOAA, and I can tell
17 you that autonomous vehicles, both acoustic
18 mapping devices like the USVs that we're looking
19 at, and now even airborne hydrographic lidars,
20 we've, all that technology is getting transferred
21 to the private sector, particularly on the east
22 coast of the U.S.

1 And it's all of these types of things
2 that get invented and grow and nurtured and
3 challenged by the likes of the people on this
4 panel and NOAA itself, and University of New
5 Hampshire. It's incredible to me to watch that
6 transfer of technology that moves to the private
7 sector and into industry. So if there ever was
8 an example of public-private partnerships, it's
9 the ability to move these ideas from the public,
10 from the government sector, and the things that
11 we do here and that we talk about here, and then
12 being embraced and going out and really making a
13 huge impact on the world.

14 The other aspect of it all is, you
15 know, we're talking about NOMEAC and Alaska. My
16 two favorite things to do, mapping in the ocean
17 and working in Alaska. So I couldn't be happier.
18 With that, I think I will wrap it up and call it
19 a day and thank everybody. And today's meeting
20 is officially over.

21 (Whereupon, the above-entitled matter
22 went off the record at 5:38 p.m.)

A	
Abdullah 1:16 4:17,18 4:19 25:2 127:19 137:20 162:21 167:2 169:2 189:12 192:15 237:1,2	accuracy 164:13,15 198:4 202:8,12,17
ability 25:5 55:22 74:11 97:18 250:9	accurate 132:20 193:17 193:20
able 14:2 55:11 62:7 63:16 70:3 75:2 76:18 81:10 85:15 88:3 89:14 91:6 97:2 98:14 99:21 101:6 102:7 105:1 131:11 132:2,5 132:7 134:14 136:16 141:19,20 143:11 169:14 177:3,8 187:11 191:18,21 192:3 196:5 198:16 215:19 219:19 224:10 226:22 232:6 239:18 241:13 242:1 247:2,3 249:2	accurately 205:16
above-entitled 51:3 113:18 250:21	achievable 180:17
absolute 30:19 164:15 165:2	achieve 17:10 84:11 105:2
absolutely 29:4 45:19 167:2 237:3	achieved 236:11 237:5
abstaining 18:21	achieves 169:17
academia 4:21 34:14 107:9 158:19 161:11 164:7 198:7 237:21 238:11 240:16	acknowledge 158:17
academic 15:20 54:10 100:7,15 119:14 127:3 140:17 143:6 209:19 211:21	ACMS 3:12 17:11
academics 212:4	acoustic 57:17 58:21 68:5,7 249:17
accelerating 148:2 230:18 245:14	Acoustical 60:16
acceleration 147:21	acquire 86:22 188:6
acceptable 94:14 212:20	acquired 125:22 211:19
access 43:2 45:16 55:20 94:22 125:21 226:13 245:12	acquisition 57:9 58:2 87:7 132:12 133:17 142:21 151:17 211:7 231:4 246:19
accessible 14:7 18:19 86:17 197:10	act 6:8 13:16,17 14:5,11 14:19 49:16 117:14 125:18 209:11
accomplished 239:14	Acting 2:12 11:19 12:2
accomplishing 34:8	action 46:20
accomplishment 208:22	active 30:4 122:11,15 144:10 215:8
accomplishments 63:6 63:8	activities 35:10 37:1 60:19 79:22 92:5,6 94:8 102:2 120:13 121:19 123:14 149:6 149:6 228:21
account 153:4	activity 48:6 82:17 175:17,18 178:20 197:22 220:15,16
accumulate 231:7	adapt 33:18 247:3
accuracies' 181:18	adaptable 28:5
	add 64:17 65:10 134:17 142:14 149:5 150:20 162:22 243:18
	added 64:22
	adding 60:17 64:14 72:2
	addition 17:14 22:8 34:21 50:15 54:22 83:10 86:6 100:6 117:5
	additional 19:22 22:20 22:21 64:17 86:22 149:5 159:21 194:22 195:2 246:15
	Additionally 32:4
	address 61:21 172:8
	addressed 107:11 165:20 216:15
	addressing 166:3 235:2 240:3
	Administration 1:3 90:18
	administrative 12:2 14:21 15:6 18:15 19:21
	administrator 2:12 11:20 13:5,6 19:11 197:1 224:15
	Admiral 2:8 3:4 12:17 25:17 26:15 29:9,15 35:14 91:9,11 114:22 123:21 140:7 159:20 163:1 206:2,2 226:3 227:16 229:1 247:10
	advance 22:18 29:2 57:7,11 195:5
	advanced 4:9 21:12 104:22
	advancements 149:17
	advancing 44:12
	advantage 14:2 140:12 143:2 149:16 234:19 236:18
	advise 13:20 14:6,14 29:2
	advise 16:1 228:2
	advises 196:22
	advising 197:4
	advisors 79:16 80:6
	advisory 13:15,16,17 14:4,6,18 16:1,3 79:14 159:13 244:9
	advocacy 6:10
	advocate 37:5 49:17 249:14
	aerial 30:13 87:1 205:1
	Aeronautical 90:4
	affect 221:14
	affiliate 54:9
	affiliation 208:15
	afford 45:17 97:11
	mentioned 21:2
	afraid 38:4
	afternoon 5:7 6:5 8:8 8:18 9:13 11:7 26:19 35:5 37:9 39:7 123:22 195:3 216:10 219:17 236:8
	afterward 196:12
	age 236:17
	agencies 14:14 15:19 86:2 98:21 99:4 107:9 112:19 113:3 119:9 123:6 124:9 139:16 163:9 167:4 171:16 206:15 207:15 230:5
	231:6 240:17
	agency 34:20 38:21 47:13,15 139:11 163:13 164:3,7 167:19 237:5,12,18 238:13 246:15 247:1
	agency's 39:21
	agenda 16:7 17:8
	aggregating 163:9
	agile 131:21 132:8
	ago 33:21 70:7 103:6 111:15 121:7 165:10 179:11 181:12 186:15 186:17 187:4 201:13 203:16,16 213:20 221:8 226:1 227:19
	agree 116:4 190:3 224:7 237:15
	agreed 226:4
	agreement 53:5,9 56:2 56:4 71:16 83:20 84:5
	agreements 99:3
	aground 179:11,11
	ahead 4:5,10 7:9 8:16 11:18 12:14 26:13 43:19 50:22 51:8 76:19 109:20 112:6 123:20 127:22 128:7 137:1 143:17 147:5 166:21 195:10,10,15 205:22 210:20 218:8
	AI 44:12,20 46:11 47:22 58:16 236:17
	aid 240:9
	air 90:6
	airborne 78:14 249:19
	aircraft 43:4
	airport 90:9
	Airspace 90:16
	AIS 75:4,11 110:1,8 111:1 176:22 208:21 208:22 225:20 226:11 226:15,17
	Alan 15:9,14 119:22
	Alaska 7:15,15 17:5 29:12 42:3 43:15,17 50:10,21 82:9 89:13 99:13 102:12 116:16 117:2 118:2 128:8,13 128:19,20,21 129:4,7 130:22 132:18 133:9 134:19 135:4 139:21 158:10 165:6,11,15 166:4,10 167:9 168:7 168:10,16 170:11,18 171:8 172:5,17,18 173:14 174:10 176:4 176:10,19 177:2,15

- 178:12,16 179:7,21
180:16 183:8,13
184:16 185:9 186:16
187:14,16,20,22
188:4,14 189:15
190:19 192:16,18
193:9 199:14 203:8
204:13 213:18,21
215:5,14 216:8,20
217:6 223:21 227:7
229:5 230:6 241:16
241:19,22 243:5
248:8 250:15,17
Alaska's 49:5,8 174:15
183:15
Alaskan 118:2 131:3
Alaskans 172:21
Alexandria 20:7
algorithms 98:13
align 94:4,8 115:21
125:18
aligned 78:4
aligning 92:2,4 182:4
alignment 92:14
Allison 20:7
allocating 22:2 159:2
allotted 23:3
allow 59:15 98:14 149:7
157:15 233:2 240:13
allowance 120:11
allowed 45:20 72:8
161:20 171:19
allowing 46:1 218:12
allows 46:6 47:2 88:22
233:8
Aloha 26:19
alongside 159:5,14
alphabetic 12:7
alphabetical 10:7 20:5
168:14
alphabetically 4:16
alternate 193:13
Amanda 20:14
amazed 224:8 230:17
236:10
amazing 62:16 105:16
106:4 170:6 193:17
228:6 239:15
ambitious 95:2
AMEC 130:22 135:13
165:17 171:15 172:15
Ameele 20:16
America 60:16
American 9:15
Americans 33:10
Americas 5:9,10
amount 39:19 40:11
68:14 92:13 105:16
109:8,9 113:9 135:8
167:11 177:1 230:6
236:10
amounts 79:18
amplification 40:22
analysis 33:2 69:4,13
151:21 152:15 154:5
154:18,19 209:21
analysts 10:9
Andy 2:2 3:9 10:10,13
10:16,20 13:9 35:20
51:21 52:18 53:1
62:10 182:20 243:15
244:5
animal 60:9,9
animals 57:19
Ann 1:19 6:14,16,19
168:11 176:14 229:15
Anne 1:20 7:4,5,5,7,9
7:10 9:3,19,20 10:4
177:17 227:11 228:9
announced 78:18
announcements 79:5
answer 110:10,15
145:18 147:1 149:19
208:9
answers 149:21
Antarctic 142:2
anticipate 97:2
Anuj 1:16 5:5,8 25:1
169:4,8,22 170:17
236:7 237:4
anxious 229:2,7
anybody 137:16 162:19
163:22 193:20 194:13
195:7
anyone's 149:11
anyway 96:11 150:3
191:11 199:17 241:9
AOOS 214:10 215:2,16
apologies 52:7
apologize 52:10 180:14
apology 170:3
apparent 36:4
appear 36:6 231:3
applaud 136:5
applause 50:12 242:16
application 121:22
133:10 227:2
applications 39:22
84:17 123:13 148:17
180:5
applied 232:11
apply 102:8 248:6
applying 226:5,15
appointed 159:13
appreciate 19:14 37:12
44:8 47:8 49:2 91:5
112:14 137:21 146:22
169:20 178:12 191:4
193:14,21 194:3
202:20 203:7 206:3
206:10,18 208:4,11
208:11 210:14 213:3
213:4 214:4,5 216:6,7
217:21 218:5,7
219:19 221:18 222:1
222:6 236:15 241:10
242:21 244:17 245:16
245:22 246:20
appreciated 187:5
202:17 233:18
approach 81:9 92:1
140:10
approached 144:6
approaches 211:14
approaching 70:11
175:22 176:2
appropriate 22:15
98:15 115:8 197:21
appropriation 36:2,5
appropriations 36:10
36:14 144:15 145:15
appropriators 157:17
approval 136:17
approve 193:8
approved 131:1
approximately 19:22
April 44:9
arcane 56:4
archive 94:17
archives 95:21 211:22
arctic 24:20 49:7
128:16 206:13 207:1
218:19 229:4
area 4:22 6:12 43:6
69:14 82:13 85:1
99:13 155:7,22
169:13 177:20 178:21
181:12 204:13
areas 30:14 34:15
36:21 44:16 61:2
79:17 82:8 87:2 89:19
95:8,13 108:14
144:21 148:2 151:19
152:6,11 155:10
157:7 159:10 216:21
226:8 232:4,5 243:11
arena 164:12
argument 109:13
Arlington 5:1
arm 99:5,13
Armstrong 2:2 3:9
10:10,15,16 13:9
35:20 52:19 53:2
182:20 183:4 243:15
243:16
Army 93:16 95:12,15
96:12 144:3 207:16
artic 118:3 141:14
142:1,1
articles 79:9
artificial 21:10 34:7,11
104:20
Ashley 17:7 20:9 29:17
124:1 138:9 172:4,4,8
172:11,13 173:7
228:16 238:18
ashore 233:3
asked 114:12 195:4
196:10
asking 28:3 159:19
214:6
Aslaksen 20:7 181:8
aspect 152:20 250:14
aspects 44:10 182:10
205:2 246:13
ASPRS 239:4
assembly 210:18
assess 85:15
assessing 31:11
assessment 99:15
152:5
assets 140:13,16,17,17
140:17,21
assimilate 231:6
assimilation 74:5
245:11
assist 20:1
Assistant 2:9,12 12:2
13:5
Associate 7:1
associated 39:9 102:3
association 6:7 9:16
19:7
Associations 215:21
assuming 219:5,8
assurance 87:11
atmosphere 2:11 41:18
atmospheric 1:3 40:15
45:4
attached 52:22 150:8
attempt 14:19
attendance 26:8 37:8
attended 209:7
attention 24:6 28:12
69:21 78:9 91:20
105:21 157:3 179:21
235:20 239:19
audience 127:2
audio 18:18 94:15
221:1,2
augmented 59:11,15
August 43:12,14 80:2

85:5 204:7
authority 145:14
automated 59:7,8
 205:15
automation 34:10
autonomous 47:22
 58:6,7,15 81:19
 103:21 227:17 249:17
available 37:19 45:22
 60:18 81:12,21 86:9
 92:16 95:9 97:14
 101:13 121:4,14
 125:7 129:19 132:16
 135:7 200:22 213:8
 227:1 230:20
Aviation 90:18
avoid 113:4 235:3
awaited 92:8
award 56:13,19
awarded 56:14
aware 37:5 190:19
awareness 24:6
awesome 29:22 30:1
awful 245:4
awkward 108:5

B

B 43:20 132:3
baby 208:5
back 5:15,17 7:10 9:2
 11:14 23:5 37:14
 42:14 43:8 48:9 51:1
 51:6 52:8 63:5 75:17
 97:12 104:2,7 105:11
 106:5 110:14 113:16
 114:17 116:14 117:10
 118:4 128:6 132:3
 144:12,22 145:13
 156:3 168:9 169:9
 174:7 175:11 181:5
 183:19 187:1 192:4
 193:6,10 194:7
 222:13 230:21 239:18
 241:1 242:5,15
 246:12
backbone 84:12,12
backbones 32:20
background 113:10
 249:3
backscatter 59:5 121:8
 125:13
backscattered 153:16
backscattering 153:18
backyards 70:6
bad 137:11
balance 147:19 148:8
 150:13 155:3 234:17
balancing 92:20

Ballard 232:22
band 209:17
bar 10:2 154:17 234:12
Barglow 20:8
barriers 142:22 143:2
Barry 99:13
base 64:2 68:10 181:2
based 5:11 9:9,16
 12:21 23:11 54:13
 56:17 57:3 86:4
 126:20 154:18 157:8
 203:18
baseline 203:21 204:9
 204:19
baselines 124:17
basic 83:5 121:21 211:9
 219:15
basically 124:14 128:11
 145:17 181:17
basis 70:6
bat 91:13
bathwater 208:5
bathy 151:21 152:14
 185:3 188:8 205:6
bathy-topo 200:15
 202:6
bathymetric 58:20
 94:21 95:3 107:20
 121:6 153:17 164:17
bathymetry 39:12 40:11
 40:17 41:16,19 47:2
 59:4 93:14 94:17,22
 97:13 99:1 121:7
 125:10 188:10 198:2
 198:13 199:12 200:19
 201:7 209:21 214:18
Bay 47:6 63:18,20 72:3
 74:13 102:13 201:5
Beach 9:15,16 32:6
beaches 171:4
beaked 60:20
beam 125:12
bear 99:9
beard 231:13
beating 175:6
beautiful 53:16 76:11
becoming 81:21 230:19
began 203:15
beginning 118:13
 119:10 157:1 205:12
begun 53:4 160:6
 203:22
behalf 29:1 53:11 99:9
behavior 60:10,22
believe 75:13 110:13,15
 181:11 229:6 243:9
bells 81:11
beneficiary 176:5

benefit 36:21 39:1 46:7
 90:2,11 109:4,5 130:1
 233:8
benefits 58:9 64:14
 77:16 108:20 144:4
 175:15 228:16,19
 232:2
best 38:11 60:18 79:1
 98:11 124:22 160:2
 177:10 200:21 207:21
 211:6,10 226:22
 236:18
Beta 31:11
better 41:12 67:14,16
 67:19 86:15 133:14
 134:6 176:5,8 181:3
 182:2 198:7 223:1
 226:11,13 231:13
beyond 123:5 169:19
 171:18 219:14
big 9:8 32:10 38:1 41:6
 42:12 45:2,8 47:7
 50:20 66:2 72:15
 73:22 96:16 97:17
 100:20 103:2 106:10
 119:20 125:19 198:21
 221:20 228:5 245:4
 248:7 249:13
bigger 131:15 175:18
biggest 54:16 240:11
Bight 89:9
bill 36:10 49:18,18
billion 33:6
bio 9:21 26:11 37:19
 52:22
biogeochemical 161:9
biologist 216:12
bios 4:9,11 21:12,14
 25:3
bit 26:18 39:12 42:8
 54:6 57:1,21 61:19
 63:6 66:7 82:11 84:15
 88:2 101:2 107:5
 108:4 109:1 113:2
 114:19 119:3 142:14
 149:22 162:22 163:19
 167:1 186:11,17
 198:18 199:17 215:6
 231:13 232:19,20
Blackwell 2:3 3:10,17
 10:8,22 11:1 13:7
 17:7 29:16 35:7 76:7
 76:10 128:9 137:19
 172:13 174:3 181:6
 185:10 190:16,18
 191:10 192:12 242:12
Blackwell's 229:18
bleeding 100:16

blended 61:6
bless 50:11
blocks 146:20
blue 24:5 28:14 38:20
 175:13 177:6 199:6
board 13:18 16:4
 159:13
boat 39:14 103:14
 229:22
boats 103:10 145:2
Bob 216:8,9 217:21
 232:22
bodies 13:22 14:1
body 202:12
BOEM 220:15,19
 221:19
bold 17:10
boldly 117:14
Boledovich 20:8
Books 6:16
border 96:21
bottom 61:22 130:19
 150:16 165:3 230:8
boundary 41:19
brainstorm 163:15
brainstorming 241:2
branch 14:15
brand 174:20
break 48:7,17 51:1 52:9
 106:13 113:15
Brennan 20:9
brief 22:18 35:22 44:2
 77:15 86:19 126:16
 180:9 199:20
briefed 33:22
briefing 34:3
briefings 112:22
briefly 87:4,15 88:18
 90:1 211:15 247:12
brilliant 223:13 248:20
bring 65:8 70:15 71:12
 72:21 80:21 83:17
 84:6 96:1 99:8 101:2
 136:18 163:17 164:1
 164:1 182:15 192:4
 207:19
bringing 42:21 74:2,6
 80:16 99:6 110:5
 162:4 175:11 181:22
brings 100:14 127:13
broad 17:1 134:14
 150:12
broader 220:14
broadly 97:16 105:7
Brohl 205:19 206:1,6
broken 201:11
brought 138:4 163:1
 193:2 233:22

budget 35:22 145:9
build 94:16 98:19 123:5
 142:9 149:14 164:6
 167:13 212:9,19
building 53:16 113:3
 129:9 146:19 171:11
built 67:6
bullet 65:12 171:9
bumps 101:17
buoy 65:5,7,10 66:18
buoys 64:22 65:2 110:6
 111:1,2
Bureau 33:2
bureaucracy 14:2
Burns 20:9 195:1
Burt 20:9
business 10:1 46:3,4
 65:14 120:3 199:1,1
 236:21
businesses 85:19
buttons 241:8 243:17
buy 134:6 142:18
buying 177:7

C

C 132:3
C-O-N-T-E-N-T-S 3:1
Calcasieu 30:17 31:20
calculus 230:18
California 8:1,3 23:13
 60:21 161:2,3 181:12
call 3:2 19:18 70:1,2
 124:11 144:2 235:12
 250:18
called 65:5 68:19
calling 92:9
calls 117:22 144:4
cam 213:9
camera 46:17 88:12
campaign 72:15 131:22
 163:8
campaigns 120:16
 140:8 141:13 150:14
 155:5
campus 53:17
Canada 218:17 219:7
 226:16
Canadian 96:21 218:4
canal 85:9,9
capabilities 65:20 99:6
 101:5 113:4,6 120:21
 211:4 229:11
capability 47:3 99:7
 100:15 143:5 149:4
 238:12
capable 61:15
capacity 19:5 99:6,7
 143:5 149:5

capitalize 130:6
Capt 3:9 10:15 53:2
 182:20 183:4 243:16
captain 1:16,19,20,20
 1:21 5:5,8 6:14,16 7:4
 7:11 8:19 9:19 10:10
 13:9 20:8,15 35:20
 52:18 137:5,19 140:4
 225:3 227:11 229:14
 236:6 243:15
capture 26:4 235:8
captured 22:7
care 114:1 158:6
career 244:9
carefully 122:10 146:4
Caribbean 219:8
Carnival 8:20
Carolina 8:9,12,13 9:17
 43:11
cartography 59:8
case 61:1 90:21 98:12
 173:6
cases 87:20 157:4
cast 141:5
casting 135:3
Castle 53:19
catch 196:8
caught 201:20
causing 99:18
cautionary 154:16
 198:3,19
CDC 42:16
CDIP 8:3 110:5
center 2:2,4,5,6,14
 10:12,18 11:9 12:9
 13:8 30:9 35:21 52:20
 53:6,9,15 54:4,6,8,14
 54:19,21 55:2,8,9
 58:2,13 62:20 80:7
 216:9 217:1 239:4
centers 210:18
centimeter 202:14
centrally 241:16
century 29:6 207:20
certain 164:21 205:2
 230:6
certainly 82:14 86:12
 95:1 117:19 128:9
 148:21 166:9 173:10
 190:21 192:10 206:12
 206:14,17 219:20
 222:18 239:19 241:18
cetera 117:22 121:10
 121:10 157:13 162:7
 179:15 199:15,15
 204:15 231:9 248:9
chain 28:13
chair 1:13,15 3:4 4:3

