

U.S. DEPARTMENT OF COMMERCE

+ + + + +

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

+ + + + +

VIRTUAL PUBLIC MEETING

+ + + + +

THURSDAY
SEPTEMBER 24, 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

NOAA STAFF PRESENT

CAPTAIN RICK BRENNAN, Chief, Hydrographic
Surveys Division, Office of Coast Survey
VIRGINIA DENTLER, Center for Operational
Oceanographic Products and Services
LYNNE MERSFELDER-LEWIS, HSRP Coordinator

ALSO PRESENT

MARIA BURNS, Ph.D., College of Technology,
University of Houston

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

Round Robin Recap from Day 1 4

HSRP Discussion Continues on the
Implementation Plans for the NOMECS and
ACMS Ocean and Coastal Mapping Strategies.31

Public Comment Period Continues on
NOMECS and ACMS73

HSRP Technical Working Group update:
Precision Marine Navigation
Challenges in Restricted
Visibility and Fog 101

HSRP Discussion: HSRP Priorities, Papers,
Letter, Working Groups, Other. 145

Meeting Recap and Round Robin with 163
HSRP Members, Actions, and Wrap Up

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

2 12:59 p.m.

3 CHAIR SAADE: Hello. This is Ed
4 Saade. I serve as the HSRP Chair. Welcome to
5 day number 2 of our September 2020 virtual
6 meeting. We'll jump right into it.

7 And we'll start off the day with a
8 round robin of the HSRP Panel members for
9 comments, insights continued from yesterday. And
10 to start that off, Rear Admiral Smith, would you
11 like to go ahead and take the floor?

12 (Audio interference)

13 MS. DENTLER: Rear Admiral Smith, we
14 can't hear you.

15 RDML SMITH: I'm sorry. I was muted.
16 I'll just thank everyone for a great first day
17 yesterday. And as I've said a couple of times,
18 I'm really in listen mode here. And I want to
19 spend most of the time listening to what the
20 Panel's thoughts are, particularly on NOMECC this
21 morning. So, I yield back any remainder of my
22 time.

1 CHAIR SAADE: Thank you, sir. Okay.
2 So, we'll go do the round the table. And we'll
3 do it in normal alphabetical order. I will do it
4 at the end in reverse alphabetical order. So,
5 Captain, why don't you go ahead first, please.

6 MEMBER ABDULLAH: Good morning,
7 everyone. I agree with the Admiral. I think it
8 was a great day yesterday. And for the
9 strategies, I think my emphasis is for the way --
10 for a success in implementing the strategies,
11 really is going to be on -- depend on how much
12 NOAA is going to work with our federal partners,
13 with the private academia research institution.
14 It is very crucial to set on the table and tackle
15 it that way.

16 We come up with a good recommendation
17 from HSRP, but I think I just want to emphasize
18 the public and private partnership, and the
19 development of standards. Though I don't think
20 we should take any actual practical step in the
21 field before we all agree on the national
22 standard, how we are going to collect data.

1 That's all I have. Thank you.

2 CHAIR SAADE: Thank you, Qassim. Next
3 up is Captain Anuj Chopra.

4 MEMBER CHOPRA: Hi. Good afternoon.
5 Good morning. Anuj Chopra here. Completely
6 agree with Qassim, Dr. Abdullah, on his comments.
7 I believe the NOMEK strategies -- just because of
8 NOAA itself -- it involves many more partners in
9 working together.

10 I feel there's a huge opportunity to
11 have that public-private partnership. And as the
12 Admiral said yesterday, focus on innovation and
13 technology to take it forward.

14 Very excited about the Alaska strategy
15 as well. I think both these initiatives are the
16 way to go ahead, and looking forward to them.

17 Take a moment and wish all the
18 mariners on this call, and who are present, today
19 is World Maritime Day. So, wish all of you World
20 Maritime Day. Happy World Maritime Day, and take
21 it from there. Best wishes. Thank you.

22 CHAIR SAADE: Thanks, Captain. I

1 apologize again for any background noise. My
2 home here is in front of the old --- so, every
3 now and then things get loud and I have to go
4 mute. Sean Duffy, you're up next. Sean, you may
5 be muted. Okay. We'll --

6 MEMBER DUFFY: All right. I'm here.
7 Thank you. I don't have much to say. So,
8 appreciate Captain Chopra hitting Maritime Day.
9 That's a big event for us. And it's great that
10 we're all working together on the Panel today.
11 And I appreciate being here. Thank you.