5:4,13 6:3,13,17,19
 7:3,9,17 8:6,14 9:1,11
 9:18 10:4,20 11:4,12
 11:21 12:4,12 21:18
 23:9,11 24:17,19,20
 24:21 37:11 47:19
 48:13,18 50:14,17
 51:6,14,18 52:2,4
 106:8,21 109:16,20
 112:1,6 113:7,21
 114:6,14,17 116:6
 127:21 128:5 137:3
 140:4 143:14,17
 145:17 147:2 151:1,7
 156:2,6 158:7 160:15
 160:18 168:21 194:8
 195:9,14 222:12,15
 223:10 224:3 225:3,7
 225:17 227:10,13
 228:9 229:14 230:15
 231:16 233:13 235:5
 236:6 237:1 239:9
 241:5 242:10 243:14
 244:5 245:19 247:6
 249:1,9
chairman 13:4 23:6,6
 26:14 106:6 206:2
 222:13 235:7
chairs 24:18
challenge 41:11 45:1
 216:16 239:22
challenged 88:3 147:9
 170:9 250:3
challenges 3:7 28:16
 33:18 41:6 52:12
 86:12 106:3 144:19
 170:3,10 179:6
 204:14 240:1 243:2
 246:21 248:7
challenging 27:22
 179:9 218:20 224:11
chance 82:10 168:18
 223:2 243:22 245:22
change 32:16 50:2
 179:15 205:14 238:3
 238:5,8 245:13
changed 186:18
changes 28:10 60:22
 85:2 111:16 189:5,6
 204:20,21
changing 228:7
Channel 31:21 100:3
channels 50:3 201:10
Chappell 17:8 20:10
 29:17 124:1 172:4,8
 228:16
chapters 127:1
characterization 15:12

29:12 117:16 121:16
 121:18,20 125:6
 156:17
characterize 153:8,10
 163:6
Characterizing 118:21
charge 45:21,22 46:2
 128:18
charged 15:15 128:15
Charles 31:22
Charleston 9:17
chart 97:11,12 227:6
charting 57:15 59:20
 94:1 97:7 177:3
 178:16 179:7,12
 206:19 207:3 214:19
charts 6:17 97:9,9,10
 177:8
chat 248:17
check 110:14 121:17
 194:12
checked 27:19
checking 193:14
checks 161:5
Chesapeake 43:13
 102:13 201:5
Chief 4:20 8:11,11
chiefs 49:13
choose 98:14
Chopra 1:16 5:5,6,8
 11:17 25:1 170:2
 236:7,8
chord 224:20 229:20
chose 116:3 122:9
Chris 20:11
Chrissy 20:11
Christine 20:9 195:1
chronic 35:1
chunk 163:19
circumstances 27:2
circumvent 14:2
citizen 212:19 234:13
clarification 193:13
clarify 106:16 107:5
 115:11 148:19
clarity 133:12 226:12
Class 43:20
classes 61:9
clean-up 91:13
cleaner 175:14
clear 36:16 119:1 163:3
 192:2 207:4
clearly 27:1 39:4
 103:11 107:18 153:1
 178:21 219:2
climate 50:1
climatology 133:9
cloakroom 14:20 15:1

- clock** 48:8
close 27:14 236:21
closely 42:15 79:17
129:2 211:13
closer 198:17
cloud 34:8 45:10,19
58:16
CMTS 205:4 206:8,10
206:12
co- 10:16 24:16 35:11
53:11
co-chair 1:15 4:8 7:19
7:20 13:4 107:3
109:11,14,18,21
110:16 111:13,20
120:1 129:1 147:6
160:17,19 164:9
166:14 168:4,22
169:4,8,22 170:16
172:1,10,14 174:5,12
176:13,17 177:16
178:5,9 179:19,22
180:6,13 181:4 183:1
183:5,7,13,18 184:6,9
184:14 185:7,12,15
185:19 186:5,13
190:3,14,17 192:13
193:4 194:2 224:5
Co-Chairs 172:14
co-director 2:2,5 12:8
52:19
co-directors 10:11 13:8
co-interactive 140:18
co-op 207:3
co-ops 13:7 27:9 30:9
30:16 31:4,12 32:10
38:20 62:20 72:18
76:2 77:13 88:20
110:19 207:9 221:4
co-serving 241:12
coalition 9:8 68:19 69:7
coast 2:8,16 6:2 12:21
27:9 30:8 31:13,16
32:4,7 35:15 43:11,14
49:8 50:4 70:11 73:16
73:18 74:2,4 75:3,8
84:21 88:20 89:14
91:10,17 92:3,5 95:21
97:3,4 102:4,10
107:16 111:11 124:3
140:1 144:1 147:14
147:15 148:5 152:10
152:12 161:3 177:2
182:18 207:9,15
215:14 220:16 226:2
226:5,8,21 249:22
coastal 2:5 3:12 8:1,2
17:5 21:22 24:3 25:15
25:19 27:7,10 29:12
32:16 33:13 34:2 35:9
42:3 49:15 64:4 65:6
70:8 73:10 77:7,9
84:16 85:22 87:15
94:1 97:20,22 108:14
112:17,21 116:9,16
117:2 123:18 124:2,7
128:8,13 129:5,8
130:21 131:4 133:20
134:20 135:4,13
136:19 138:11,18
165:6,11,16 166:5,10
167:6 170:11 171:7
172:14 173:3,14
175:20 181:14 184:17
186:16 189:13,15
190:19 191:20 200:10
203:15 206:14 209:7
209:10 210:5 214:1
214:10,17,20 238:21
239:7 243:5 245:13
246:12 248:8
coastline 41:10 42:4
139:16 237:12
coasts 28:11 120:20
code 55:20
Colantuno 20:10
collaborate 55:22 111:5
173:20
collaborating 77:13
113:2
collaboration 34:14
113:14 219:4 240:14
collaborations 112:15
collaborative 88:19
collaboratively 207:19
colleague 203:2
colleagues 13:11 28:4
collect 14:3 30:13
58:10 85:21 88:4
139:9,12,21,22 188:9
237:16
collected 85:5,13 94:18
139:12 162:17
collecting 45:7 80:7
89:17 133:4 168:1
180:4 182:18 212:4
237:12
collection 78:3,15
88:15 129:21
colors 103:12
Columbia 9:22 80:4
column 59:5 121:8
125:13
combination 28:9
combined 153:17
come 5:15,17 7:10
11:14 33:12 51:1 55:1
70:12,18 79:2 100:13
102:18 114:17 124:11
144:11 145:13,20
165:14 169:9 174:7
183:9 190:4 197:15
232:16 239:18 240:8
240:22
comes 36:3 41:14
44:12 142:8 150:9
164:17 174:2 182:13
235:1
comfortable 227:19
coming 10:2 13:2 63:7
71:15 72:2 74:18
118:10,19 149:9,17
160:9 165:19 175:21
176:2,7 183:6 190:7
191:22 218:16 231:3
242:19 248:7
comment 3:19 16:13,15
17:12 22:4,5,9,12,16
25:19 96:5 106:18
114:9 126:14 135:7
137:8,9 140:2 143:21
147:4,10 151:2,3,9,9
154:2 158:15,16
159:17 160:19 174:10
180:4 181:10 184:2
190:13 192:16 193:5
194:14 196:11,15,22
197:8,16 198:6 199:4
199:11 208:11 209:2
210:22 218:8 219:19
220:9 222:4,5,11
224:13 227:21 228:3
229:18 231:1 237:19
238:2,3,8 243:19
commentary 195:15
commented 197:13
commenter 203:1
commenters 196:10
199:19 243:21
commenting 183:11
comments 16:19 19:10
21:7,21 22:7,18 25:18
25:22 26:3 29:3 44:8
112:15 116:20 127:2
134:17 148:12 156:8
156:12,18 157:22
162:20 166:19 168:9
168:19 170:18 176:14
180:7,10 181:7
183:20,22 184:3
186:1 187:6,12
188:19 190:6 194:13
194:19,22 195:2,4
196:3,7,18 199:20
200:5 203:11 209:5
209:12,14 210:11,15
216:7 217:21 218:6
218:10,13 222:7,9,22
229:17,18 236:2
239:13,17 247:8
249:8
commerce 1:1 2:10,11
24:4 32:20
commercial 6:11 15:20
45:10 103:18 119:14
120:12 143:6 175:17
commission 13:18
committed 15:17 16:21
119:11
committee 6:18 13:16
13:16,17,18 14:5,10
14:17,19 119:8
128:20,22 130:22
176:21 205:20 206:7
213:17 216:3
committees 14:6,12
16:1,4 244:9
common 204:11
communicate 49:12
79:12 134:10
communicated 136:15
communication 27:18
104:21 125:1 130:8,9
134:2
communications 134:5
communities 27:11
33:13 171:7
community 45:4 46:9
46:14 59:21 93:1
100:15 102:18 118:15
158:19 159:1 171:21
200:14,15 202:22
246:18
companies 101:2
company 164:3
comparison 68:4,6
compassionate 28:7
competition 56:14,17
56:17
competitively 56:14
compilation 96:7
compilations 95:4
212:20
compile 94:19
compiled 97:5 217:2
compiling 201:2
complementary 131:14
207:1
complements 100:18
complete 65:13 87:7
108:8
completed 16:13 67:10

- 77:17 90:3 111:15
130:18
completely 94:4
completing 65:21 118:2
128:15 167:21
completion 150:17
complex 98:8
complexity 147:1
compliance 142:20
221:19
complicated 164:18
166:1 217:4
complements 244:17
component 45:8 54:19
135:19 173:1 214:18
components 126:18
132:11 197:5 214:17
comprehensive 166:3
179:5 196:14
computational 204:17
computing 34:8 45:12
45:14
concept 218:22 234:2
concern 81:17 147:17
148:15 163:1,2
concerning 152:1
concise 222:6
conclusions 236:20
condensed 13:12 19:17
26:2
condition 41:19
conditions 32:16 155:9
conducted 90:9
conducting 43:14
conference 13:19
confidence 18:7
congratulations 62:11
105:19 170:8
Congress 14:19 33:20
36:1 37:4 49:14
Congressional 33:22
34:3
Congressman 48:12,20
48:21 50:13,19
congressmen 227:11
connection 83:5
connections 131:18
conquer 163:16
consensus 200:13
conservation 40:4
214:13
conserving 21:11
consider 34:16 116:22
150:6 181:19,20,21
181:21 206:18 207:6
208:2 217:17
considerable 113:8
consideration 122:4
192:6
consistent 144:16
145:8 202:6
constraints 119:12
construct 84:9
contact 110:19 111:9
111:18 172:4
contagious 247:15
contain 105:7
contained 43:6
context 92:12 115:20
150:14 212:13
continually 224:8
continuation 47:11
continue 33:17,19
37:14 49:17,20 51:8
58:12 59:14 60:4
61:17 70:13 76:16
78:8 85:20 87:10
105:4 106:2 130:4
158:10 165:5 174:6
177:10 230:16 235:22
continued 104:19
242:13
continuing 34:18 36:7
58:6 59:12 67:20
98:19 204:8 225:16
continuously 95:11
contract 99:8,22 198:15
contracted 31:19
contractor 138:22
contractors 100:19
101:1 102:5,7
contracts 100:20
101:12 102:6 198:16
contribute 37:15
161:21 238:14
contributed 33:6 166:8
169:18 187:10 189:11
189:22
contributing 124:7
contributions 28:13
55:11
contributor 96:13
control 58:4 71:10
82:13 83:8 87:11 90:8
161:4,12,16,22
162:10 164:11,19
165:2 184:21 229:9
246:3
controlled 103:20
convenient 18:10
conversation 92:3
122:6 137:1 143:11
216:17
conversations 157:5
157:16 158:3 233:19
233:21
convince 226:22
cooked 238:3
cool 46:12,17,21 47:3
cooperation 66:22
237:11 240:14
cooperative 53:5 56:2,4
cooperatives 214:14
coordinate 119:19
120:16 139:19 140:20
163:7 241:3
coordinated 140:21
coordinating 128:19
173:8
coordination 17:2
131:3 140:8 225:11
234:1 246:9
Coordinator 2:15
core 199:9
cores 132:14,14
Corp 139:21
Corps 65:4 93:16 95:12
95:15 139:4 167:7
207:16
Corps' 96:12
correct 114:8 190:10
193:21 249:11
corridor 69:1
CORS 77:2 82:20 83:21
84:3,7,12 221:4
cost 131:8 234:19
cost-effective 66:9
costal 204:13
costs 125:1 157:12
council 13:18 15:15
172:20 187:1
counsel 117:7 119:21
120:1
counterpart 172:16
countries 55:3 219:6,8
country 32:12 75:12
223:22
couple 12:13 36:4 40:4
43:21 46:10 52:10
66:13 71:22 78:5
86:21 99:11 113:22
126:5 134:17 136:15
137:4,7 143:20 156:4
156:8 166:17 197:13
198:1 203:11,16
204:6 220:6 229:16
coupled 41:18
course 22:19 26:5 27:9
32:12 39:19 40:14
42:9 44:21 48:3 50:3
50:10,21 52:22 58:6
58:19 59:17 61:4,10
91:8 104:5 115:14
149:8 156:22 169:12
183:21 208:3 218:19
219:7 226:20 227:5
246:12
cover 35:15 73:17
121:8 223:5
coverage 185:4 209:21
covered 180:2 183:16
covering 73:16 76:22
covers 121:7
COVID 27:1,6 28:11,16
42:8 48:4 68:13 72:7
91:7,17 105:15
167:16 170:7 175:7,9
180:19 197:17,22
209:18 210:3 215:12
224:10 225:13 228:4
231:13 232:18 233:7
236:12 245:1 246:22
COVID-19 24:13 167:3
CR 145:21
created 135:14
creating 36:21 55:4
198:15
creation 130:20
credence 155:1
credit 69:11,12
creeks 201:11
crew 201:12
crews 42:19
crisis 209:18
criteria 154:18 162:10
critical 29:4 32:1 38:20
41:17 97:6 177:9
199:6 200:18 205:11
223:20,21 246:6
Croatia 8:21
Crosset 20:10
crowd 30:2
crude 154:5
cruise 8:20 142:15
cruises 233:6
cued 48:15
cultivate 28:7
curation 211:10
curious 110:11
current 20:21 41:3,5
65:1 66:3,15 72:3
78:11 80:20 134:21
161:18
currently 5:22 82:6
83:15,18 84:2 107:10
124:5
currents 41:4 59:18
66:19 162:6
curtail 14:20
customers 78:21
customs 140:14
cutting 102:8

cycle 160:12

D

D 132:3

D.C 4:22

daily 70:6 95:17

dammit 174:22

dangerous 99:16

dare 207:20

Darren 20:16

dashboard 70:8,14
73:11

database 94:20 95:10
95:16,17,18 205:6,7

Datawell 162:8

date 134:19,21 196:8

datum 72:13 80:18

81:13 89:2 184:21

202:7,13 204:14

datums 82:15 89:1

187:20 241:20

Dave 6:20,21 7:3 24:18

25:12 158:8 164:10

166:15 168:7 169:20

172:1 173:7,13 174:7

174:11 177:17 180:6

181:5 183:19 185:20

190:3 191:2,4 192:17

192:17 193:1,14,22

203:7 213:17 216:3

223:14 228:9 229:14

239:3

Dave's 194:3 214:4

David 1:19 20:8

day 11:5 33:11 47:17

56:22 76:10 106:7

250:19

days 24:7 42:12,13

136:16 142:18 208:16

de-emphasizing 122:5

dead 187:3

deadline 129:17 229:22

deal 34:22 47:7 73:22

177:7

dealing 28:1 41:3

228:13

Deanne 24:21

dear 203:2 239:20

death 175:6

decade 90:15 149:9

decades 150:21 210:7

135:7 146:8 166:13

December 36:8 119:7

135:7 146:8 166:13

decided 17:20 18:2

decision 76:3

deck 240:7

declared 15:5

dedicated 17:13 53:16

dedication 247:16

deeds 28:6

deemed 14:13

deep 32:2 148:3,17

149:3 150:3 152:12

155:7 157:11 208:19

209:15 211:11 230:12

234:12

deeper 62:5 96:7

100:16 108:18 109:10

116:1 148:7 149:8,11

150:14

defer 48:13 106:12

deferred 17:22

define 42:16 108:9

120:8 153:2 154:17

155:11

defined 152:22

defines 13:17

definitely 44:6 45:7

50:20 76:2 129:16

167:7 174:3 182:14

192:17 237:7

definition 121:17 139:3

154:4,15 155:6

definitions 156:16,16

delay 71:22 77:1,22

78:18 79:13 137:17

delayed 36:5 68:12

73:7 79:1 80:10 92:11

215:11,12

deliver 129:21 235:21

deliverable 73:20

delivered 87:16

demonstrate 74:21

202:11

demonstrating 60:21

demonstration 74:14

Den 20:16

Denis 217:22 218:3,5

219:18

Dentler 2:14 7:7 20:11

23:8 48:15 169:7

180:11

departed 43:9,12,16

DEPARTMENT 1:1

depend 161:14

depending 155:9,18

depends 150:7 161:15

deployed 44:16

depth 49:8 107:19

115:1 165:1 238:18

depths 116:5

Deputy 8:10

derive 55:9,18 123:14

describe 46:19 123:19

described 146:5 232:3

describes 92:17

describing 116:16

deserves 24:6

design 205:12

Designated 2:8

designed 83:2

designing 141:13

despite 28:16 91:16

106:3 175:9 241:13

destroyed 67:8

detail 29:15 141:19

191:14

details 126:9 173:11

189:9

detected 61:1

detection 59:4

determine 85:17 86:3

90:12

determined 160:4

determining 133:11

devastating 99:20

develop 16:6 17:5 58:6

65:15 115:2 120:3

122:10 124:14 133:21

159:15 189:15

developed 66:17 67:11

113:6 116:14 118:6

122:13 165:17 166:13

239:3

developer 138:21

developing 15:10 16:11

21:1 58:17 59:13

117:9 119:12 122:16

136:1 138:5 159:1,9

165:10 179:18 213:22

214:1 234:10,16

development 15:18

55:12 57:14 59:2

117:17 122:20 130:3

131:3 156:20 159:4

159:15 206:17 239:2

243:7

devices 205:1 249:18

devoted 215:6

Dewberry 6:22

DFO 193:13

dialogue 21:3 37:15

163:20

dictate 225:13

Diego 6:17,18 8:4 23:12

difference 49:9 157:9

differences 101:4

different 44:10,19 70:1

86:17 87:2 89:3,4

92:21 98:7 101:3

118:14 119:9 123:2

132:4 139:3 140:21

144:9 151:15 155:16

155:16,21 156:16

157:11 159:10 161:5

166:7 168:12 181:17

181:22 189:4 198:15

214:16 217:13 221:4

228:20 235:13,22

237:12,13 241:4

246:5 249:16

differs 95:3

difficult 78:13 107:7

142:13 151:20 163:22

164:18 167:16,21

237:6 238:9

difficulties 78:6

digging 39:8

digital 57:12 66:5,8

95:20

digitally 226:11

diligence 193:15

dimensions 47:3

direct 48:1

direction 140:14

directive 144:14 145:22

235:17

directly 117:19 137:8

director 2:3,4,8 6:7

7:14,22 8:20 9:8,15

10:1,17 11:1,8 12:20

13:6,7 53:12 91:10

206:7

director's 224:8

directors 4:13 10:9

35:6 51:10 52:12 92:1

105:22 239:10

disappointed 175:3

231:11,14

discourse 157:20

discover 95:22

discoverable 207:22

discovered 186:21

discuss 20:20 25:10

27:3 29:9 35:4 52:15

136:3 166:9 182:8

discussed 232:1

discussing 21:5 166:16

242:19

discussion 3:11 5:2

17:2,9 25:14 118:14

136:7 144:16 160:2

180:3 182:9,13 192:5

195:19 216:14 221:13

224:16 246:1,3

discussions 14:20,22

15:1 37:9 126:22

156:20 158:10 189:8

221:22 232:13

disparities 120:20,22

disparities 200:21

dispense 4:10 21:13

dispenses 13:20
display 59:18
Disproportionately
 109:5
disseminate 133:2
 225:20
disseminated 18:18
disseminating 133:5
dissemination 226:6
distance 61:8
distracting 199:9
distributable 212:3
distribute 95:14 153:4
 212:16
District 80:4
ditto 224:6 247:12
dive 62:5
DiVeglio 20:11
diverse 190:6
divide 163:16,16
divided 93:4
Division 31:19
doable 210:10
dock 85:12
docks 165:1
document 16:14 18:20
 92:15 154:13
documentation 219:11
documents 158:4
doing 16:14 23:15
 24:14 34:20 38:15
 43:5 46:11 47:12
 58:19 64:16 68:9
 72:19 73:1,4 75:11
 78:3 86:13 96:18 99:1
 110:22 111:5 114:10
 115:12 134:9,13
 145:10 148:4 161:2
 167:14 177:11 193:15
 193:17 200:10,12
 201:4 207:18 211:8
 214:15 222:7 229:19
 229:20 242:17 243:1
 244:3 246:11 247:4
dollar 234:16
domain 96:1
domestic 33:7
Don 3:6 26:17 48:21
double 101:12,17
 110:14 194:12
doubt 175:18
downloading 39:20
dozen 22:6 188:16
Dr 1:16,17,19 3:5 4:17
 5:16 6:21 9:12 10:9
 11:13,14,15,19 12:5,6
 13:8 15:9,14 24:10
 25:7 26:8,16 37:13,21

37:22 47:19 53:11
 63:15 119:22,22
 140:6 141:22 143:13
 183:6,8,15 184:1
 185:12,14,16 186:22
 187:7 194:6 200:3,5,6
 200:6 202:20 210:15
 210:21 216:8,10
 224:15 233:13 235:15
 237:1 239:11,12
 245:8,19,21 247:7
draft 25:14 32:3 119:7
 124:6 127:7 135:6
 160:10 236:3
drafting 14:4 124:10
 126:3 160:5 171:17
drama 248:15
drawn 28:12 157:3
dressed 76:14
drive 103:14
driven 28:7
driving 46:3 92:18
drones 81:20
dropping 18:21
dry 85:12
due 19:17 26:2 119:7
 180:17 193:15 215:12
 225:12
Duffy 1:17 5:13 9:7,8
 143:16,19 145:19
 146:22 169:11 235:5
 235:6
Duffy's 143:14
dug 246:16
duplicate 139:20
duplication 113:4 126:1
Durham 10:18
duties 2:10
dynamics 112:12

E

ear 248:17
earlier 16:11 63:3 91:16
 132:14 181:7 191:13
 211:1 216:14 227:16
 236:10 245:22 248:19
earliest 21:7
early 12:13 18:2 72:10
 75:12 105:9 117:8
ears 49:20
Earth 210:16
earthquakes 179:14
easier 98:10 149:14
 198:18
east 84:21 220:15
 249:21
easy 108:10 152:3
eating 33:11

ECDIS 115:4
echo 60:6,20 61:1
 231:22 237:4
echoing 210:22 211:2
Ecological 203:15
economic 33:2 36:22
 117:21 118:22 175:16
economies 27:11
economy 24:5 28:14
 32:21 33:3,5,6,8
 38:20 49:5 175:13
 177:6 199:6
ecosystems 27:11
Ed 1:12,20 3:4,14 4:7
 5:6,19 6:4,6,13 7:11
 7:11,14,17 9:3 12:19
 13:4 18:9 21:18 23:6
 23:7,8,10 24:20 38:6
 48:11 51:13 114:15
 114:16,18 127:20
 137:2,6 140:3 143:16
 147:11 151:1 156:9
 166:20 168:19 174:13
 176:13 177:22 178:6
 193:6 194:7 195:18
 222:13,14 225:18
 230:15 231:16,20
 232:3 236:9 237:3
 242:4,4,9 243:17
 244:2,6 245:18
Ed's 9:3,3
edge 100:17 102:8
editing 58:18
EDT 1:12
educated 24:8
education 54:20 57:19
 61:4,12
EDWARD 1:15,18
Edwing 2:4 3:9 10:8
 11:6,7,8 13:7 35:11
 62:20 63:1 110:12
 111:8,14,22 184:13
 231:12 241:6,7
EEZ 94:3 120:7,17
 155:15 163:6,8
effect 60:8,19
effective 55:5
Effectively 127:8
effects 50:2 57:18,18
efficiencies 143:3
efficiency 58:9 93:6
 133:17
efficient 58:14 66:15
 234:19
efficiently 31:18 184:10
 188:5 232:7
effort 17:4 35:11 72:14
 77:4,12,22 78:1 79:21

82:15,19 83:11 87:16
 88:19 94:12,16 96:4
 115:22 116:1 122:7
 133:15 136:6 157:13
 162:2 173:8 182:6
 190:1 204:19 206:18
 210:19 213:19 227:7
efforts 29:19 31:20 62:8
 79:3 86:3,20 97:19
 113:5 120:19 130:6
 139:20 144:6 181:11
 206:12 211:6 235:21
eHydro 95:15
eight 68:2,8 84:2,6
 137:13 167:10 194:19
 199:20
eight-year 230:17
eighth 174:21
either 38:13,15 40:12
 219:11 248:3
EJ 20:15
electronic 57:15 59:19
 170:3
element 218:21 238:18
elevated 69:6,9
elevation 68:20 228:15
 228:19
elevations 72:22
Elko 1:17 5:16 9:12,13
 9:14 112:4,7 170:19
 173:12 233:14,15
ellipsoidal 89:2
email 110:18 172:7
embrace 147:13 233:11
embraced 234:7 250:12
embracing 178:4
emergency 8:10 21:9
 30:7 40:3 46:8 77:6
 85:22 235:19
emerging 229:1 231:10
 234:3
emphasize 138:8
 206:20 207:13 215:21
 237:8 238:15 246:2
emphasizing 164:5
 207:6
employee 19:4
employees 54:18 79:10
enable 88:13 126:12
 127:9
enabling 97:15
enacted 36:1
Encinitas 8:3
enclosed 35:2
encompasses 93:12
encourage 21:21 25:18
 173:22
encouraged 157:4

211:12 225:20
encouraging 226:7
 239:16
end-user 15:21
ends 57:13 164:22
endure 113:6
energy 69:2 179:20
engage 16:20 27:18
 171:9 172:21 212:17
 212:18 247:17
engaged 26:1 29:19
 206:16 207:17 233:18
 244:10
engagement 24:19
 130:9,10 134:3,18
 240:14 242:14 243:13
 245:16 248:2
engaging 18:8 68:10
 102:16 171:5
Engineer 139:5,22
 167:7
Engineers 6:22 65:4
 93:16 95:12,15
 207:16
enhancement 37:3
enhancements 71:19
 89:5
enhancing 70:13
enormous 79:18
ensure 14:5 16:21
 31:17 93:1 123:11
 125:6,20
ensures 29:5
ensuring 27:10 32:2
enterprise 231:3
entertain 239:1
entire 27:14 99:10
 108:10 202:15
entities 84:10 135:2,13
 135:15 191:20
entity 19:7
environment 42:18
 58:18 86:13 170:7
 225:12
environmental 2:10
 32:16 142:20 221:19
 228:13
environments 223:20
envision 120:18 121:2
 146:21 150:17
envisioned 140:12
equally 163:14
equipment 101:5
 209:17
era 245:15
Eric 219:22 220:1
erode 143:1
error 181:18,21

errors 182:3
especially 21:22 28:9
 54:17 180:3 200:14
 230:17
Esri 203:3,14
essential 14:13 27:7
 28:20 32:8 33:16 49:4
 76:3 219:4
Essentially 45:8
establish 63:16 64:11
 65:8 124:17 130:17
 187:20 204:12
established 84:3
 161:16
establishing 14:8 71:2
 119:21
establishment 82:20
estimate 90:13 202:13
estimated 42:13
estimates 181:19
estuaries 108:1
et 117:22 121:9,10
 157:13 162:7 179:15
 199:15,15 204:14
 231:9 248:9
Ethics 19:1
evaluation 244:16
event 127:9
events 31:15
eventual 16:22
eventually 120:15
 197:15 201:9
everybody 10:16,22
 11:8 80:9,21 113:13
 137:22 138:2,9 139:4
 139:6 141:18 163:18
 167:17 173:22 175:6
 178:3 179:21 189:10
 189:19,21 190:4,19
 196:8 200:7 210:12
 216:11 223:2 236:16
 240:18 250:19
everybody's 217:10
 222:6
everyone's 198:22
 246:21
evidenced 39:3
Evidently 178:14
evolution 47:11 176:10
evolved 183:17
evolving 211:17 212:15
exactly 16:14 156:12
examine 34:19
example 31:18 121:5
 141:6 152:7 200:20
 205:10 250:8
examples 40:5 98:5
 99:12 101:20 122:1

exceedance 70:17
exceeded 87:20
exceeding 31:7
excess 121:20
exchange 6:9 7:15
 163:14
excited 23:13 39:11
 47:5,10 67:12 166:9
 236:12,19 238:7
exciting 35:19 39:19
 74:5 76:4 96:11 98:1
 117:17 205:9 231:22
excludes 13:21
Exclusive 118:22
excuse 52:7 180:11
execute 120:16 132:7
 163:8,22
executing 248:20
execution 99:5 140:8
executive 6:7 7:14 9:8
 14:15 128:20,22
 130:22 206:6 213:19
 214:3
exercise 13:22
exist 16:18 211:13
existence 129:15
existing 15:22 70:14
 71:18 129:10 142:14
 212:13 223:18
expand 129:20
expanded 74:17
expanding 73:17
expansion 35:12 47:5
 175:10
expansive 111:6
expect 22:4 89:13
 115:15 150:13
expected 80:11
expects 87:10
expense 230:12
expensive 65:19
experience 23:21 78:11
 155:18 170:5 189:13
 232:21 237:11 239:6
expert 19:5 244:11
expertise 19:20 29:21
 60:3 101:5 159:8
 177:21 243:11
experts 124:8
exploration 5:21 6:1
 15:10,11 16:3,3 29:11
 117:16 121:16,18
 125:5 152:10,16,19
 155:13,20 177:12
 231:8
exploratory 89:12
explore 163:6
exploring 152:11

155:19
exponentially 227:22
exposed 99:14 188:8
express 47:13
expressed 81:16
extensive 175:15
extent 121:12 185:1
 208:2
external 95:22
extracting 57:10
extraction 204:1
extremely 40:1 171:1
 208:7
eye 184:22 185:5
eyes 49:20

F

FAA 90:10
FACA 14:18 15:4,5
face 243:2
facilitating 126:19
facilities 55:22 210:1
facility 53:16,19 56:11
facility's 53:20
facing 27:22 200:18
fact 28:12 32:22 87:21
 115:15 149:12 154:10
 160:6 171:8 180:17
 191:7 197:14 206:11
 249:14
factors 228:13
faculty 54:9,9
fades 108:18
fair 68:14
Fairfax 6:22
Fairweather 43:15
fall 17:22 72:11
fantastic 38:1 110:2
 201:2 222:17
far 40:10 42:12 49:9
 84:19 102:17 112:13
 134:18 136:6 161:4
 177:6 179:10 187:5
 196:2 221:9 224:18
 247:13
farther 58:22
fast 178:2
faster 33:8 34:15 176:8
favorable 189:19
favorite 38:14 217:10
 250:16
fear 240:11
features 125:9 127:1
fed 162:4
Federal 2:8 13:15,16
 14:4,15,18 15:19,22
 30:15 34:20 56:5 83:4
 84:10 86:1 90:17

- 98:21 99:10 100:6
101:15 105:7 123:6
124:9,18 129:3 135:2
135:12,15 140:17
142:21 155:12 161:18
167:4,19 171:16
237:5,18 238:13
240:16 244:8
federally 83:1
feds 161:10
feedback 29:20 80:6,8
127:2,6 160:8 181:8
185:17 189:19 244:12
246:18
feeding 61:2
feel 105:13 112:11
137:11 160:20 163:11
196:15 233:17 244:19
feeling 178:11
feels 76:13
feet 30:18 31:1,5,14
fellows 55:1
fellowship 55:2
felt 166:11 227:19
FEMA 30:14 85:21
Ferdinand 53:22
Fernandina 32:6
Ferrini 96:5,10 210:15
210:21
field 60:5 72:15 167:22
201:12
figure 46:20
figured 143:22
fill 12:15
filled 240:4
filling 210:2 212:12
final 49:17 84:11 87:12
finalizing 87:5
finally 61:19 75:4
226:20
find 102:7 114:4 138:12
152:18 230:9 231:5
234:21 240:12,19
finding 240:13
fine 169:2 186:14 189:3
finish 115:17
finished 100:2 188:1
200:20
first 10:13 33:2 45:12
57:7 74:4 77:1 84:20
89:7 92:8 93:5 96:20
114:2 119:7,17 120:2
120:7 129:9 130:16
137:5 141:3 144:1
160:20 171:11 175:2
184:19 200:3 209:8
213:16 214:10 228:12
234:11 236:9
fiscal 36:3 63:4 215:20
Fischer 220:1,3,5,13
fish 214:12,14 217:18
fisheries 50:2 216:9,11
217:6,10 221:12
228:14 246:13
fishing 24:4 38:15
39:17 177:11
fit 120:14
five 56:22 57:6 62:14
113:17 119:16 163:4
163:4 186:13 196:9
201:12 238:1
five-minute 186:6,7
five-year 53:4,8 56:20
fixed 95:6
flagging 117:20
Flash 3:7
flavor 121:2 199:18
fleet 42:10 43:22
fleets 143:6
flexibility 142:10
flexible 28:4 98:13
flight 164:14
flights 43:5
flipping 223:11
floats 145:2
flood 69:4 70:6
flooding 32:17 69:5,16
69:18 86:4
floods 69:3
floor 22:22 51:17 165:3
196:6 222:13
Flooring 118:20
Florence 87:8
Florida 31:5 32:6 68:16
100:11 102:12
fly 139:16
flying 161:2
focal 173:8
focus 24:4,6 92:2
121:17 122:3 163:17
163:17 170:15 171:4
177:15 184:17 188:15
239:17
focused 129:6 168:15
focuses 151:10
focusing 134:1 138:1
183:12 187:19
fog 35:2 59:14 65:15
folks 28:3,18 45:3 81:6
129:12 248:11,19,19
follow 20:1 117:2
125:16 173:10 181:7
191:12
follow-up 127:15 182:9
243:22
following 24:15 25:17
30:12 31:15 32:3
56:22 125:11 182:14
Folly 9:16
food 116:18
foot 31:13
force 13:19 15:2 153:17
forced 157:5 233:4
forecast 40:9 70:10
73:14 74:12,17
forecasting 41:3
forecasts 40:8 74:18
foremost 129:9
forgiving 28:7
form 136:2 138:12
forma 16:13
formal 114:18
formalizing 14:8
formally 159:13 223:3
format 26:2
formation 14:12
formed 161:11 171:14
former 218:3
forth 228:8
fortunately 43:7
fortune 216:19
forum 146:3
forums 17:1
forward 5:2 17:9 18:13
24:9 25:8 34:18 37:9
38:7 39:6 41:7 45:1
52:16 62:13,18 65:21
67:13 88:10 106:10
112:10 123:3 127:5,6
127:15 136:7 154:13
167:6 185:6 190:2
193:9 194:6 195:22
222:7 223:22 225:14
225:15 226:4 227:4
227:20 230:3 232:8
232:16 233:11,20
234:20 236:18,20
245:15 246:4
forward-thinking 61:15
found 64:10 94:18
141:7 201:5,10 212:8
foundation 77:2 82:20
83:17,21 84:3,5,7
132:9,14 143:4
152:21
foundational 78:16
89:17 149:6 150:2
207:7 208:6
four 10:5 21:14 122:7
128:10 129:7 130:17
248:4
Fourchon 68:21 75:22
fourth 130:7 131:13
frame 80:17
framed 219:11
frames 81:13
framework 94:9
framing 218:14
Francisco 10:2,3
frankly 115:19
freely 45:22
frequency 70:16
frequent 230:19
frequently 95:14
friend 203:2
front 243:6
frontier 178:19
frustrating 161:1
Fugro 4:8 23:11
full 5:2 15:3 52:22
58:20 59:3 97:5 105:3
145:2 201:17,22
204:12
fully 29:18 66:4 68:2
97:5 147:12 153:11
207:5 232:6 233:7
234:7
fun 30:2
function 40:15
functions 13:22
fund 145:13
fundamental 61:12
funding 36:12,16 56:15
69:8 71:7 86:22
144:19 145:2,8,8,9,20
146:1,11 150:2 159:2
159:21 209:13,15
210:8 215:6
funds 50:9 67:9 68:10
68:11,15 101:13
further 14:18 127:12
168:19 169:1 170:17
174:10 185:8 189:8
192:5 244:18
future 37:10 63:7 88:16
89:19 109:6 112:22
117:14 139:6 148:3
198:10 216:1
FY 36:2,5,10,16 43:22
FY20 72:7
FY22 89:15
-
- G**
-
- gain** 58:8 127:1
Galen 20:15
Gallaudet 226:3
game 46:21 179:5
gap 151:21 152:2,14
154:5,18,19 209:21
gaps 151:22 200:18
210:2 212:12
Gary 1:22 8:7,9,14

179:22 189:12,17
223:6 224:7
gather 16:10,11 117:8
gathering 16:5 72:20
gauging 73:2
gavel 104:2
geared 211:11
gears 84:15
Gee 1:18 5:18,19,20
24:21 25:13 147:8
149:20 150:11,22
151:8 155:4 156:5
158:14 160:14 174:9
231:17,18
general 47:10 104:7
151:2 167:1 177:12
200:13 227:21 242:8
246:20
generalization 59:8
generally 93:19 94:1
generation 71:10
generous 18:11
geodetic 2:3 8:12 11:2
30:8,11 35:8 37:2
76:7 77:9 79:14 82:7
82:13 89:18 184:20
207:3,10
geographers 119:4
geographic 101:4
geographies 120:20
geohazard 99:17
GEOID 89:6
geometry 153:18
Georgia 47:6 63:18
Geoscience 220:1
geospatial 60:3 80:16
80:16 98:2 125:18
129:5 172:20
getting 24:5 36:7 37:3
42:14 71:10 75:8
77:21 78:3 83:20
86:15,16 135:3,18
136:9,13 150:15
161:19 170:22 181:8
190:6 214:7 236:20
243:6 249:20
GIS 197:12
give 35:8 40:4 79:1
106:6 109:1 113:10
122:1 152:7 155:1
167:18 177:9 180:8
185:21 196:5 200:11
200:19 202:16 206:8
238:14 239:1
given 65:17 92:3
168:11
giving 67:13 122:3
124:4 238:1

glaciers 99:14
glad 50:18 80:19 111:8
138:4 175:12,21
177:15 178:16 179:21
202:21 219:19 221:22
223:16 226:19
glass 245:4
Glenn 20:8
gloating 244:19
global 32:13 83:10
93:11 96:3,6 203:17
203:17 210:19 211:16
212:9
GMRT 96:6 211:16
212:1
GNSS 72:20 132:15
215:7,15
goal 20:20 61:14 82:22
94:7 105:3 108:21
120:5 121:15 122:7
123:5 124:13 125:19
129:20 130:2,7,16
131:21 132:8 133:7
134:1 140:7 150:15
163:4,7 175:7 219:12
219:13
goals 34:8 93:4 119:16
119:17 128:12,13
129:7 130:15 146:21
163:4 166:4 226:5
God 50:11
gold 244:10
goodness 208:21
gosh 107:13 180:14
GoToMeeting 22:10
gotten 60:15 91:16
186:1,20 196:8 209:8
241:11
governance 16:22
119:18 219:12
governed 13:15
government 14:15
16:12 56:5 99:10
100:7 105:7 143:6
159:8 242:6 249:15
250:10
governmental 231:6
GPS 181:21
graduate 54:20,20
61:15
grand 178:18
grander 197:5
grant 56:5 65:14 69:8
GRAV-D 188:1
gravity 78:15
gray 103:12
greater 65:19 189:9
210:9

greatly 49:1 167:4
grew 33:7
gross 33:6
ground 81:19 146:4
groundtruthing 196:19
group 13:20 15:3 17:15
19:6 24:20,21,22 25:3
35:4 100:22 112:12
123:18 124:6 126:7
129:2 152:18 159:12
159:14 161:12 170:13
172:15 189:1 190:1,6
207:1 210:5 236:2
237:9
groups 15:21 24:17
54:17 107:9 112:20
212:5 242:1,18
grow 250:2
growing 64:8 134:5
227:22
Guard 32:7 50:5 111:11
207:16 226:2,5,21
Guard's 75:8
guess 12:13 115:1
147:10,17,18 150:5
151:9 153:21 158:14
162:21 166:18 169:4
184:11 216:16 239:12
242:3
guests 222:18
guidance 19:11 25:6
guide 124:18 125:4
195:21
gulf 31:13 41:11 72:2
73:3,13,16,18 74:19
85:7 97:1 141:15
144:1 155:8 220:17
221:7
gun 151:4
gung-ho 113:13