12 CHAIR SAADE: Thanks. Thanks a lot,
13 Sean. Dr. Nicole Elko, you're up next, please.

14 MEMBER ELKO: Thanks. Good afternoon
15 from sunny Folly Beach, South Carolina. I really
16 enjoyed yesterday's sessions. I took a cue from
17 Dr. Jacobs, who had his WRV surfboards behind
18 him, and brought mine in today. I don't have a
19 Hawaiian shirt. But that surfboard has been to
20 Hawaii with me. So, yes, I'm really looking
21 forward to today's discussion. Thanks.

22 CHAIR SAADE: Thank you, Nicole. Next

1 is Lindsay Gee, please.

2 MEMBER GEE: Hi. Good afternoon, all.
3 Yes. I -- yesterday, to reflect everybody's
4 comments here, and I think it was a good day. It
5 was -- particularly I think the Alaska strategy.
6 So much work had gone into that, that we've got -
7 - still, I think, there's still lots to do, I
8 think, to just round out our comments to the
9 NOMEK. But, it's -- the strategy itself is huge,
10 as Clary would say. I mean, he was great about
11 it. But it does present some really big
12 challenges. And I hope we can focus our comments
13 on that today, to get a good recommendation out,
14 and a paper on that. Thank you.

15 CHAIR SAADE: Thanks a lot, Lindsay.
16 Ed Kelly, you're up next.

17 MEMBER KELLY: There we go. Everybody
18 can hear me, I trust. Yes. I think we had a
19 really good day yesterday. I'm kind of very
20 excited. And I'm very pleased with what we all -
21 - both on NOMEK and the Alaska strategy.

22 I think what we need to do is continue

1 -- from what I've been hearing, is to continue to
2 focus our recommendations that NOAA is the lead
3 agency that should get involved to ensure the
4 full interagency cooperation, as well as public-
5 private.

6 And that it should be NOAA as a lead
7 agency in helping to set the standards for both
8 the data, and the guidelines, and the procedures
9 for all of these. And that we have to continue
10 to underpin NOAA stressing in everything they do,
11 the importance of both their services and
12 products to the success of the blue economy.

13 So there's just a couple of -- kind of
14 underlines the emphasis points that I think we
15 need to be putting together as we continue to
16 listen today, and formulate what our
17 recommendations will be.

18 And it's not -- yes, it's fairly sunny
19 from here in Bridgewater, New Jersey. Not as
20 exciting as Hawaii, Alaska, Florida, or anyplace
21 else. But so far so good. Thanks.

22 CHAIR SAADE: Thanks, Ed. Captain Ann

1 Kinner, please.

2 MS. DENTLER: You're muted, Ann.

3 MEMBER KINNER: No. I -- was not my
4 fault. Thank you. Yes. I totally agree with
5 what Ed has said, and his comments that I got
6 emailed this morning, and Qassim's too.

7 And particularly the idea that
8 somebody's got to take the lead in pulling all of
9 these disparate things together, whether they are
10 resources from Seabed 2030, NOMECC, whoever,
11 pulling them all together.

12 We have a big job. It's an important
13 job. And it's the old thing of, how do you eat
14 the elephant? You do it one bite at a time. So,
15 we start with, who's in charge? We start then
16 with, what is the task? What's the first task?
17 What's the next task, and so on.

18 But yes, somebody has to take the
19 lead. NOAA, I would think would be perfectly
20 positioned to do that. And again, to pull in all
21 of these private sources as well, whether it's
22 Lamont, or Woods Hole, or New Hampshire, or

1 whoever.

2 CHAIR SAADE: Okay. Thank you, Ann.
3 Captain -- oh sorry, Dave Maune. You're up next.

4 MEMBER MAUNE: Hi. For some reason my
5 videocam isn't working today. I don't know why.
6 I was very pleased with the support we've
7 received for the Alaska Coastal Mapping Strategy,
8 for the white paper there. And I want to endorse
9 Qassim's recommendations regarding standards for
10 the NOMEK, and that sort of thing. That's all I
11 have.

12 CHAIR SAADE: Thanks, Dave. Captain
13 Anne McIntyre, please.

14 MEMBER MCINTYRE: Hi. Good morning,
15 everybody. Nothing really to add here. I
16 appreciate everybody's hard work on these issues,
17 they're outside my area of expertise. I know
18 it's been a lot of work. And I agree with the
19 comments that everybody else has made.