H

H 151:2
habitat 216:13
habitats 108:15
HABs 97:20
Haines 15:14 119:22
Hains 217:22 218:2,3,9
half 31:13 95:8 104:14
154:2 196:5 223:1
half-day 13:12
hammered 226:3
Hampshire 5:22 10:17
10:19 12:10,10 47:6
52:21 53:4,12,14,17
53:19 56:18 62:15
64:1 100:8 250:5
hamstrung 82:4
hand 12:14 107:2
114:13
handle 41:15
hands 45:18 240:7,20
240:22
hands-on 61:8
happen 132:1 157:5
221:9
happened 115:21 121:1
144:21
happening 49:7 179:16
182:17 232:4 248:16
happens 88:7 94:4
171:10 235:14
happier 250:17
happy 12:3 23:13 76:18
80:10 81:15 82:6
91:13 169:17 176:9
208:9
Harbor 6:18 66:14
176:21
harbors 111:3
hard 32:17 44:1 62:11
66:7 131:2 149:22
229:5 241:8 244:22
hard-hit 32:12
hardcopy 66:3,12
harder 28:18
Hargrave 24:21
Harvey 67:9 87:6
hashed 237:15
Hassler 43:12 53:22
hat 4:21 19:9,10
hate 144:8
Hawaii 17:19,22 38:9
46:15 76:13 175:1
210:12
Hayes 20:11
hazardous 32:15
hazards 64:5 214:10,17
HAZMAT 67:3
head 73:19 218:4 226:1
244:19
headed 43:16
heading 228:17
headphone 176:16
headquartered 6:22
11:2,10
headquarters 226:3
heads 210:18
health 117:15
healthy 49:3,4
hear 7:5 11:15 17:14
21:14 25:1 52:11 76:4
96:4 119:15 127:10
141:3 146:15 157:21
160:7 170:20 175:8
176:19 184:3 185:17

200:7 202:21 213:12
 220:3 224:6 225:5
 229:2 231:2 235:15
heard 16:9 29:16 35:18
 97:8 100:9 144:16
 145:20 148:13 189:18
hearing 17:10 18:13
 29:15 35:5 52:16 75:5
 94:10 100:12 158:17
hearings 15:6
heart 81:14 120:5
 219:21 239:20
heavily 103:16
height 40:18
held 138:20 151:21
Helen 205:19,21,22
 206:6 208:10
hello 4:18 10:15,22
 48:20 50:7 114:21
 143:16 203:4
help 19:15 21:15 63:20
 89:18 94:8 169:14
 198:12 212:19 223:19
helped 20:6 26:22
helpful 110:17 113:1
 170:20 171:1 185:18
 212:10 222:10 243:20
 246:12
helping 67:15 74:7
 79:12 96:1,2 157:7
 167:19
helps 48:1 101:6
 155:11 247:22
hemisphere 5:11
hesitant 160:20
Hey 48:11 169:11
 193:11 225:5
hi 6:21 7:13 8:22 9:13
 9:20 11:7 128:2 203:4
 208:18 216:9,10
 236:8
Hicks 20:12
hidden 16:18
high 30:19 31:1,6,14
 41:21 44:15 69:16,18
 70:5 83:1 93:14,17
 95:7 99:17 118:8
 154:17 188:3,11,13
 220:22
high-accuracy 201:16
 202:1
high-level 174:8
high-performance
 45:14
high-resolution 201:3
 201:16,22
higher 30:19,20 31:1,5
 41:22 216:18

higher-level 217:14
highest 30:21 31:6 36:2
 83:13,13 200:22
highlight 80:1 88:10
 167:3 204:20
highlighting 215:7
highly 83:1
highway 68:21 69:9
 93:7
Hill 13:10
hiring 78:7
historic 70:9 97:12
 220:16
historically 238:3
history 99:20
hit 42:12 78:5
hitting 70:20 85:11
hold 17:20 138:10
 247:8
holding 126:8,22 127:8
 152:4
home 13:1 55:3
homeported 54:1
homes 85:19
honestly 163:21
Honorable 3:6
honored 26:7
Hooper 20:12
hope 25:10 29:20 38:4
 61:16 76:11 105:6
 116:15 119:15 136:9
 136:17 138:6 207:5
 232:15 234:21 243:22
hopefully 37:3 62:6
 76:15 87:12 158:4
 176:7 231:19 232:12
 233:7 236:2 239:18
 240:9 245:17
hoping 141:3 143:10
 176:18 191:16 240:22
host 46:2
hosted 80:1
hour 48:9 51:2 113:16
 151:5 196:5 223:1
hours 221:17
house 15:13 36:9 39:5
 49:16,19 88:1 94:6
Houston 23:12
HSRC 7:20
HSRP 1:14,15,15 2:1,8
 2:15 3:2,4,21 4:4,9,12
 10:6 13:9,13 16:2
 18:12 19:2,3 20:1,18
 21:3,5,8,11,18 23:11
 23:15 24:11 25:10
 26:16 28:19 30:1 34:9
 65:17 77:20 90:6
 106:14 107:1 112:8

116:22 135:22 138:1
 156:13 165:9,10,21
 166:6,11 168:6
 174:18 178:16 186:15
 187:10 189:1 191:17
 192:16 196:20,22
 197:4 205:21 206:3
 208:12,13,22 244:10
huge 78:15 94:12
 135:14,14 140:15
 211:3 240:6 248:11
 250:13
hugely 202:17 207:10
human 238:9
hundred 41:10
hung 122:2
hurricane 30:3,4,17,22
 31:3,8 67:8 68:14
 77:7 84:20 85:6 86:8
 86:20 87:8
hurricanes 30:5,12
 34:22 72:1 84:19 86:7
 87:3 101:18
hurting 137:16
hybrid 57:17
hydrodynamic 59:19
 97:20
hydrographer 208:19
hydrographers 61:15
hydrographic 1:4,12
 2:2,6 10:12,18 12:9
 13:8,14 16:2 19:13
 26:20 31:18 35:21
 37:1 43:10 52:20 53:6
 53:15,22 58:5 60:6
 100:20 102:18 138:18
 138:20 218:4 238:22
 249:19
hydrography 24:3
 92:19 103:15

I

ice 214:18
idea 45:20 237:10 239:1
 239:1
ideal 59:9
ideas 17:10 37:16 141:3
 173:19 179:7 222:22
 235:8 250:9
identified 30:14
identifies 130:14 217:8
identify 34:15 122:19
identifying 181:17
 216:21
idle 197:18 209:9,14,19
IGLD 72:12
IHO 209:2
Ill 41:1
Ike 30:22
image 85:1,10 176:22
 204:2
imagery 85:5,13,15,20
 87:1,5,22 203:18
images 30:13 85:4,8
 86:9
imaginable 109:8
imagine 43:4 101:7
 109:7 122:18 217:3
imagined 27:5
imaging 125:15
immature 103:7
immediately 30:12 32:3
immensely 245:16
impact 24:13 60:7 93:3
 93:21 139:13 144:11
 144:18 175:16 221:9
 250:13
impacted 88:8
impacting 27:1 228:1
impacts 31:10,11 48:4
 69:14 85:6,17 86:4
 219:1
implement 35:17 134:8
implementation 3:11
 15:18 16:6,17 17:6
 117:1 118:11 119:6
 120:4 129:18 131:4
 131:12 135:19 136:11
 136:18 146:8,10,14
 146:17 153:1 155:22
 166:12 191:19 192:1
 192:6,21 243:7 248:8
implementations 39:9
implemented 123:3
 178:17 207:5
implementing 15:16
 17:11
implications 97:17
importance 27:3 130:8
 138:2,5 199:11
 217:17 225:12
important 28:9 29:18
 32:11 38:17 40:1
 41:20 42:2 44:6 47:12
 49:6 78:21 81:17
 85:14 95:5 131:10
 138:14 139:18 149:12
 153:1 154:4,12
 162:15 177:5 200:12
 200:15 202:9 207:10
 208:4,7 212:11
 219:10 247:19
importantly 92:22
imports 69:2
impossible 33:10
 145:10

- impressed** 24:8 63:11
174:16 175:5,8
244:20
- impressive** 105:20
178:3
- improve** 29:5 32:18
34:6,13 58:9 74:7
88:14 89:18 103:19
125:1 133:13
- improved** 34:15 59:18
66:11 93:13
- improvements** 37:16
73:11,12 169:15
- improving** 34:17
- in-** 87:22
- in-house** 87:13 99:7
100:18
- in-person** 25:8
- inaccurate** 201:13
- inception** 128:22
- include** 19:18 24:18
39:18 57:9,12 83:20
98:22 119:1,2 125:9
125:16,20 130:9
131:21 160:12 187:2
198:7 218:19 224:18
224:22
- included** 80:3 110:9
218:16
- includes** 54:8 56:8
57:17 125:5
- including** 27:8 35:7
36:11 58:20 78:6 79:4
79:20 89:1 127:5
163:8 207:15 248:8
- inclusion** 127:12
- inclusive** 15:17 119:5
119:11
- incorporate** 65:9
187:11 191:6
- incorporated** 89:5
187:17
- incorporating** 190:5
214:8
- incorporation** 89:8
245:9
- increase** 113:5 115:15
144:17 145:9
- increased** 145:8 146:1
176:5 178:20
- increases** 36:15 145:13
- increasing** 69:5
- incredible** 250:5
- incredibly** 41:20 44:6
- individual** 18:17
- individually** 188:21
- industrial** 6:11
- industry** 6:11 19:6
54:10 55:8,17 102:16
158:19 167:19,20
171:19 198:7 207:18
240:16 243:8 250:7
- ineffective** 115:14
- infection** 42:21
- influencing** 166:12
- influential** 166:11
- info** 157:15 189:6
- information** 8:2 36:20
64:4,13 65:6 67:4,18
76:3 80:7,17 86:4
111:9,18 132:19
134:13 136:18 177:10
181:9 188:13 191:16
191:18 200:16,22
201:3,7,14 202:1,6
205:3 207:21,22
208:1,21 217:3
223:14 225:21 226:6
226:9,9,10,14,17
230:11
- informed** 16:19 24:8
- infrastructure** 36:20
67:18 77:2 82:8 85:3
85:17 93:7 98:2 199:7
221:2 223:21 226:21
- initial** 126:4 157:8
160:4 195:4 232:16
- initially** 159:19
- initiate** 21:2
- initiatives** 24:4 34:6
207:4 208:3
- inland** 115:5
- innovation** 65:14 130:2
- innovative** 28:5 105:17
- input** 15:19 16:5,11
21:22 22:14 25:19
29:4 34:16 41:16,22
117:8 119:13 127:2,5
127:12 134:7 135:4
136:13 156:13 157:6
158:5 160:8 162:18
166:6 172:6 179:8
194:3 214:6,7 218:12
243:1,9,11,19
- inside** 93:9
- insight** 48:1
- insightful** 21:8
- insights** 47:21
- inspiration** 247:14,21
248:6
- inspirations** 247:22
- inspire** 116:20 123:8
- inspired** 247:16
- inspiring** 248:4
- install** 221:4
- installed** 68:1
- instance** 154:11
- Institute** 200:9
- institution** 7:21 55:4
- institutions** 54:11
- instrument** 161:15
- insufficient** 154:10
- integrate** 67:14 71:12
131:13 231:7
- integrated** 49:15,19
66:10 67:11 124:1
209:6,10 210:4
211:22
- integrating** 110:6
131:17 220:18 234:2
- intelligence** 21:10 34:7
34:11 104:21 238:11
- intend** 18:9 125:1
- intended** 125:3
- intending** 124:16
- intensification** 41:9
- intent** 115:11 119:5
148:20,21 150:10
192:11
- intentions** 240:5
- interact** 173:20
- interactions** 56:11
230:5
- interactive** 58:18
- interagency** 98:20
100:4 112:20 118:7
119:19 123:17 124:6
126:7 138:7 152:17
190:20 191:7 207:15
221:21 234:1 237:9
237:14 239:7 246:8
- interest** 48:5 126:20
141:14 148:15 176:20
180:18 224:20 227:1
247:7
- interested** 59:12 102:1
109:21 158:21 202:2
- interesting** 228:18
230:9
- interface** 22:11 176:6
- interference** 94:15
221:1,3
- interior** 68:22
- interjection** 166:15
- internal** 67:11 156:20
- internally** 97:6 175:9
- international** 55:1
72:12 83:10
- interoperability** 162:16
- interpretation** 59:2
- interrupt** 156:3
- introduce** 200:4 208:16
- introduced** 168:8
- introducing** 116:11
- introduction** 23:5 38:6
- introductions** 3:3 19:16
- intros** 4:14 10:7
- inundation** 70:8,16
73:10
- invaluable** 29:21 106:1
- invent** 141:11
- invented** 249:15 250:2
- invest** 105:4
- invested** 103:2
- investing** 103:16
146:13
- investment** 36:22 103:4
104:19 105:6,8
146:18 211:3
- invitation** 50:7
- invite** 135:1
- inviting** 4:12 48:21
- involve** 123:8 160:2
- involved** 128:21 129:12
129:13 136:1 142:6
148:6 158:20 159:4,7
163:9 171:22 209:6
214:11 241:16,21
248:13
- involvement** 158:18
174:16
- involving** 77:8
- IOOS** 215:21
- Irma** 87:6
- Isaiah** 84:21
- Island** 89:9
- Islands** 73:5,6 100:3
- isolated** 43:1
- issue** 21:4 25:14 34:10
165:11,21 181:13
186:15,19 214:10
225:21 240:12
- issued** 56:19 117:11
- issues** 28:2 78:7 165:22
221:20
- it'd** 63:5
- it'll** 104:18
- item** 60:13
- items** 16:7 157:18
- ITRF** 89:6
-
- J**
-
- J** 1:15,18
- Jacobs** 2:9 3:5 11:13
11:14,15,19,19 13:5
24:10 25:7 26:8,16
37:13,21,22 47:19
63:16 184:1 185:13
185:14,16 194:6
224:15 245:8,20,21
247:7
- JALBTCX** 95:20 139:22

167:8
James 242:8
January 56:21
Jefferson 43:9
Jersey 6:8
Jill 20:15
job 4:15 24:14 25:5
 36:21 41:12 50:10
 136:8 137:12 174:11
 181:3 190:5 193:17
 194:4 201:2 223:16
 228:6 240:18 244:3
 249:4
John 15:14 20:12,14
 119:22
join 17:19 47:20 158:9
 219:20
joining 13:11 21:20
 24:12 26:18,20 39:6
 205:18 213:4 216:7
 217:22 218:5 222:2
Joint 10:11,18 12:8
 13:8 35:20 52:19 53:6
 53:15
Joseph 200:3,8
jot 224:21
Journal 60:15
Joyce 208:14,16,18
 210:14 211:2
judgment 149:11,12
Julia 20:14
Juliana 2:3 3:10,17
 10:8,21 11:1 13:7
 17:7 29:16 35:7 51:21
 76:7,9 91:3 116:16
 127:17,22 128:6
 137:3,8,8 156:7
 170:21 172:2,12
 173:14 181:5 183:20
 185:8 190:10,15
 229:18 242:11 243:14
 244:16
Julie 1:15 7:18,19 8:6
 13:4 24:16,18 25:13
 26:15 107:2,2 109:20
 110:12 158:8 160:15
 162:21 164:10 168:3
 169:3,11 174:9
 180:11 181:6 182:20
 184:5 192:15 224:3,4
 225:3 235:7 244:2
Julie's 112:16
July 43:9 92:16 94:6
 146:7
jumped 151:4
June 15:13 78:19
 116:14 118:5,9
Juneau 7:15 208:20

226:1
justifications 217:5

K

Katrina 31:8
keep 21:15 43:1 50:8
 78:14 108:21 137:17
 148:8 158:17 185:5
 196:3 211:19 222:8
 223:17 231:9 237:6
 240:5 247:22
keeping 16:17 90:16
 184:22 245:13 248:18
 249:3
keeps 199:15
Kelly 1:18 6:4,5,6 20:12
 114:2,3,7 151:4
 174:13,14 177:22
 230:15,16 242:4
key 20:22 55:8 152:20
 234:11
keyed 175:12
kick 4:4
kicked 215:2
kickoff 12:16
kilohertz 60:20
kinds 119:9 122:1
 216:1
Kings 47:5 63:18,20
Kinner 1:19 6:14,15,16
 176:15,18 229:15,16
Kitsap 71:15
knew 165:15
knife 144:3
knit 98:16
knowledge 15:7 211:14
known 60:17 121:19
knows 27:20 33:9 42:10
Kristen 20:10
kudos 168:2 171:12
 247:4

L

LA 68:19
labor 20:3
laborious 107:18
lag 118:3
laid 73:11
Lake 31:21
Lakes 72:13 102:12
 119:2 141:15 218:15
 218:17
Lamont-Doherty 96:10
 210:16
land 72:22 90:6 182:5
landfalling 38:2 40:7
Landsat 203:18
landscape 28:21

214:13
landslide 99:18
language 138:3 169:18
large 74:3 200:18
 204:13
larger 93:1 123:15
Larry 2:5 10:10 12:5,7
 13:9 53:11 62:6 140:5
 182:22 183:5 186:22
 187:4 209:12 239:11
 241:5
lastly 84:8 89:16 96:3
 238:15
late 52:10 225:9
latest 23:14 62:3 79:20
 94:22 122:12 176:3
 189:4
Laura 20:13 30:5,13,17
 32:3 38:2 41:8 85:6
law 119:12
layered 132:19
lead 5:10 25:13 128:7
 149:22 160:16 216:20
leader 27:12
leaders 25:16
leadership 2:7 3:22
 4:13 10:7 17:6 18:11
 25:4 27:19 193:1
 223:15 236:11 239:11
 247:20
leading 31:21 79:4
 155:20 224:16 244:3
leads 136:10
leaps 106:10
learn 86:10 126:12
 127:10 205:9 229:10
 229:11
learned 229:3
learning 58:17 170:4
 204:2,16 205:11
leave 66:8
LeBoeuf 2:12 3:5,8
 11:22 12:1 13:6 17:7
 24:10 25:7 26:8,14
 51:10,12,15,22 52:3,6
 62:10 75:19 91:3
 104:5 105:12 156:9
 184:4,8 235:15 244:6
led 70:1
Lee 12:10
left 84:22 98:6 196:15
 204:6,7
legislators 14:5
lemonade 245:5
lend 239:6
length 14:16
lens 92:2
Leonardi 15:9 119:22

lessons 229:3
let's 48:18 50:22 62:19
 76:6 91:9 106:5,6
 130:16 168:6,13
 177:17 183:13 190:8
 190:15 191:10 223:6
 239:11
letter 224:14 225:1
 235:9 236:4
letters 194:5
level 30:18,21 31:2,4,7
 31:7 36:2,13 37:2
 64:6 67:21,22 68:3
 69:14 70:4,17,21
 72:20 83:13 89:18
 100:14 101:14 115:21
 118:8 141:19 145:8,9
 162:1,13 187:16
 196:1 202:22 214:19
 215:2 216:18 235:20
 241:22 247:17 248:1
 248:6
levels 30:16 31:12,14
 72:22 242:2
leverage 55:11 130:2
leveraging 236:15
license 55:21
lidar 58:21 87:1,5 88:11
 95:20,20 107:20
 125:12 133:10 161:2
 164:16,17 181:10,16
 182:18 185:3 188:6
lidars 249:19
life 28:20 33:17
light 32:15
lightning 126:19 238:2
likes 250:3
limitations 229:12
limited 17:16 35:2
limiting 22:22
limits 14:13,16
Lindsay 1:18 5:18,20
 6:3 24:21 25:13 147:3
 147:5,6 148:11 154:3
 156:4,12 158:7,12
 159:18 174:8,13
 231:17,17 233:13
line 38:18 59:1 140:1
 150:16 182:9
lined 137:4 199:21
 222:4
lines 8:21 164:14 228:8
link 126:15
linking 96:9
links 117:20
list 4:16 7:12 64:19
 168:15 195:7 197:11
 219:22

listed 71:20 90:21
listening 44:7 47:17
little 12:15 39:12 42:8
 46:2 54:6 57:1,21
 58:22 61:19 63:6 66:7
 82:4,10 84:15 88:2
 101:2 103:10,10
 106:19 107:5 108:4
 109:1 113:2 114:19
 142:14 150:9,18
 154:16 158:9 160:20
 162:22 163:19 166:22
 186:11,17 198:17
 199:17,22 226:18
 227:17 231:13 232:20
 238:5 245:18
Littlejohn 20:13
live 112:18
lives 27:1
local 144:18 179:8
 204:22 240:17
locals 172:21
located 4:22 7:15 8:3
 8:12
location 13:2 72:8
locations 75:9
locked 184:20
logged 47:17
logical 189:14
logistics 21:19 142:16
 198:17
logjam 225:21
long 75:5 92:8 99:19
 110:3 186:20
long-term 64:5 70:20
 199:9
long-time 48:22
longer 109:3 143:10
 186:21 191:15 196:11
 230:2
longevity 83:2
longshore 41:4
Longstreet 242:8
look 17:9 18:13 23:19
 25:7 30:2 34:18 46:20
 52:15 62:4 63:5 69:19
 90:21 123:3 127:5,14
 134:7 144:22 193:16
 209:2,20 212:12
 222:7 242:7,8 245:15
 248:21
looked 134:21 161:17
 215:22
looking 5:2 24:9 32:21
 37:9 38:7 39:6,16
 44:10 58:3,15,17 59:1
 59:7,10,17 60:2 62:13
 62:17 65:21 84:9

112:10 125:20 136:7
 143:1 145:18 178:21
 181:15 194:6 205:14
 220:7,14,18 223:18
 223:22 225:15 230:3
 230:8 233:20 234:20
 236:18,19 242:1
 249:18
looks 7:7 11:4 141:4
loosely 16:15
lost 42:12
lots 201:10,10 214:16
 240:4 245:22 246:17
Louisiana 68:15,20
 75:22
love 20:4 45:16,20
 136:16 171:7 178:11
 196:5 239:1 249:8
loves 179:21
low 188:4,6,13
low-cost 234:13
lower 85:10
Lowrance 39:14 47:1
Luckily 144:8
Lucy 20:12
lull 38:3
Lynne 2:15 20:13
 106:12 190:10 193:12
 194:9 195:9,11
 223:11

M

M 1:17 3:4
machine 58:16 204:2
 204:16 205:9,10
machinery 142:16
magnetometer 125:14
magnified 40:19
Mahalo 37:8
main 102:15 188:15
maintain 56:12 61:10
 64:17 83:4
maintains 53:20
maintenance 97:5
major 29:8 49:10 50:4
 57:5 69:1,1 80:15
 93:10
majoring 60:5
majority 81:6
makers 76:3
making 33:19 73:12
 86:16 103:14,15
 105:14 113:14 116:22
 117:7 129:18 182:1
 198:3 235:12 250:12
manage 44:13 151:20
managed 68:13 145:4
 243:16
management 8:10,11
 40:3 44:21 47:21 86:1
 125:10 211:5,9 226:2
 246:7
manager 5:20
managers 46:8 217:1
managing 44:17 58:8
manned 188:10
manufacturers 162:7
manufactures 162:5
map 42:5 57:8 58:1
 108:21 120:6,16
 152:21 163:5,8 181:1
 188:8 204:12 223:19
mapped 153:12
mapper 208:19
mappers 55:5
maps 39:14,16,18
MARAD 205:4
march 12:22 56:16 97:3
 148:16
Maria 87:6
marine 6:9 7:14 33:3,5
 36:19 57:19 60:2,2,9
 60:9 93:7 108:14
 200:9 205:20 206:7
 207:7,11 221:12
maritime 6:7,11 9:9
 32:20 35:1 38:16 40:2
 46:8 59:21 178:19
 179:10
mark 36:16
marked 36:9
marsh 200:20
Maryland 11:3,11 12:22
 13:1
masked 15:1
master 95:18
match 139:19
material 53:1
materials 4:9 21:12
 25:4 26:12 37:20
matter 19:5,20 28:21
 51:3 113:18 124:8
 250:21
matters 27:3 38:19
mature 102:22 122:10
maturing 17:3 102:19
 122:16
Maune 1:19 6:20,21,21
 24:18 25:13 158:8
 164:10 172:3 173:13
 186:2,7,14 187:9
 191:8 192:10 193:3
 194:1 203:8 228:10
 228:11
Maune's 193:14
maxim 230:21
maximize 123:6 125:22
maximum 57:10 93:2
Mayer 2:5 10:10 12:5,6
 12:7 13:9 53:11 140:6
 141:22 143:13 182:22
 183:6,8,15 186:22
 187:7 239:11,12
McCammon 187:14
 213:5,7,9,12,15
McConnaughey 216:8
 216:10
McIntyre 1:20 7:4 9:19
 9:20,21 177:18,19
 227:11,12,14
McLaughlin 20:14
mean 30:18 31:1,5
 107:14 110:2 116:12
 139:2,9 153:2,13
 154:8 162:22 163:13
 167:5,8 183:20
 217:16 227:10 238:4
meaning 217:13
meaningful 141:20
 185:3
means 59:15 144:18
 154:15
measure 36:7 107:11
 165:1 230:21
measured 30:17 31:13
measurements 72:21
 199:15
measures 145:21
 161:17
mechanism 80:5
 140:11,19 240:12,13
 240:19
mechanisms 241:2
media 69:20 70:1
medical 210:1
meet 88:4 122:21
 146:21
meeting 1:6 4:5,6 13:3
 16:7,19 17:9,20,21,22
 18:6,7,19 19:19 20:3
 20:20 21:10,16 22:19
 23:14 25:8,12,22 26:2
 26:7,21 37:10,14
 38:10 44:9 50:17 62:6
 77:21 117:6 123:11
 135:16 172:11 174:22
 208:20 209:8 225:22
 231:15 237:3 238:16
 241:9 242:19 244:4
 250:19
meetings 13:13 15:3,4
 18:4,12 19:2 189:2
 242:14
meets 108:11

Melanie 20:10
member 3:2 4:9,18 5:6
 5:19 6:5,15,21 7:13
 8:8,17 9:7,13,20
 11:17 21:11 51:12,15
 51:22 52:3,6 62:10
 75:19 91:3 104:5
 105:12 112:4,7 114:3
 114:7,21 127:19
 137:6,20 143:16,19
 145:19 146:22 147:8
 149:20 150:11,22
 151:4,8 155:4 156:5
 158:14 160:14 162:21
 164:10 167:2 168:6
 169:2,11 170:2,19
 172:3 173:12,13
 174:9,14 176:15,18
 177:19 178:7,10
 179:20 180:1,15
 186:2,7,14 187:9
 191:8 192:10,15
 193:3,19 194:1
 206:15 223:7,12
 225:5,8,19 227:12,14
 228:11 229:16 230:16
 231:18 233:15 235:6
 236:8 237:2
members 1:14 2:1 3:21
 4:12 10:6 13:10 17:14
 19:1,3 21:3 24:11,16
 54:10 106:17,22
 116:12,21 136:1
 165:9 166:7,7 171:22
 187:10 188:22 206:3
 241:11 242:13
memo 39:3 158:3
 178:15,17
memorandum 117:12
 117:13 118:4 157:2
 165:8,14,19 186:18
 217:8
mental 27:13
mention 45:2 46:10
 63:9 65:2,11 90:1
 130:4 135:21 175:15
 187:13 216:11 219:16
 249:7
mentioned 23:10 29:10
 44:9 63:3,16 84:18
 86:6 89:11 109:22
 132:13 140:9 151:15
 153:16 157:1 164:11
 171:15 173:7,14
 174:20 185:22 186:17
 191:12 218:14 219:12
 219:14 228:12 235:10
 236:9,16 241:19

248:19
mentioning 181:13
 206:9 244:15
merging 73:15
Mersfelder-Lewis 2:15
 20:13 106:14 128:2
 186:9 190:12 193:11
 194:11 195:12 249:6
message 38:18 79:12
messages 79:6
messaging 77:2 108:4
met 1:12 38:13 87:19
 123:15 161:10 185:2
metadata 246:4
meteorological 66:20
meteorology 45:4
meter 95:8
meters 65:1 72:3
 104:15 107:6 108:4
 109:9 115:1,3,4,4,7,7
 115:13 116:2 147:19
 147:20,22 148:10
 202:15,16 203:19
 210:9
metrics 87:19 88:4
Mexico 73:4,14 74:20
 85:7 97:1 141:16
 155:8 219:7 220:17
 221:7
Miami 8:21
mic 62:19 91:9
Michael 87:8 215:9
Michelle 20:9
microwave 68:3,5
middle 72:15 164:19
 228:15
midst 240:9
Mighty 9:10
Mike 20:7 181:8,12
miles 41:10
milestone 108:7,8
milestones 104:8
Miller 208:14,18,18
million 36:3 234:16
mind 28:15 169:6
mine 142:4
minerals 217:9,18
mini 158:9
minimize 126:1
minimum 125:8 155:12
 155:13 162:10
minute 21:14,14,15
 51:1 190:16 214:8
 229:22 249:11
minutes 12:13 18:14
 23:1 48:9 51:2 52:10
 113:17 121:6 156:4
 186:10,13 190:13

194:16 200:1,2 238:1
missed 20:17
missing 187:21
mission 84:17 229:9
 245:1,2
mission-critical 228:21
Mississippi 9:10 32:6
 73:19 100:10 144:7
 144:20
misunderstand 151:14
mix 61:7 217:4
mobile 72:3 74:22 75:1
 205:1
Mobilizing 167:22
mode 61:6 222:21
model 41:20 46:4 59:19
 73:14 74:2,3,5,7,20
 89:14 96:6 98:16
 154:7
modeling 60:5 67:12,14
 97:19 108:14 199:12
 199:14 200:10,13,14
 201:20 202:4,21
 246:19
models 40:15 41:2,16
 41:17,18,21 67:16
 73:15 74:19 89:6,10
 89:13,19 97:20,20,21
 132:17 201:15
moderate 147:4 195:15
moderating 51:20
modern 53:18
modernization 35:11
 37:2 77:4,22 78:1
 79:20 82:15,19
modernized 81:18
modest 36:15
modifying 192:20
Moller 72:4
Molly 187:14 213:5,6
 216:6
moment 8:21 20:5 24:3
 147:12 158:2 184:8
 231:21
momentum 148:9
 149:15
MONEC 3:12
money 103:2 104:12
 109:8,9 142:8 143:9
 146:12 150:4,8,10
 158:1 163:18 175:16
 197:15 215:19 230:13
monitor 133:16,21
monitored 206:12
monitoring 58:3 134:13
 206:18
monopolize 227:8
month 56:19

months 16:21 23:21
 28:16 99:12 126:5
 127:7 167:10
morning 5:7 6:15 8:17
 178:2 195:5 242:5
motion 46:13
move 76:6 226:4 232:8
 233:11 250:9
moved 88:10 175:7
movement 48:6
moves 250:6
moving 26:6 43:19
 176:8 178:3 226:20
 227:19 236:14
Multi-Resolution 96:6
 211:16
multi-year 100:2
multibeam 60:20
 107:17 125:11
multibeams 209:9,16
multinational 219:1
multiple 24:2 144:4
 180:5 192:9 215:19
 215:20 217:8
muted 6:4 7:5,13 23:8
 143:15 169:9 178:6,6
 178:7 224:4,4 231:17
 231:18 241:6

N

nailed 41:8
name 4:15,16,19 5:8,19
 6:6 8:9,18 9:14 219:4
names 183:3
narrowly 93:5,21
NASA 83:16,20 123:10
Nathan 20:12
nation 27:16 28:15
 32:19 50:10 78:17
 90:13 228:15
nation's 33:5,5,8 34:2
 87:19 93:7
national 1:3 2:3 11:2
 12:2 15:11 27:8 29:10
 30:8,11 35:8,10 54:17
 67:21 76:7 77:3,8
 81:18 82:15,18 83:6
 83:16 84:4,13 86:3
 87:17 90:16 117:15
 117:20,21 118:7,20
 121:6 124:17 125:17
 132:10 138:10,17,17
 142:5 144:5 153:17
 161:19 171:4 181:14
 186:22 199:6 205:6
 207:2 210:6 215:5
 217:12 221:12 238:18
 238:21 239:4

- native** 172:21
natural 92:14
nature 19:17 71:11
 73:20 117:6 238:9
Nautical 8:20
Nautilus 6:1 152:9
naval 64:1,2
navigate 177:8 207:11
navigation 3:7 17:16
 19:13 20:21 28:19
 33:14 35:1,6 36:12,22
 37:17,17 38:16 40:2
 52:13 57:12 59:6
 66:16 73:21 88:21
 93:5,13,20 96:14
 97:21 108:13 115:2,9
 115:12 116:5 144:7
 148:15 149:2 154:11
 177:4 185:1 199:5
 207:17 208:1 217:10
 217:18 226:10
navigation-relevant
 107:16
navigational 29:7 32:5
navigator 57:14
Navy 63:19 71:14 75:21
NCEI 95:21
NCI 152:4
NDBC 161:10
near 39:18 128:17
 188:9 210:3 239:20
near-term 70:19
nearby 13:1 53:19 65:7
nearly 33:10
nearshore 39:12 41:1
 107:8 185:2 200:14
 200:19 246:19
neat 178:12
necessarily 40:1 64:12
 203:6 234:7
necessary 132:10
 188:2
Neches 85:9
need 16:10,10 42:1
 67:3 121:21 122:11
 122:15,19 130:4,5
 131:11 133:17 142:5
 146:3 153:9 154:13
 154:14,14 155:1,11
 155:21 156:13 157:5
 157:6 162:11 163:13
 168:2 169:5 172:7
 185:5 187:19,22
 188:6,9 193:8 194:10
 198:6,20 199:8 202:5
 223:17 232:5
needed 35:17 72:21
 74:20 81:22 111:15
 111:16 202:14 226:4
needs 92:21 93:5
 108:12 122:19,21
 123:11,14 131:18,18
 133:18 143:4 146:10
 153:6 155:22 185:1
 188:12 199:2 205:11
 206:19 217:9,13,14
 230:1 235:2
neglected 148:18
neighboring 219:6
Neil 2:9 3:5 11:13,19
 13:5
net 135:3 173:6
network 37:3 55:5 64:8
 64:15 65:5 67:22
 79:15 82:21 83:7,22
 84:7,12 132:15
 198:12 221:5
never 12:6 141:14,19
 150:20 175:1 235:19
nevertheless 179:3
new 5:22 6:8,8 9:9
 10:17,18 12:9,10 17:3
 24:13 35:16,17 39:17
 46:11 47:1,6 52:20
 53:3,4,8,12,14,17,19
 53:19 55:4 56:13,18
 56:20 58:18 62:8,15
 63:17 64:1 65:15
 66:14,18 71:2 75:21
 80:17,18 81:12 84:9
 89:9 92:17 95:22
 96:21 97:9 100:8
 104:21 112:8 113:5
 122:16 130:5 133:16
 133:19 158:1 169:13
 174:20 199:13 208:3
 209:17 223:18 224:1
 234:3,13,18 246:1
 247:4 250:4
news 48:6 79:5 156:22
newsletters 79:10
NGA 207:16
NGO 171:4
NGS 13:6 27:9 32:11
 38:20 72:18 77:5,13
 77:13,16,21 79:5,10
 84:1,18 88:20 89:7
 90:4 167:7
NGS's 35:9
nice 11:4 25:20 106:10
 139:4 190:4 194:4
 221:9
nicely 183:9
niches 215:1
Nicole 1:17 2:12 3:5,8
 5:16,17 9:3,12,14,18
 11:22 12:4 13:6 17:7
 24:10 25:7 26:8,9,13
 37:11 44:9 51:9,11
 53:2 62:9 63:2,3 70:1
 75:18 86:6 91:12
 104:1 105:10 106:8
 112:2 156:8 168:11
 170:17 172:9 174:19
 184:1,6 233:14 244:5
 245:19
NIH 42:16
nimble 245:10
nimbleness 101:14
nine 84:9 166:7 167:10
 194:19 199:21
NMFS 216:12,20
NOAA 1:3 2:7,13 3:9,22
 4:13 10:6,16,17 11:19
 12:21 13:5 16:1 18:10
 19:4,9,11,17,22 20:4
 28:2,17 33:1 34:3,5
 36:11 38:14 45:2,10
 45:12 49:1,10 50:20
 53:3,10,21 54:3,11,13
 54:17 56:8,10 57:4
 65:13 86:2 87:10
 95:19 99:1 100:3
 111:3 117:1,4 130:20
 132:14 138:22 139:5
 139:21 144:3,5
 163:11 167:7 170:8
 173:9 188:18 190:21
 191:2 197:1,2,4 201:1
 206:16 211:22 213:20
 218:11 226:21 231:5
 234:7 236:11 237:4,8
 238:13 239:6 240:2
 242:16 244:19 247:20
 249:15,16 250:4
NOAA's 11:1 19:13
 21:1 50:3 124:2
 128:21 191:5 199:5
 226:6
NOAA-UNH 10:11
nobody's 198:22
Noil 203:2,4 206:9
NOMEC 15:15,16 17:1
 17:11 92:4,5,12 94:5
 94:13 104:8,9 117:2,7
 118:19,21 119:17,21
 124:13 135:6 140:7
 154:15 158:11 170:11
 183:11 190:9 206:13
 207:1 216:22 219:1
 230:4 232:13 233:21
 235:22 239:17 241:16
 241:18 248:8 250:15
non 160:12
non- 10:5
non-federal 123:7
 126:12 127:9
non-government
 124:19
NON-VOTING 2:1
nonfed 161:20 162:4
nonfederal 160:3,13
nongovernment 158:20
 159:3 232:4
nongovernmental
 198:8
Nope 185:10
Norfolk 43:9 54:16
normal 24:13 31:14
normally 19:16
Nortek 162:8
north 8:4,9,11,13 177:2
northeast 6:12 96:21
 204:3
Northern 73:13 74:19
 85:7
Northerner 218:16
NOS 2:3,4,9,12 10:6
 19:19 20:21 25:16
 27:14 28:3,8,17 29:1
 29:18 32:17 33:1 34:1
 35:7 36:11,15 38:1
 43:22 52:11 70:2
 85:16 105:22 207:10
NOS's 3:7 30:3 33:14
 36:1 52:13
not-brief 23:4
note 60:14 150:8,9
 154:16 198:3,19
 205:21 206:11 214:9
 215:17
notes 18:15 195:21
notice 57:3 226:8
November 117:11
 118:4,5 134:20 146:7
 173:16
nowadays 66:10
NSF-funded 211:2
NSRS 132:18
nuclear 63:21
nui 37:8
number 24:1 54:9 55:1
 56:11 64:7 69:15 78:2
 78:6,10,19 79:9,19
 84:1,19 86:1 87:2
 90:19 115:6,19,19
 117:6 129:11 135:12
 163:7 196:9 202:10
 232:1 233:22 234:5
numbers 36:10 42:13
numerous 214:13
nurtured 250:2

NWLON 67:6 71:12
72:4
Nyberg 20:14

O

o'clock 249:10
object 59:4
objective 14:7 131:6
132:8
objectives 128:12
130:14,17 131:21
157:12 166:4 188:17
observation 2:10 49:16
67:12,15,22 237:16
observations 67:17
121:20 195:19 215:3
Observatory 210:16
observed 31:4 151:16
observing 8:1 33:14
36:12 49:19 187:14
213:21 246:5
obtain 188:5
obtaining 69:8
obvious 158:18
obviously 23:20 38:16
66:8 85:14,18,22
103:9 142:4 147:11
148:7 204:4
occur 69:6 80:12
occurred 84:21
occurring 83:11
ocean 2:5 3:12 5:21 8:1
12:3 15:9,11 16:2,3
20:22 21:22 24:2
25:15,19 27:8 29:11
33:12 35:17 39:4
41:18,19 49:16,19
54:17 55:2,5 58:5
59:3 60:8 92:9,18
93:1,18 96:8,15 101:8
105:3 116:8,17
117:16,19 118:15
119:8 120:13 121:11
123:18,20 124:1,5,6
124:12,14,19 125:4
127:11 133:21 138:11
145:22 147:15 152:9
164:20 165:3 187:14
207:2 209:6,10 210:5
210:19 213:4,21
218:18,19 230:8
231:21 250:16
ocean's 147:12
OCEANIC 1:3
Oceanographic 2:4,15
11:9 30:9 62:21
oceanography 7:22
121:9

oceans 2:11 49:3,4,21
202:4 218:15,18
OCS 32:10 35:16 38:19
201:1
October 75:9 126:8
odds 113:5
OEAB 122:3
OER 152:12 153:7
offer 198:11
offers 198:1 240:1
office 2:8,16 4:13 5:1
10:9 12:20 15:9 30:7
31:16 32:4 35:14
52:12 67:1 91:10
105:22 207:9 215:6
217:2 241:12,15
officers 14:14 239:14
officers' 147:14
offices 52:17 74:17
official 2:8 12:16
officially 4:4 77:21
78:18 250:20
offshore 6:1 74:3 185:4
221:6
Oftentimes 150:9
oil 67:2 71:7
old 201:7 203:2
OMAO 42:15 43:2 44:1
onboard 42:22
once 64:11 68:5 74:21
75:1 81:7 139:10
180:4 230:21
one's 199:1
one-minute 186:3
one-third 116:1
ones 64:18 118:19
168:12
ongoing 17:1 20:17
29:5 129:4 229:4
online 8:15 11:13 61:9
134:9
onset 34:21
open 15:4 121:12
218:12
Opening 3:3
openness 163:20
operate 14:17 42:17
59:13,14
operated 83:1 229:9
operating 14:9 24:12
65:7 74:2 177:1 212:7
operation 53:5 61:2
156:18
operational 2:4,14 11:9
13:22 17:2 30:9 62:21
73:14 94:20 133:18
217:16
operations 5:21 6:9

42:11 48:4 64:3 66:18
78:14 102:12
operators 221:4
opinions 14:3 113:11
opportune 214:2
opportunistic 143:3
213:19 221:14
opportunities 3:7 16:20
52:12 55:15 123:6
216:1 231:2 240:2
opportunity 56:15 57:3
126:13 127:12 136:10
138:15 173:3,18
197:18 206:4 211:12
213:1 228:7 236:22
237:18 240:20,21
opposed 229:19
opposite 149:13
OPS 35:12
OPTEMPO 101:13
115:15
optimistic 225:14
optimize 93:6
optimizing 44:18
orange 103:11
order 10:7 20:6 92:11
94:18 98:16 120:3
156:17 213:20 214:3
223:11
organization 4:15 9:9
68:19
organizational 197:7
208:15
organizations 28:1
122:22 140:18 142:4
198:8
organizers 233:16
Orleans 9:9 169:13
orthometric 89:2
outcome 25:12
outlets 70:1
outline 203:9
outlined 126:9
Outlook 69:17
output 74:7
outputs 59:19
outreach 57:20 79:3
158:18
outside 9:17 54:15
100:6 159:8 169:13
180:7 183:20 187:12
203:17
overall 36:14 108:21
167:1
overarching 218:22
overlapping 164:14
overseas 226:18
overseeing 14:9

overview 170:21 174:8
180:9 185:21 206:5
owe 242:15
owner 6:16
ownership 159:5
owns 226:21

P

P-R-O-C-E-E-D-I-N-G-S
4:1

p.m 1:12 4:2 51:4,5
113:19,20 250:22
pace 231:8,9 245:13
Pacific 155:8 167:9
package 168:18
page 1:20 7:11,13,14
24:20 166:3 178:6,7
178:10 179:20 183:2
225:18,19
pages 166:1 186:20,21
paid 239:19
pandemic 18:2 27:16
32:13 63:10 78:12
80:20 86:14 241:14
pane 161:19
panel 1:4,12 13:14,19
17:14 24:11,16 26:21
29:2 59:12 102:1
106:17 116:12 117:5
135:22 143:20 158:9
169:5 193:7 195:18
222:18,21 224:13
241:11 242:13 247:16
248:2 250:4
panel's 34:13
paper 34:10 136:2
165:11,22 166:3,8
169:14 174:8 176:10
179:4 180:9 185:22
186:16,19 189:4,22
191:14,17 193:9,16
194:5 209:13 223:15
230:6 238:7 243:5,12
paper's 177:13
papers 21:4,6 25:11,14
202:10 235:21 236:1
par 178:22
parallel 17:4 110:22
148:1,4
parameter 41:16
parameters 66:20
151:15 155:11,14,21
161:8,9 162:3
paramount 225:12
parcel 122:7
part 25:12 55:8 61:5
83:21 84:3 94:9,12
96:7,17 103:13,15

- 106:17 107:7,11,16
108:11,11 110:8
116:15 118:3 119:20
121:10 122:6 131:15
141:6,11 149:11
156:19,19 188:15
191:20 196:16 197:10
203:14 205:5,11
212:6 223:1,21
230:12,13 243:4
PARTICIPANT 106:20
participants 18:8
124:18 222:17
participate 23:14
170:13 174:1 223:16
239:2
participating 18:12
participation 25:21
56:6,8 123:7 134:5
135:12,15 196:2
238:10
particular 14:11 82:9
84:2 121:22 154:9
165:15 176:20 181:15
200:19 203:7,12
206:16 216:12
particularly 34:4 41:9
44:11 57:18 60:8
70:10 104:13 148:15
158:22 177:2 185:9
187:13 189:11 197:17
199:4 212:10 221:18
224:19 225:19 230:4
232:5 249:21
parties 248:4
partner 65:4 83:7 84:10
94:8
partnering 92:22 93:15
partners 13:10 27:15
30:15 34:20 55:17
65:9 78:21 79:11 83:4
83:16 119:14 125:4
129:3,3 136:20
161:20 162:4 191:1
203:17
partnership 35:21
44:11 45:9 47:8 55:9
55:10 62:14 72:17
96:10 123:5 135:14
145:6,11 149:1
161:11 163:5 167:12
167:12 180:3 219:15
236:13 237:21
partnerships 34:15
39:2 62:21 98:20,22
99:9 100:7 103:17
122:22 123:5 129:10
171:11 232:2,8 250:8
- parts** 118:14 227:2
249:16
pass 17:18 30:18 62:19
91:9 106:5 184:19
passage 49:17
passed 49:16 201:19
209:11
passion 192:18
pat 242:15
path 67:13
pathway 55:14 59:11
patient 214:7
patiently 82:14
Paul 2:16 3:16 123:17
123:20,22 137:7,20
153:22 158:16 209:2
238:17
pay 78:9
peak 30:16
peaks 31:3
Penn 4:21
Pensacola 31:5 32:7
people 23:2 25:22
33:22 40:8 43:18 54:7
64:12 70:5 72:8 80:2
80:11 107:12 110:3
130:1 141:14 142:17
151:13 158:5 159:4
164:2 165:17 167:22
172:5,7 173:18 177:7
182:16 197:13,20
204:21 212:3 224:9
228:12 230:7,20
233:3,9 238:7 240:17
250:3
people's 85:19 134:7
percent 87:17 154:20
181:1
percentage 96:15
perfect 204:4
perform 87:10
performance 134:11
244:15
performing 2:10 161:6
167:4
perimeter 162:6
period 16:13,15 17:12
22:12,16 56:20 60:13
96:5 147:5 194:9,14
222:4,5 230:17
peripherally 241:17
permafrost 214:20
permission 18:17,20
permitted 220:15
permitting 221:12,13
person 37:10 110:19
112:9 184:11
personal 19:4 232:21
- personally** 27:21 33:21
39:11 159:6
perspective 18:14
148:6 171:3 172:20
173:9 176:1 179:2
204:17 217:12 228:17
Ph.D 2:9
phase 26:7 65:13 96:20
118:10 126:4 160:4
phased 81:4,8
phases 96:19
PhD 197:12
Phelps 20:14
Phil 114:15
philanthropic 15:20
119:14 143:7
philanthropy 240:16
photograph 75:22
photos 84:22
physical 27:13 121:9
161:8
picked 79:11 204:4,5
picture 220:14
pictures 103:9
piece 21:19 78:16 98:1
118:17 215:3 219:12
pieces 176:3 181:22
214:21
Pier 10:3
pile 40:13 244:18 245:7
piling 239:13
Pilot 226:9
Pilots 10:1,2
pivot 102:21
pivoting 70:22
place 28:10 70:10,18
81:13 99:3 129:17,18
135:10 142:22 154:22
159:9 162:14 173:19
175:3 209:3 219:5,6
221:2
places 75:2 155:17
185:2 235:14 241:19
plan 15:18 16:6,18 17:6
35:16 43:22 53:8 57:1
67:12 70:13 73:12
76:21 92:10 105:2
118:11 119:6 120:4
129:18 131:4,11,12
131:21 132:8 133:3
135:5,6,20 136:11,19
138:6 146:8,10,14,17
156:21 166:12 179:6
191:19 192:1,6 210:7
210:7 220:20 234:22
243:7
planned 17:19,22 132:5
219:22
- planning** 24:19 70:19
148:6 198:8
plans 3:11 17:8 35:12
84:8 117:1 132:3
134:10 150:17 156:14
156:21 157:14
platform 181:19
platforms 58:7
play 27:9 49:10 50:4
214:15,22
playing 146:16
plays 197:4
please 4:14 8:7 9:5
10:14,21 11:18 12:17
19:8 22:9 53:13 55:7
56:1 57:2,22 58:11
59:6,22 60:11 61:3
63:15 64:9 68:17
76:20 77:19 82:16
84:14 86:18 87:14
88:17 94:11 98:4,18
100:5 101:19 103:22
117:10 126:2 128:8
130:12 131:20 133:7
143:18 195:12,16
218:8 237:22
pleased 34:4 92:13
96:16 100:21 129:1
157:21 176:12 179:17
183:10,16 187:9
196:1 227:5 229:10
229:11
plenty 36:20 143:8
plus 200:11 201:7
207:21
pockets 132:4
point 33:4 94:21 102:21
104:3 105:1,10
111:10 113:8 115:11
135:17 145:10 154:4
154:13 158:3,4,5
169:21 173:8 180:21
181:9 182:21 204:10
205:13 209:13 228:22
232:9 235:16 244:20
pointed 23:17 91:15
157:10
points 83:8 131:17
164:16,19 165:2
197:9 206:20 246:8
247:9
policies 238:4
policy 16:12,13 117:11
117:13 170:11 178:15
178:17
poling 39:15
pool 163:18 215:19
popping 112:21

- port** 6:8 31:21 32:2,9
 63:17 68:21 71:6 72:4
 75:22 93:22 95:13
portfolio 3:7 19:14
 20:22 35:7 37:18
 52:13
portion 105:8 180:10
portions 188:14
portrayal 59:9
ports 31:17 35:3,13
 47:5 63:22 64:7,8,11
 65:8 71:2,13,14,19,21
 75:4,11,21 85:16
 87:19 93:10,17
 109:22 110:7,8,19
 111:2,3 144:17
 175:18 205:2 208:21
 225:20 226:7
Portsmouth 47:6
position 21:4,6
positioning 33:15
 36:13 83:11 90:7
 221:6
positive 25:9 48:6
 226:12
possible 15:17 18:10
 43:2 82:3 84:10 104:9
 140:13 177:10
possibly 219:13
post 118:3
post-disaster 34:11
postage 150:19
posted 62:1
postponement 137:10
posts 175:7
potential 140:9 145:21
potentially 140:20
 159:12 160:11 212:17
pouring 158:2 196:3
Powell 20:15
Power 198:11
powers 14:13
practical 61:8 238:19
practices 124:22 211:6
 211:10
praise 245:6
pre- 25:21
precise 115:2,8
precision 36:22 73:20
 93:13 226:10
Prediction 2:10
predictions 66:15
preparation 152:16
prepare 80:14,20 82:1
prepared 77:21
preparing 137:13
presence 56:10
present 1:14 2:7,13
 62:7 136:3 153:15
presentation 132:13
 218:14
presentations 21:16
 51:21 91:14 107:1
presenters 21:15
presently 211:20
Preservation 9:16
preserved 95:9
President 4:7,19 5:9
 7:1 13:21 23:11
 117:11,18 178:14
presidential 39:3
 117:12 118:4 144:14
 157:2 165:8,14,19
 186:18 217:8 235:16
presiding 1:13
pretty 36:13 40:10
 42:11 43:2 101:7,14
 103:6 118:8 120:22
 128:10 150:12 178:12
 182:7 192:7 217:4
 218:10 220:22 248:21
prevalent 14:21 190:21
prevent 125:2
previous 104:20
primarily 59:11
primary 53:15 67:21
 83:7,10 125:9 126:17
 127:1
Prince 99:19
prior 213:22
priorities 131:7 141:13
 188:15 214:1
prioritization 216:15
 225:11
prioritize 157:7,18
 217:15
prioritizing 92:20 179:7
 216:21
priority 38:21 39:4
 42:11 85:15 87:19
 129:21 131:14
private 55:12 127:4
 140:18 161:11 163:5
 164:3 167:13,20
 172:22 175:11 180:3
 180:18 198:7 231:2
 232:4 237:21 238:12
 240:15 249:21 250:6
private-public 163:13
privilege 15:8
privileged 5:10
pro 16:12
probability 70:17 74:12
 99:18
probable 98:15
probably 22:22 33:9
 38:5,10,12 41:7 42:10
 43:19,21 46:14 115:8
 149:20 174:22 179:1
 182:8 193:8 204:6
 217:11
problem 46:5 101:7
 104:12,15 108:10
 128:5 146:13 152:7
 173:21 204:11 230:1
problems 102:9,9 152:3
procedures 15:6
 164:11,13,14 212:7
process 14:8 16:11
 39:13,15 42:5 48:2
 57:13 86:11 118:7,16
 123:19 126:21 192:9
 198:9 204:8 212:18
 218:12 246:10
processed 212:1,13
processes 88:14
processing 46:1,12
 58:7,14,16 124:20
 168:1 212:6 245:11
procurement 43:20
 88:11
produce 66:9 106:2
 133:1
produced 89:7
producing 40:16
product 33:7 66:11
 71:9 88:22 134:6
 151:12
production 18:5 60:9
productive 18:10 24:14
 245:3
products 2:4,15 11:9
 30:10 33:12 34:12,19
 57:15 59:2 67:15 81:5
 129:21 133:2
professional 59:21
 243:1
professionally 27:21
professor 200:9
profiling 125:14
program 7:22 8:2 17:1
 35:13 45:2,9 57:20
 65:6 77:10 87:16 90:4
 92:19,19 97:7 101:15
 107:14 123:15 124:2
 140:22 144:21 146:20
 149:15 154:22 155:12
 203:8,10 204:1
programmatic 57:5
programs 33:15 36:13
 37:6 38:22 100:3
 145:4 197:2 199:10
 205:12 207:7,10,14
 208:7 247:16
progress 35:15 61:22
 132:5 165:16 175:8
 176:1 237:4
project 43:10 73:21
 74:15 100:2 137:22
 138:22 180:16,22
 229:4 238:20
projects 20:22 43:14
 61:11 78:4 102:7
 176:8 225:11
promised 175:1
promote 28:19 126:2
 130:9,10
promoting 134:2
 174:19
propagated 181:16
 182:2
propagation 57:18
proper 132:17
properly 40:9
property 28:21
proportionally 149:16
proposal 57:4
proposed 81:2 130:20
 236:14 238:17
prosperity 117:15,21
protect 28:20 32:19
protected 108:14
protocol 116:18 121:11
 123:20 124:5,12,15
 124:21 125:3,8,17
 126:3,13 127:6,11
 138:5,6,13,16 159:22
 160:5
protocols 42:17 120:8
 159:9 234:11,17
prototype 33:3
protracted 118:6
proud 18:5 49:15 54:2
 63:11 102:17 189:18
 237:7 243:4 244:20
 247:1,5
prove 33:4
proven 224:2
provide 4:14 19:10,20
 20:22 25:11 26:3
 28:20 29:20 32:19
 33:15 34:1 71:11
 74:11 76:18 79:18
 81:4 82:3 83:5 111:9
 116:18 124:21 126:13
 127:11 156:13 177:3
 185:3 205:3,5 206:5
 218:22 221:5 247:21
provided 21:8 22:17
 68:18
providers 23:19 45:10
 45:19

provides 44:5 66:11
126:16
providing 20:17 29:6
45:7 76:2 118:18
179:8 207:17,21
242:22 243:11 245:11
proving 167:15
provision 14:14
provisional 14:1
public 1:6 3:19 14:7
15:5,7 16:5,9,10,13
17:12 18:19 19:2
21:21 22:4,5,6,9,12
22:13,16 23:14 25:18
29:3 45:16,18 46:7
93:2 96:1,5 106:18
116:21 117:5,8
118:17 119:13 123:9
123:12 135:1,7 146:3
147:4 148:12 151:2
163:5 167:13 180:9
180:18 186:1 194:9
194:14 195:15 196:2
196:17 212:21 218:7
222:4,5,11,19 231:1
238:2,3 243:19,21
248:1,1 250:9
public- 175:10 180:2
public-private 145:11
164:7 174:16 176:6
232:2 236:13 250:8
public/private 34:14
39:2 44:11
publication 60:16
published 66:6 92:16
116:14 118:8 202:10
Puerto 73:4,6 80:4
pull 26:22 97:12 136:16
227:2 247:2
pulled 70:9 136:9
pulling 95:19,21 96:2
purpose 126:11 127:8
154:9
purposes 133:13 149:2
157:12
purview 228:1
push 130:4 240:10
241:8
pushed 40:12 243:17
pushing 167:5,20
235:20
put 18:6 20:6 71:4,6
97:5 98:7 104:8 136:6
146:19 150:3,4 165:2
166:1,2 190:22 203:8
227:7 228:8 238:7
242:21
putting 69:16 243:4

Q

Q&A 106:13,14,17
QARTOD 161:8
Qassim 1:16 4:17,19
5:4 25:2 128:6 137:6
166:18,21,22 168:10
168:22 189:11,17
192:14 237:1 239:9
quality 58:4,10 71:10
83:1,13 87:11,11 90:8
106:3 133:12 152:5
161:4,12,16,22
162:10 164:11 231:4
246:3
quarantining 42:19
quarters 126:12
question 22:5,9,10
51:16 104:11 109:17
112:3,16 114:5,12,20
114:22 127:19 140:6
141:2 147:3,10,18
148:11 149:19,21
150:5 151:9 153:21
156:11 159:16 171:13
193:5 216:16 217:7
221:11 234:16
questioning 144:15
questions 19:10 75:17
106:22 111:19 113:22
121:12 127:15 128:1
128:4 137:4 140:14
145:14 157:22 158:13
162:20 186:12 192:14
196:19 208:9 220:6
221:17 246:17
queue 22:11
queued 52:5
quibble 119:4
quick 42:7 47:4 52:9
106:12 112:5 121:17
192:15 196:21 229:17
quickly 128:11 156:10
196:7,13 228:6
229:20 230:19
quiet 227:8,9
quite 52:14 95:13
101:16 118:13 184:10
184:18 215:6
quote 198:22

R

R 2:12 3:5,8
radio 248:14
rainbow 103:12
Rainier 43:13
raise 114:4,13 228:22
247:17
raised 107:2 156:19

165:7
raising 221:18 222:1
Raleigh 8:13
ramp-up 249:11
rampant 14:20
ran 179:11
range 14:3 58:20
134:15 210:1
rapid 31:19 32:1 34:21
41:9 43:2 66:18
rapidly 97:18 234:2
Rassello 1:21 8:15,17
8:19 114:21 180:15
225:5,8
rate 69:5 230:18 231:9
rating 136:12
raw 152:4 212:2
RDI 162:8
RDML 3:10,15 12:19
48:11,16 50:12 91:12
94:16 104:6 106:16
107:14 108:3 109:12
114:15 115:10 116:10
127:16 141:1 142:3
148:11 150:7,12
154:1 184:16 195:17
202:19 205:8 208:10
210:13 213:2,8,11,14
216:5 217:20 218:3
219:18 220:4,8
221:16 247:11
reach 100:15 193:19
203:17
reachable 210:3
reaching 214:5
read 64:19 168:11,18
170:21 178:14,16
218:10
readily 97:13 121:14
reading 4:11 21:13
readings 235:13
reads 115:4
ready 52:5,11 75:8 81:5
132:3 189:7 191:17
202:22 213:8
real 20:3 47:4 106:12
148:9,15 156:10
161:12 185:21 208:22
real-time 58:4 70:9 74:4
74:6 207:17,22
realistically 150:1
reality 59:10,11,15
realize 243:8
realized 174:21
realm 101:8
Rear 2:8 3:4 20:13
25:17 247:9
reason 141:11 213:10

215:17
reasonable 109:8 150:1
reasons 108:17 173:2
233:22
rebuilding 97:10
recall 36:1 73:21 165:9
Recap 3:21 43:22
receding 99:14
received 22:6 86:22
148:13 168:9 180:7
187:12 192:8
recognition 22:12
241:10
recognize 22:17 24:15
109:3 157:9 211:18
recognized 108:7
114:13
recognizing 108:19
199:19 211:3 243:19
recommend 172:3
195:10 234:22
recommendation 34:13
187:16 194:6
recommendations
13:20 21:5,9 25:11
29:3 44:5 116:22
124:21 136:2,8 187:3
187:15,18 188:16
190:2 242:20
reconnected 27:19
record 22:13 30:21,22
31:7 34:3 51:4 113:19
196:17 222:1 250:22
recorded 18:16
records 31:7
recreational 59:20
red 96:12 103:11
redirect 148:21
reduce 125:1 246:10
redundancy 246:10
redundant 125:2
reefs 46:16
reestablished 72:5,6
refer 138:16
reference 35:10 77:3
80:17 81:12,18 82:18
83:6 84:13 132:11
191:21 202:6 221:6
referenced 191:3 235:7
Referring 191:4
refine 131:6 204:8
refinement 157:6
reflectometry 215:7
refraction 40:21
regard 21:11 60:12
regarding 100:8 115:1
151:10 158:10 171:14
181:9

region 96:22 109:3
 144:2 161:14 179:9
regional 74:3 79:16
 89:10,14 120:19
 121:2 140:9 150:14
 155:5,6 210:18 215:5
 215:21 216:15 217:2
regionally 120:18
 141:12,20
regions 32:12 120:22
 217:13
registration 126:16,21
regrets 17:18
regretted 142:13
regular 19:9
regularly 135:16
Regulations 142:21
reinforce 156:10
reinvent 209:4
reiterate 44:4 245:9
rejoining 51:12,16
relate 77:3
related 29:7 82:17
 137:9 145:14 200:21
relationship 54:2,3
 55:19
relative 112:16 164:13
 217:17
release 77:22 92:11
released 15:12 33:2
 56:16 89:3 92:12 94:5
releases 89:4
releasing 43:21
relevant 29:6 41:2 92:6
 132:21 198:1
reliable 83:1
relies 207:8
relieved 80:14
rely 67:16
remain 28:5 36:11
remarks 22:19 26:10
 37:12 38:8
remember 19:8 117:18
 144:13 208:6
remembering 207:6
remind 19:3 30:6
reminder 19:1 224:16
reminders 21:15
remiss 244:14
remote 7:2 72:7 77:9
 84:16 103:20
remotely 184:18
remove 68:7
rendering 46:18
renewal 89:20
renewed 99:4 100:21
reopen 31:17
reopening 32:2,8

repeat 116:11
repeated 24:1
replace 19:9
replies 156:11
reply 154:1
report 4:22 19:19 35:15
 69:16
reported 77:20
reporting 69:17
reports 61:22 224:8
represent 6:10 19:6
 28:14 203:5
representation 171:18
 172:17
representative 26:17
 38:8 171:3
represented 119:9
representing 243:10
represents 239:22
request 25:18 222:22
requested 192:22
require 44:19 129:22
required 18:17 131:9
 152:19 155:6 221:1
requirement 220:19
requirements 182:4
 217:5 220:22 221:13
 221:20 228:15
requisite 198:4
research 53:8,21 54:3,8
 54:12 61:11,13 62:8
 65:14 100:16 142:14
 186:22 193:16
research-to-operatio...
 55:15
researchers 55:21 56:9
 212:17
resides 57:20
resilience 27:7,10,13
 34:2 70:15,19 97:22
 246:13
resiliency 175:20
resolution 36:8 41:21
 41:22 44:15 93:14
 95:7,7 198:4 200:22
 203:1,19
resolutions 161:13
resolved 78:8 181:14
resource 131:10,12
resources 139:15
 142:11 148:22 163:18
 164:8
respect 196:20 202:12
respond 220:10
responded 84:19
responders 85:22
responding 67:2
response 21:9 30:3,7

32:1,5 34:16 38:2
 66:18 67:1,4 77:7
 86:7 138:1 192:16,21
 235:9 236:3
responsibilities 199:10
responsible 85:16
 198:20
rest 26:15 36:15 83:7
 106:6 127:18 178:22
Restoration 67:1
restriction 88:7
restrictions 215:13
restricts 14:11
result 101:17 217:4
resulted 90:13
results 62:7 202:11,12
 228:18
resumed 51:4 113:20
resuming 42:10
resurvey 201:12
ret 1:20 3:9
retained 18:18
retired 7:21 8:20 9:22
 208:19
retitle 105:13
return 55:3,17
review 1:4,12 13:14
 26:21 160:12 188:22
 247:18
reviewed 189:20
Rich 2:4 10:8 11:6,8,12
 13:7 35:11 51:21
 62:20 75:19 91:15
 109:22 110:13,17
 183:21 184:11 231:12
 241:5,6 244:16
Richard 3:9
Rick 20:8
Rico 73:4,6 80:4
rightly 184:18
RightShip 5:9
rigorously 97:18
rip 41:2,4
rise 64:6 69:14 70:4,21
Risk 8:10
River 9:8,10 10:1 73:19
 144:7,20
RMDL 146:2
roadmap 146:18
roads 85:17
Robin 3:21
Rockport 67:7
role 21:1 27:8 49:11
 50:4 122:16 156:6
 196:19 197:2,2,4
 241:18
roles 122:11
Roll 3:2

roll-out 81:4
rolled 70:7
rolling 135:18
rollout 156:21
rooftops 32:22
room 141:18 162:9
roughly 42:13
round 3:21 50:12 77:11
 115:19 242:16
roundtable 126:22
route 93:22
routes 93:8
routinely 212:6
rule-based 98:8
rules 13:15 98:9
run 41:22 53:9 56:21
 76:21 145:5 179:10
run-of-show 248:18
running 248:18 249:4
runs 68:21
runup 97:19
Russia 219:7

S

Sabine 85:9
safe 49:3 66:15 90:17
safeguard 117:14
safety 31:17 63:21
 177:8 207:12
safer 175:14
safety 6:18 28:19 35:1
 93:6 96:14 176:21
 177:4 231:9
Saildrone 229:4,8
Sal 8:15,18 9:1 114:19
 116:6 180:12,13,14
 181:5 225:4,18
Sally 30:6,13 31:3 38:3
 86:8
SALVATORE 1:21
sampling 246:2
San 6:17,18 8:4 10:2,3
 23:12
sanctuaries 108:13
Sanctuary 152:12
sat 209:9,14
satellite-derived 198:2
satellite/airborne
 133:10
satisfying 228:20
save 143:22
saw 31:10 41:8 46:13
 46:15 56:7 165:22
 176:20 183:3 248:1
saying 44:7 117:12,13
 128:14 160:21
says 150:10 163:5
 164:6

- scalable** 149:4
scale 101:9 103:1
 146:20 178:18
scan 125:14 139:17
scene 30:12 31:16
scenes 75:7 248:11
scheduled 173:15
scheme 97:9
science 5:21 9:15 60:18
 83:16 84:5 119:8
 124:8 200:10 212:19
 216:9,13 217:1
 234:14
Scientific 68:18 69:13
Scientist 4:20
scientists 54:12,13
 56:8 217:1
scope 108:9 115:3
 142:5 143:12 205:17
scoping 219:1
Scott 20:15
scrape 95:17
scratch 97:10
screen 130:19
Scripps 7:21
sea 42:12,14 64:6 69:14
 70:4,17,20 99:2
 126:12 214:17
seabed 99:2 121:8
 125:12 154:6 210:19
Seabreeze 6:16
seafloor 98:15
seamless 96:9 98:16
 120:15 202:4,5
Sean 1:17 5:13,15 9:2,6
 9:7,11 143:14,15
 158:1 169:10 209:12
 235:5 236:6
Sean's 156:11 224:15
seaport 69:2
season 30:4 84:20 91:6
 144:10
seat 237:22 238:14
Seattle 43:16 54:16
second 23:15 30:21
 37:14 42:7 82:17
 93:18 95:11 120:15
 129:20 131:6,20
 132:8 218:21 228:22
 249:1
Secondly 133:16
Secretary 2:9,11
section 51:19
sector 33:7 55:13
 102:17 103:18 122:13
 127:4 140:18 141:7
 173:1 249:21 250:7
 250:10
- sectors** 15:21 119:20
 180:19 203:5 240:15
 241:4 243:10
securely 207:12
security 117:15,21
 217:9,18
seeing 70:5 187:6
 190:4 231:20,21
 232:14,20
seek 21:6
seeking 172:6
seen 40:8 42:13 85:3,12
 112:9 169:15 175:17
 247:20 248:2
segue 235:10
selected 56:18
self 10:7
self-mute 9:4
self-muted 7:8 147:7
selfish 179:2
sellable 154:22
Senate 36:15 49:18,18
send 172:8 201:11
sending 222:8
sense 140:13 146:5
 179:1 235:12
sensed 184:19
sensing 7:2 77:9 84:16
sensitive 202:11
sensor 58:3 65:15,19
 104:22 181:20 234:19
sensors 44:15 64:14,17
 64:22 67:21 71:5,6
 144:17,19 234:13
 235:12,13
sent 22:8 226:11
sentiments 81:1
Sentinel-2 204:1
separate 65:16 248:14
September 1:9 4:4
 43:16
sequence 217:16
seriously 238:17
seriously 242:22
serve 10:10 19:4 23:10
 27:15 125:3 192:20
 238:13
serves 24:16 133:14
 210:16
service 12:3 19:12 27:8
 45:10,19 54:17 74:11
 88:22 94:21 97:16
 144:5 151:3 161:19
 207:2 208:12 214:12
 214:14 215:5,18
 218:4
Service's 86:3
services 1:4,12 2:4,15
- 3:7 11:10 13:14 16:2
 17:16 19:13 20:21
 26:21 28:20 29:5,7
 30:10 31:19 32:18
 33:16 34:1,12,19 35:6
 37:17 38:16 52:13
 57:12 59:7 93:13
 120:15 199:5 207:18
 208:1
serving 19:2 98:2
 167:17
session 18:16 51:10
 105:14 114:1,20
 118:17 195:20 222:16
 223:13 233:17
sessions 39:7
set 30:22 51:19 52:2
 79:16 82:13,20 84:11
 91:13 120:8,13,15
 154:17 155:12,14
sets 87:5,12 129:6
 131:19 133:2 234:12
setting 142:1
seven 72:14 125:9
 126:17 127:1 137:12
 199:20
shaggy 242:7
shallow 104:14,14
 107:17 115:16 148:9
 148:17 149:1,16
 150:5 155:7 157:10
 164:21 165:4 198:13
 230:13
shallower 104:15
 108:17 109:13 116:5
 150:13
share 15:15 26:5 53:7
 127:4 134:14 136:17
 191:19 211:14 230:11
 244:11
shared 81:2
sharing 47:21 134:12
 176:6
sheets 220:7
Shep 2:8 3:10,15 12:15
 12:17,20 23:17 35:14
 38:7 91:9 105:12
 107:5 112:15 116:7
 137:21 144:12 147:10
 147:13 153:22 156:22
 157:9 163:1 172:2
 183:21 184:15 195:13
 195:14 205:7 241:19
 244:16 249:1
Shep's 147:4 156:10
Shepard 3:4
shift 196:12 199:18
 239:10
- shifts** 228:5
shining 76:15
ship 31:21 42:20 53:22
 56:10
ship's 8:19
shipping 49:9 50:3 93:8
 177:12 178:20
ships 32:3 59:14 209:8
 209:14,19 212:16
shore 9:15 39:18 40:10
 40:12,22 128:17
 188:9 198:17
shoreline 37:1 87:1,17
 87:18 107:11 128:16
 128:17
shores 171:4
short 4:14 17:15 48:22
 50:6 112:2 130:13
 135:8 196:10 206:5
 218:10
shorthand 119:3
shortly 173:11
shoulders 163:12
shout 20:5 32:21 38:1
 167:18 206:9 248:11
show 84:22 154:19
showed 69:4,13 121:5
showing 85:8,10
 176:22 195:2 204:10
 213:10
showrunners 248:13
shows 152:6
shut 144:6
shutdowns 78:10
side 81:16 88:18 111:11
 125:14 129:5 133:20
 133:21 148:14 160:3
 160:13 177:2
sideways 209:5
sign 139:5 174:1
 226:12 236:4
signed 71:16
significant 54:19 55:18
 60:13 61:4 96:13
 101:17 105:8 108:6
silos 211:13
Silver 11:3,10 12:21
 54:15
similar 13:19 46:22
 88:4 91:22 120:13
 135:6 138:6 205:6
similarly 31:3 95:19
 100:1
simply 16:12 97:11
 104:9,13,16 120:6
Simultaneous 50:16
 108:2
single 33:11 125:11

- sir** 141:1
sit 143:4 159:14 163:13
 211:1 237:14
site 56:9 215:9 218:6
sites 83:3,17,21 84:1
 215:15 217:14 226:17
sitting 12:10 159:5
situation 105:18 167:3
 232:18
six 186:21 190:13
size 146:21
skiff 39:15
skip 114:11 177:17
 180:13
sleeves 135:18
slide 9:21 53:13 54:5
 55:7 56:1 57:2,22
 58:11 59:6,22 61:3,18
 62:2 63:15 64:9 65:12
 66:1 67:5 68:17 70:22
 73:8 74:1,8 75:14
 76:20 77:18 82:16
 84:14 86:18 87:14
 88:17 89:21,22 94:11
 98:4,18 100:5 101:19
 103:22 104:20 117:10
 119:16 121:15 123:16
 126:2,10,15 130:12
 131:20 133:7 134:16
 227:17
slides 127:14 128:10
slip 240:20,21
slow 226:19
slow-moving 34:22
slug 103:2
small 37:16 39:14 43:6
 65:14
smaller 198:16
smart 133:9
Smith 2:8 3:4,10,15
 12:17,19,20 26:15
 29:9,15 35:14 48:11
 48:16 50:12 91:9,11
 91:12 94:16 104:6
 106:16 107:14 108:3
 109:12 114:15,22
 115:10 116:10 127:16
 140:7 141:1 142:3
 146:2 148:11 150:7
 150:12 154:1 184:16
 195:17 200:7 202:19
 205:8 208:10 210:13
 213:2,8,11,14 216:5
 217:20 218:3 219:18
 220:4,8 221:16
 227:16 229:1 247:10
 247:11
Smith's 25:17
smooth 18:7 248:22
smoothly 205:16
 248:18 249:4
snags 78:5
social 86:1
socially 61:7
societal 108:11,20
 175:15 217:9
Society 60:16
socioeconomic 77:16
 90:2,20
software 23:19
solid 39:14
Solutions 220:1
solve 101:7 173:20
solves 46:5
somebody 198:20
 199:1 238:8
SOMP 124:11 138:14
 158:22 159:15,21
 196:18
sonar 125:12,14 188:11
soon 71:3 82:3 88:4
 113:17
sooner 81:22
sophisticated 157:16
sorry 23:9 51:15,18
 52:7 128:4 147:9
 156:7 174:9 180:14
 183:3 187:4 199:14
 231:18
sort 42:16 46:15 47:2
 60:18 67:2 92:17,22
 100:17 101:3 116:1
 120:7,8 122:2,3,5
 123:9 141:2 143:4
 146:16 148:19 149:18
 154:6 209:5 228:14
 247:17
sorting 44:18
sorts 70:15
sound 60:5,9 99:19
 139:17
souder 61:1
sounders 60:6,7,20
soundscape 60:2,8
source 121:6 171:1
sources 95:22 98:7
 125:11,22 181:18
 215:19
South 9:17 66:13
 100:11
Southeast 43:15,17
 187:22
Southern 8:1 60:21
 100:10
space 107:15 211:2,16
span 91:20
spatial 35:10 77:3
 81:18 82:18 83:6
 84:13 89:1 132:10
 199:7
spatially 89:8
speak 8:16 9:5 113:12
 172:22 208:6 223:3
 245:22
speaker 4:11 21:12,13
 23:1
speakers 22:21 52:14
 222:3
speaking 18:21 50:16
 53:10 108:2 138:2
 195:3
specialist 7:2
specialty 216:12
specific 30:14 130:14
 170:10 171:6
specifically 203:13
 234:1
specification 138:21
 237:13 238:20
specifications 88:15
 124:22
specify 161:13
spectrum 59:3
spelled 218:17
spend 230:13
spends 107:15
spent 27:6
spill 67:2,3 71:7
spite 105:15 106:4
spotlight 175:21
spread 40:12 101:4
spring 11:3,11 12:22
 17:21 54:15
Squadrons 198:12
squeeze 23:2
SR 1:17
St 215:8
stable 143:5
staff 2:13 13:10 19:17
 19:20,22 20:4 21:20
 23:18 24:11 34:1
 54:11,12
stage 120:7 248:16
stages 21:7 117:8
stakeholder 21:20
 34:16 127:10 134:2
 134:18
stakeholders 13:10
 24:11 37:4 78:22 80:8
 80:13 81:3,16 82:5
 120:21 129:22 130:10
 130:11 131:7 134:15
 148:14 157:16 171:5
 171:6,9,19 204:22
stamps 150:19
standard 93:17 116:17
 120:8 121:11 123:20
 124:5,11,14 127:10
 138:10,13,17,17
 139:2,3,11,18 159:1
 212:7 238:21 244:10
standardization 162:15
standards 124:17,22
 125:17 131:8 182:5
 209:3 210:6 234:11
 234:18 238:19
start 4:5,17 52:18 56:21
 63:9 64:12,14 128:14
 154:22 190:9 194:9
 194:12,17 195:10,11
 203:20 210:2 223:6
 227:1 236:3 239:11
 239:13 240:3,3 241:1
 249:7,9
started 135:18 136:13
 181:1 186:15 192:18
 249:12
starting 43:8 171:16
 209:3 234:9
starts 40:10,22 226:7
state 4:21 20:21 30:15
 34:20 68:22 80:3
 119:2 124:18 128:19
 129:3 135:1,12,15
 140:17 171:15 172:16
 213:20 214:13 240:17
stated 211:1
statement 114:18 145:1
 145:18 206:4
statements 243:21
states 13:21 94:2
 117:14 118:22 120:17
 124:14 150:8 178:22
 204:3 206:20 207:20
station 30:18,22 31:4,8
 67:6 71:12
stations 31:12 68:2,8
 82:22 83:2,9,14 84:6
 84:9,11 132:16 215:8
 221:5
statistics 33:3
status 35:9 77:8
stay 27:17,19 36:17
 55:12 88:13 158:8
 242:3
stays 38:4
Stennis 32:5
step 74:20 192:9
 222:21 225:14 227:4
 238:17
stewardship 125:10
 126:1

Stoddard 20:15
stood 120:2 131:1
stop 47:16 74:8 115:12
stopgap 36:7 145:21
stopping 28:11
storage 44:22 45:15,17 46:5
storm 30:20 31:11,15 40:8,9,16,19 70:20 86:5 97:21
storms 38:2 40:7 43:5 64:5 70:11 144:9
straight 41:4
strategic 35:16 37:15 70:12 73:11 130:8
strategies 3:12 21:2,6 22:14 25:15,20 39:10 116:9 117:3 136:4 196:20 197:3,5 225:15 234:4 241:17
strategy 15:12,16 17:2 17:5 22:1 29:11,13 35:18 92:6,13 94:5,13 104:8,9 116:13,17 117:9 118:7,20 119:13,17 124:13 128:13,15 129:8,17 130:12 134:1,8 139:14 146:7 148:20 151:3 163:3,22 164:6 165:6,12,16,20 166:5 166:10 170:12 174:10 181:15 183:9 184:17 186:16 188:18 189:16 189:18 190:20,20 191:2,15 192:19,21 197:10 206:14 213:18 214:1 216:4 243:6 248:9
streamlining 246:9
strengthen 39:1
strengthening 19:12 134:4
stretch 31:20
strict 119:3
strictly 149:2
striking 234:17
striving 28:6
strongest 100:22
strongly 173:22
struck 91:15 178:1 224:20 228:3 229:20
structure 16:5,22 46:13 197:7
structured 16:16 142:20
structures 221:5
student 61:11

students 54:21 55:16 212:18
students' 61:12
studies 90:20
study 57:17 77:16 90:2 90:11,13 115:22 171:8 187:1,11 201:4 228:16
studying 60:19 182:1
stuff 76:4 103:7 106:9 140:4 148:3 245:7 246:14 247:6
sub-Arctic 128:16
sub-B 151:2
sub-bottom 121:9 125:13 153:19
sub-objectives 133:8
subcommittee 15:2 130:21 135:13 136:20 171:14 172:15,18 191:21 192:5
subcommittees 235:11
subject 19:5,20 124:8 221:18
submarines 63:21
submit 194:5 206:4 210:22
submitted 57:4 126:20 204:2 220:5,20
subscribers 79:7
Subsection 124:13
substantial 56:6,7
subtheme 57:9
subtributaries 201:6
success 29:6 34:17 78:3
successful 49:14 69:7 83:19 203:10
suffice 65:18
sufficient 154:8
Sugarland 5:11
suggestion 198:14
suggestions 224:17,18
suite 32:18 211:4
summaries 126:17
summarize 196:7
summary 19:18 22:18 114:10 116:13 196:10
summed 150:20
summer 33:1 72:2 126:6 165:20 215:12
summit 134:20 135:4 173:4,15 174:1 176:22
summits 173:17
sun 76:15
sunken 85:12
supplemental 67:9

68:11,15 77:7 86:20 87:13 89:16
supplementals 101:18
supply 28:13
support 19:21 20:18 32:19 33:17 61:11 64:2 67:4 68:18 79:19 81:19,20,20 83:6 84:20 85:6,21 89:6 90:6,10,15,16,17 122:20,21 124:12 132:11 147:12,21 153:12 170:13 200:11 210:9 215:4 226:5 237:19 246:18 249:3
supported 27:21 215:16
supporter 49:1 50:20
supporting 5:22 54:12 68:20
supportive 29:19 206:15
supports 86:2
suppose 155:7
supposed 215:11
surface 41:13 188:8,10
surfing 38:15
surge 30:20 40:8,10,19 86:5 97:21 109:4,6
survey 2:3,9,16 8:12 11:2 12:21 27:9 30:8 30:8,11 31:16,19 32:7 32:8 35:8,15 43:14 54:1 56:10 76:8 88:20 90:4 91:18 92:3 93:11 102:4 124:3 138:20 147:15,16 148:5 207:9
Survey's 32:4 77:9 91:10 92:5
surveyed 216:22
surveying 58:5 133:13 138:18 238:22
surveyors 90:10 201:14 209:18
surveys 37:1 66:13,21 90:9 92:21 95:13 115:13 139:7 221:14
suspect 239:21
swell 40:20
Swiss 144:3
switching 29:22 84:15 164:6
symposium 126:8,11 126:16 160:8
synthesis 211:6,17 212:9
system 8:2 35:11 36:20

47:1 49:16,20 63:17 73:14 77:3 81:18 82:18 83:6 84:13 88:12,12 90:17 96:17 104:7 110:7 111:3,17 131:16 132:11 144:5 187:15 205:20 206:8 207:8,11 213:21 248:14
systems 34:7 58:3,7 59:20 85:2,18 101:22 102:3,11 104:19,21 125:12 205:1 231:4 246:5

T

T 223:8
tab 22:10
table 162:6 163:14 164:2 237:14,22 238:14
tables 66:4,6,8,12
tackle 179:6
taken 115:20 187:4
takers 245:17
takes 184:8 230:2
talk 33:19 34:5 35:12 39:11 42:8 45:11 57:21 63:6,13 65:17 70:3 82:10 84:16 90:5 136:19 162:19 166:22 168:7 177:14 189:7 196:15 201:13 221:16 232:12,22 238:2 250:11
talked 74:10 138:9 147:19 155:5 178:15 196:9 210:5,6 229:1 237:19 240:15
talking 42:3 44:14 101:21 117:18 120:12 141:18 151:16 152:17 165:5,10 178:11 192:4 221:21 224:14 230:4,10 234:21 238:19,20,21 250:15
talks 126:19
Tampa 74:13
tangible 237:10
tanker 179:10
target 176:3
targeted 93:21
task 13:19 15:2 140:15 240:6
tasks 138:22
teach 4:21
teaching 54:9
team 5:10 18:5 27:18

130:18 135:10 136:12
169:17 170:8 216:20
244:21 247:5
Teams 32:5
teamwork 20:19
Tech 17:15
technical 23:18 24:22
25:2 114:11 130:21
182:7,10,16
technically 12:13 114:4
techniques 44:19 58:16
technological 228:5
technologies 17:3
102:22 103:3 106:11
107:10 122:8,17
133:17,22 134:10
229:2 233:9 234:3
240:11
technology 35:17 46:21
46:22 57:8,11 58:1,4
58:17 59:13 65:20
66:10 81:20 88:14
100:17 102:8,16,19
104:10,17,22 105:8
109:4,6 119:8 122:12
122:21 130:3,5
132:22 139:8,9 147:9
147:20 149:17 176:5
178:2 198:2 199:13
201:20 202:4 223:18
223:19 224:1,2
227:20,22 230:19
231:10 232:5,9,11,17
233:2 234:13,18
236:16 240:8 245:7,8
245:10 246:1 249:20
250:6
Teledyne 162:8
telepresence 233:1
tell 45:13 162:17 201:14
201:21 238:4 249:16
ten 199:21
tender 120:12
tentative 134:19
term 14:16
terminating 14:9
terminology 119:4
terms 35:22 56:3 200:2
200:18 202:8 219:14
Terrain 96:6
terrestrial 182:4
terrific 136:8
territorial 219:3
test 75:9 133:16,22
testbed 215:22
testing 43:3 164:15
Texas 5:11 31:13 66:14
67:7 68:15

thanks 5:4,19 6:3,13,19
7:3,17 8:14 9:1,11,18
10:4,20 12:4,12 23:7
23:9 26:16 38:7 47:19
48:19 51:11 75:19
106:8 109:15 111:21
112:7 113:15 114:15
137:3 143:13 156:1,7
156:9 160:14 170:16
170:17 173:12 174:11
176:13 184:15 194:8
194:8 195:17 210:14
220:13 221:15 222:16
224:3 225:3,17 228:9
229:14 231:16 233:13
233:15 236:6 239:9
241:5 242:9 243:13
243:14 245:19 247:6
theater 248:13
theme 57:11,16 60:1
themes 57:5 131:14
196:17
things 38:14 42:14
46:11,12 49:7,13
50:21 55:21 63:13
71:11 78:22 79:2 89:5
91:19,21 92:20
101:10 111:17 129:22
132:1,4,6 134:14
138:7 141:21 142:12
143:21 148:13 160:22
164:3 165:1 166:17
179:13,14 181:15
182:5 204:5,6 205:13
205:14 208:20 217:9
224:21 228:6,13
229:19,20 232:11,15
238:6 247:4 249:14
250:1,10,16
third 31:6 57:16 60:1
121:3 130:2 131:10
133:1
third-party 90:9
thirds 104:14
Thomas 1:15 7:18,19
7:20 13:5 24:16 25:13
43:8 107:2,3 109:11
109:14,18,21 110:16
111:13,20 147:6
158:8 160:17,19
164:9 166:14 168:4
168:22 169:4,8,22
170:16 172:1,10
174:5,12 176:13,17
177:16 178:5,9
179:19,22 180:6,13
181:4 183:1,5,7,13,18
184:6,9,14 185:7,12

185:15,19 186:5,13
190:3,14,17 192:13
193:4 194:2 224:4,5
Thompson 1:22 8:7,8,9
180:1 189:12 223:6,7
223:12
thought 27:12 48:2
63:5 107:13 116:19
140:19 170:6 196:4
231:12 232:17 237:13
thoughtful 44:8
thoughts 123:4
thousand 228:20
230:22
threats 34:21 35:1
three 23:1 24:17 47:2
57:5 73:15 77:6 99:4
121:15 133:8 137:17
142:18 189:4,6,12,14
200:2 215:15 218:18
227:18 228:11
thrice- 17:21
thrilled 37:13
throw 173:19 208:5
throwing 104:11 146:12
tidal 66:3,14 89:1
184:20 241:20
tide 31:14 66:3 69:16
69:18 70:5 73:19
188:3,4,7,11,13,14
tides 204:14
tied 154:6
ties 246:12
tight 129:16
timely 136:14
times 24:1 27:22 34:16
72:1 143:20 224:11
230:22 234:5 236:12
timing 11:17
title 4:15 210:17
titles 15:2
today 10:3 13:1 16:7,14
17:13 23:13 29:9 44:3
53:7,10 63:14 76:19
105:22 113:9 119:15
136:3 143:20 182:14
189:3,5,6,7 194:20
203:4 213:5 216:15
218:6 222:4 223:3,13
225:9 227:16,20
233:16 235:3 244:4
248:1,21
today's 50:17 104:10
104:16 132:21,21
250:19
tomorrow 16:8 17:13
25:3 29:10 35:4 136:3
166:9,16 177:14

182:14 189:8 193:7
194:21 195:1 222:5,8
223:5 224:13 230:3
232:13 233:21 234:21
235:7 236:2,19,19,21
239:19 240:22 247:8
249:10
tomorrow's 249:7
ton 42:4
tool 77:14 133:9,14
187:21
tools 32:18 47:22 57:13
57:14 58:18 59:8
70:16 81:5 134:9
212:2,16
top 28:15 38:18,21 39:4
42:11 106:2 113:16
132:19 149:6 150:2
topic 165:15 180:2
topics 21:4 29:8 52:15
77:1,6 79:20 112:21
113:9 126:20 165:7
197:1 224:19 228:12
242:14,19
topobathy 86:22 88:11
topobathymetric 188:6
topographic 164:12,16
topography 179:15
199:12 211:17
total 181:16 182:2
191:18
totally 137:15 210:9
224:7
touch 29:14 55:12
131:16 160:22 227:15
244:21
touched 144:12
touchpoints 117:7
track 40:16 41:8 113:14
tracking 6:9 45:5
trade 9:9
tradition 66:7
traffic 177:1
training 61:8
transcribed 18:16
transfer 250:6
transferred 249:20
transform 81:11 88:22
187:21 245:2
transit 63:21 93:11
212:11
transiting 64:3
transition 67:20
transitioned 66:4,17
68:2
translated 217:15
transmission 226:15
transmitting 23:12

226:17
transparent 218:12
transportation 36:19
 69:1 81:19 85:2,18
 205:20 206:8 207:8
 207:11
travel 72:8 88:7 172:21
 215:12
tread 146:3
tremendous 39:18
 55:10 167:11 194:4
trends 70:17 204:18
tri-office 77:12
tribal 135:2
tributaries 201:6
Tricia 20:12
trick 45:17
tricky 103:13,15
trigger 232:15,19 233:7
triple 194:12
Tropical 31:11
true 40:20 91:17
truly 103:21 140:21
 191:2 198:5 233:11
 240:13
Trust 5:22 152:10
try 9:4 49:13 84:5
 110:22 111:4 115:6
 189:15 207:19 216:17
 235:8
trying 42:5 58:8 60:6
 61:7 100:16 103:19
 114:3,11 138:10
 142:9 150:18 167:12
 172:20 178:21 191:10
 203:5 212:2,9 214:15
 240:10 246:10
tsunami 97:19 99:18
tsunamis 99:20
tuned 36:17 189:3
 242:3
turn 21:17 23:5 104:2,4
 123:16 127:16,21
 183:19 185:20 193:6
 193:10 195:13 222:12
 222:13
turned 86:16 147:15
 183:2
Turner 2:16 3:16
 123:17,21,22 153:22
 159:18
turning 26:9 51:9 116:8
turnout 34:3
twice 139:17,17,17
twist 140:13
two 3:11 13:12 15:22
 19:2 21:1,5,14 23:1
 24:7 25:15,19 31:14

38:14 43:20 63:16
 67:17 77:1 86:7 89:3
 89:4 93:4 95:4 104:14
 120:5 133:8 137:14
 137:17 139:15 160:9
 163:7 165:7 166:1
 173:17 176:3 183:2
 194:16 206:20 208:20
 209:4 210:7 218:15
 218:18 221:20 225:10
 225:22 241:8 243:17
 247:13 250:16
two-day 13:12
two-page 165:21
 186:19
two-way 41:17
type 22:9 42:18 67:3
 197:21 246:5
types 39:22 67:18
 70:14 92:21 104:19
 104:22 198:15 250:1
Typhoon 87:8

U

U.S 1:1 28:14 32:7,21
 36:19 57:8 58:1 93:16
 94:3 95:12,15 97:3,4
 120:7,20 138:17
 163:6,8 171:7 203:18
 206:7 209:21 219:3
 249:22
ultimately 46:7 61:14
UMBC 4:21
UNAVCO 215:9
uncertainties 89:9
 182:3
uncertainty 181:16
underlies 141:2
underlying 33:16
underserved 82:7
understand 26:17 35:3
 40:17,18 60:7 67:16
 78:20,22 80:11 82:2
 98:14 113:1 115:6
 151:13 170:10
understandable 137:15
understanding 41:13
 182:2 246:21
underutilized 197:19
 209:19
underway 42:14 43:8
 43:13 77:4 78:2
undisclosed 13:2
unequivocally 201:21
unfortunate 151:11
unfortunately 38:10
 144:18
UNH 12:8 13:8 53:20

UNH-Joint 2:2,5
UNH/NOAA 35:20
unit 157:12
United 13:21 94:2
 117:13 118:22 120:17
 178:22 204:3 206:20
 207:20
Units 203:15
university 10:17 12:9
 52:20 53:3,10,12,14
 53:17 55:19 56:9,18
 62:15 100:8,9,10
 103:17 240:10 250:4
unmanned 34:7 101:22
 102:3,11 104:7
 188:10 205:1
unmapped 35:16
unmute 169:5
unmuted 6:6 107:3
 169:7 177:20 178:8
 227:12
unnecessary 125:2
UNOLS 211:4,21
unpack 195:21
unusual 101:14
up-take 34:6
update 17:15 35:9,19
 35:22 48:3 62:22
 72:13 75:20 77:12,15
 78:16 79:1 80:15
 82:14 86:19 87:1 91:1
 95:18 97:18 124:4
 137:1 145:19 154:14
 195:6 199:13 205:2
updated 66:14 79:8
 87:18 88:12 89:14
 95:11 132:18
updates 3:7 20:22
 52:16 76:19 79:4,18
 182:17 205:5
updating 39:13,16 97:8
upgrade 133:9
upgraded 88:11
upgrading 73:13 74:19
 132:10
uptake 226:19
upwelling 41:14
USA 4:8 23:11
usable 94:14 121:3
 197:10
USCG 1:20
USCS 120:1
use 17:3 18:17 46:15
 55:22 59:20 85:15
 122:12 125:6,21
 129:14,18 134:9
 139:6,10 142:10
 149:1 151:17 180:5

191:18 195:21 198:12
 201:17,22 208:15
 212:3 220:11 223:18
 224:1 225:20 230:22
 231:4,7 232:17
 233:10 235:9 236:17
 239:21 241:21
useful 37:15 40:3 94:14
users 88:22 94:19,21
uses 139:4
USGS 15:15 99:15
 120:10 167:7 201:1
 203:14 213:20 214:12
usually 22:3
USVs 249:18
utility 93:6
utilize 133:13 136:10
 246:14
utilized 232:7,7
Utqiagvik 215:10
UxS 246:1

V

Valdez 71:3
valid 163:1
valuable 47:14 108:16
 108:20 198:5
value 55:10,18 57:10
 58:12 90:12 196:18
 220:21 246:16
Van 20:16
varied 102:9
variety 19:19 52:15
 64:21 115:20 197:1
various 14:6 28:13,16
 39:9 44:12 51:20
 92:21 113:9 124:8
 166:4 188:14 215:1
varying 89:8
vast 175:10
VDatum 68:10 73:1
 77:12 88:18 187:21
 241:21
vector 204:1
vehicles 198:16 249:17
venues 24:2 173:5
verbs 122:9 156:17
versa 140:2 141:16
versatile 132:2
version 196:11
versions 189:4
versus 115:7 155:7,8
 226:11
vertical 89:2 164:15
 187:20 202:7,13
 214:21
very-capable 23:6
vessel 6:1,9 48:4 53:21

142:1
vessels 43:3,7,20 54:1
 188:11 197:18 226:18
 227:18
veteran 205:21 208:14
vetted 118:6
vetting 179:7
vice 4:19 5:9 7:1 140:2
 141:16
Vicki 96:4,10 210:15,20
 213:2
video 26:18 46:20
 48:12,22 107:22
view 47:2 167:1 232:10
viewed 31:9
viewers 197:11
village 163:10
Virgin 73:5,6
Virginia 2:14 5:1 7:1
 20:11 200:9
Virginia/North 43:11
virtual 1:6 4:5 13:12
 18:4 26:20 38:10
 59:10 126:8
virtually 17:21 23:16
 42:9
visibility 17:17 35:2
 72:3 74:10,12 118:16
vision 17:11 19:14
 139:9 146:6
visualization 59:1
vital 34:17
voice 118:16,18 226:12
void 12:15
voting 10:6

W

wait 88:6 104:3 114:9
 128:3 137:14 153:7
 171:8 194:10 248:5
waited 137:13
waiting 82:14 147:14
 160:7 223:8
walk 127:17
wanted 14:5 44:4 47:4
 64:4 71:8 108:6,20
 120:11 128:11 136:22
 143:21 144:13 182:15
 187:13 189:10 190:18
 193:12 194:18 203:12
 215:17 218:21 219:16
 227:15 228:2,22
 245:21
wanting 224:18
wants 162:19 166:19
 181:9
Washington 4:22 6:2
 71:15

wasn't 69:6 220:6,17
waste 139:15 141:17
 235:19
watch 48:17 187:17
 241:22 250:5
water 30:16,18,19,21
 31:2,4,6,6,7,12 37:2
 40:12 49:8,9 59:5
 67:21,22 68:3 72:20
 72:21 85:10 89:18
 90:6 103:14 107:17
 107:19,21 108:18,18
 108:21 115:13,16
 121:8 125:13 133:12
 148:7,9,17,17 149:1,3
 149:8,11,17 150:4,5
 152:13 157:10,11
 165:2,4 187:16 188:7
 198:13 199:14,14
 208:19 209:15 211:11
 214:19 215:2 230:12
 230:13 241:22 242:2
waterfront 53:18,20
waters 35:16 57:8 58:2
 94:1 119:2 164:21
 219:3
watershed 202:3
waterways 35:3 207:12
 226:2
wave 40:21 64:22 65:2
 65:5 110:6,22 111:2,6
 161:17
waves 40:21 110:7
 162:6
WAVEWATCH 41:1
way 33:17 36:6 38:4
 39:5 40:22 46:19 70:3
 70:5 93:10,22 94:2,19
 95:3,8 102:4 114:8
 123:10 132:4 139:12
 142:2,19 146:4,16
 147:13 152:22 159:11
 162:3,16 164:1
 170:14 177:13 188:7
 192:18 196:4 198:9
 201:1 202:2,3 203:9
 205:15 226:15 234:10
 234:22 236:13 247:4
 248:21
ways 44:12 59:18 78:19
 86:17 95:5 102:15
 105:17 123:2 134:7
 144:9,12 231:5
 244:12 245:2
wearing 4:20 33:11
weather 59:18 74:11,17
 76:11 86:3 144:5
 161:19 204:14 215:5

215:18 226:14
web 4:10 21:13 25:4
 26:11 37:20 195:6,7
 213:9
webinar 1:12 18:22
 19:21 21:21 65:16
 80:1 81:3 116:11
webpage 79:8
website 18:19 39:21
 61:20,21 86:10
WEDNESDAY 1:8
weeds 182:10
week 86:8
weekend 31:10
weeks 33:21 36:4 43:21
 138:8 160:9 188:22
 229:8
weigh 159:20
weighted 163:14
Weird 12:6
welcome 3:2 8:4 11:21
 26:16 51:6 52:8 127:4
 157:19,20 183:22
well-considered 146:14
well-established
 164:13
well-integrated 96:17
went 51:4 113:19 144:9
 165:18 250:22
weren't 72:8
west 74:2,3 89:14
 152:10,12 215:14
whales 60:21
wheels 209:4
whistles 81:12
white 15:12 39:5 94:5
 136:2 191:14,16
 235:22 243:5,12
whiz 197:12
wide 115:20 135:3
 197:1 205:16
wider 34:5 173:6
widest 125:6,21
Wildlife 214:12,14
William 99:19
willing 244:11
willingness 218:7
wind 162:7
winds 40:16
wisdom 219:20
wise 179:10
wish 38:9 238:16
withhold 18:20
wonder 145:12 148:7
 159:3 182:22
wondered 171:17
wonderful 135:11
 173:18

wondering 140:11
 145:3 168:13 217:12
Woolpert 4:20
word 37:4 151:11,11
 239:21 240:5
words 28:6,22 217:16
 219:20
work's 111:11
worked 32:7 66:9 88:21
 114:6,7 244:8
workforce 27:14 28:8
 63:11
working 12:22 15:3,8
 17:15 24:17,19,20,22
 25:3 28:18 32:17
 38:14 42:15 43:10,12
 44:1 50:8 56:9 73:10
 74:16 83:15 84:4
 89:12 102:6 103:18
 110:3,19 112:10
 122:22 123:18 124:6
 124:10 126:4,7 129:2
 131:2 135:5 152:10
 162:2 165:17 172:5
 172:16,19 174:15
 176:11 189:1 207:19
 212:11 213:22 221:3
 225:16 229:5 230:20
 235:8 237:9 242:18
 249:15 250:17
works 75:10 107:18,20
 142:17 165:4 229:7
workshop 214:12
world 55:6 80:16 83:12
 125:5 127:3 132:21
 182:17 227:3 250:13
worldwide 239:5,5
worth 69:8 184:22
would've 72:6 231:12
wouldn't 103:5 175:18
 227:19
wound 217:3
Wow 123:10
wrap 223:4 247:10
 249:12 250:18
wrap-up 222:20,22
 245:18
Wright 20:16
write 160:7
writing 26:3 135:19
written 79:10 107:12
 136:14 206:4 210:22
 222:8
wrong 9:22 237:17

X

Y

year 15:10 19:3 20:2
 36:1,3 40:6 56:16
 63:4,7,12,17 64:15
 66:2 68:1,13 69:18,19
 72:14,16 73:7 79:19
 83:19 87:16 88:5,10
 89:3 99:5 100:21
 101:12,12 102:3
 137:14,17 152:11
 165:10 166:13 174:21
 175:7 178:15 179:11
 186:15 213:20,22
 229:6,6 241:13
 244:15,21 246:22
 247:3

year's 36:14

year-long 68:4

years 56:22 57:6 58:13
 61:16,20 62:14 66:6
 69:15 70:7 78:2,6
 86:21 94:18 97:4
 100:1,13 102:19
 103:5 105:9 109:6
 111:15 137:13 149:18
 161:1 162:2 174:19
 176:12 181:12 187:4
 187:5 200:11,17
 201:8,12 203:16,16
 211:18 212:8 215:20
 221:8 225:22 227:19
 229:21

yellow 103:10

yesterday's 235:2

York 6:8 66:14 96:21

York/Long 89:9

Young 3:6 26:17 48:12
 48:20,21 50:13

Young's 38:8

yous 247:12

Yutu 87:9

Z

zero 154:19 197:20

Zhang 200:3,5,6,8
 202:20

zone 112:17,18 119:1

zoom 85:3

0

0 202:15,16

1

1.1 219:13

1:00 1:12

1:38 51:4

1:49 51:5

10 48:9 51:2 186:10,13
 202:16

10-minute 186:4

10.01 31:1

100 54:7

106 3:14,15

11 68:1 83:20 187:10
 188:17

12 3:4 51:1 60:19 187:7

12:48 4:2

123 3:16

128 3:17

13,000,000,000 90:14

135,000,000 69:8

14 54:8,13

147 3:19

14th 43:16

15 249:11

15-minute 48:7

150 66:6

16 187:3,5

164 3:22

19 162:2

1900 179:12

19th 43:9

2

2 124:13 140:7

2.1 124:13

2:55 113:19

20 19:22 36:2 200:11,17

20-something 166:2
 186:20

2001 62:1 161:9 162:2

2002 209:7

2004 187:1

2008 31:1

2009 209:11

2012 214:11

2014 89:6

2018 33:7 125:18

2019 62:4 87:13

2020 1:9 4:4 28:17 36:3
 131:22

2021 18:1 87:13

2022 137:10

2030 108:7 109:10
 115:17 153:20 154:6
 210:19

21 36:5,10,16 43:22

71:1,17 75:12

21st 29:6 207:20

22 75:12

23 1:9 3:4

23rd 4:4

245 33:22

25-year 244:9

28 3:5

29th 43:12

3

3-D 46:18

3,000,000,000 90:14

3:05 113:20

30 115:3,4,7,13 199:22
 203:19

30-mile 31:20

31 54:20

35 64:7

36 64:7 82:22

37 3:5

373 33:6

3D 228:15

3DEP 182:6

4

4 3:2

4.1 89:4

4.11 89:4

4:35 194:17

4:45 194:10

40 69:22 104:15 107:6
 108:4 109:9,13 115:1
 115:3,7,13 116:2
 147:19,20,22 148:10
 163:17 181:1 202:15
 210:9

40-meter 148:2

400 42:13 80:2

49 3:6

4th 43:14

5

5 219:13

5.6 31:5

5:38 250:22

50 201:7

50% 211:20

52 3:8

53 3:9

57 87:18

5th 134:20 173:16

6

6.8 87:16

60 33:22

606 36:3

63 3:9

6th 126:8

7

76 3:10

7th 126:9

8

80s 233:1

8th 119:7 135:7

9

9 10:3

9.19 30:18

C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Hydrographic Services Review Panel

Before: US DOC/NOAA

Date: 09-23-20

Place: teleconference

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.



Court Reporter

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701