20 CHAIR SAADE: Thanks, Anne. Captain
21 Ed Page next. You're muted, Ed.

22 MEMBER PAGE: All right.

1 CHAIR SAADE: There you go.

2 MEMBER PAGE: A lot to digest
3 yesterday. Obvious we're stepping on -- or
4 jamming on the accelerator pedal with respect to
5 surveying the ocean. So, a lot -- great to see
6 so much attention now directed towards this
7 effort, and right from the White House, and down,
8 and throughout. So, a lot to do, exciting
9 opportunities in the future. So, I'm glad to be
10 a part of it.

11 It's -- we had some of the crew from
12 Rainier and Juneau this week. So, I had them
13 over to the Marine Exchange here yesterday. And
14 then said, go out and survey. So, I pushed them
15 out of the door, and cast off all lines, and
16 started doing some more surveying. But anyway,
17 we're -- pretty exciting times. I'm glad to be
18 a part of the process. Thank you.

19 CHAIR SAADE: Thank you, Ed. Captain
20 Sal Rassello.

21 MEMBER RASSELLO: Hi. Good afternoon.
22 Great work yesterday. Looking forward to another

1 day of good work with you guys. I second
2 Qassim's comment. And the comment regarding the
3 importance of NOAA to lead the project.

4 These are probably the biggest
5 projects that I have been involved with the Panel
6 so far. And obviously they need good
7 coordination and planning for the final execution
8 and results. So, I'm looking forward for another
9 good day today. Thank you.

10 CHAIR SAADE: Thank you, Sal. Julie
11 Thomas, you're up next.

12 CO-CHAIR THOMAS: Right. Thanks, Ed.
13 Well, I just have to say, I've been so impressed
14 at how engaged the whole Panel has been, both
15 with the Alaska mapping, and NOMECC, and also
16 proactive in getting outside comments. And it's
17 really great.

18 We've had some excellent feedback.
19 And we're still compiling. But I hope we can
20 work out some things today, and move forward on
21 these. So, I appreciate the opportunity of
22 working on this. Thank you.

1 CHAIR SAADE: Thanks, Julie. Gary
2 Thompson.

3 MEMBER THOMPSON: Good afternoon from
4 rainy Raleigh, North Carolina. I think yesterday
5 was a very important meeting. A lot of team
6 effort yesterday. We got to keep pulling. Now
7 we're going to talk about sort of this by rule.
8 Ed's comment about NOAA taking the lead I think
9 is very important, public-private partnerships,
10 and national standards.

11 CHAIR SAADE: Thanks, Gary. Captain
12 Andy Armstrong.

13 CAPT ARMSTRONG: Yes. Hello,
14 everyone. I also thought today -- or yesterday
15 was an excellent day. And I think we heard some
16 really great comments from the public input. And
17 so, I'm looking forward to another solid day of
18 discussions and information. Thanks.

19 CHAIR SAADE: Thanks, Andy. Juliana,
20 you're up next.

21 MS. BLACKWELL: Greetings. Just
22 echoing the same thing. It was a great

1 discussion yesterday, especially on the NOMECC and
2 the Alaska Coastal Mapping Strategy document.

3 I look forward to continued discussion
4 and input on that today, along with the other
5 updates from the working groups. So, looking
6 forward to the discussion. Thank you.

7 CHAIR SAADE: Thanks, Juliana. Rich
8 Edwing.

9 MR. EDWING: Yes. Hi, everyone. Like
10 everyone else I very much enjoyed yesterday's
11 session. I'm very much looking forward to
12 today's session on visibility and fog. You know,
13 I think it's really talking about the overall
14 system that's going to be required to help
15 vessels safely navigate in low visibility
16 conditions.

17 You know, my office helped provide
18 observations. And we're working on helping to
19 provide forecasts for visibility. But those are
20 just pieces, and not the end-all by themselves.
21 So, I want to -- effects to the overall system
22 that will be discussed. And so, looking forward

1 to that. Thank you.

2 CHAIR SAADE: Thank you, Rich. And
3 Dr. Larry Mayer.

4 DR. MAYER: I could be contrary and
5 say that I didn't enjoy yesterday's discussion.
6 But that wouldn't be true. Because I did. And I
7 thought they were great.

8 I really like the way the Alaska study
9 has evolved. I think there are really clear
10 recommendations in that, which is great. I agree
11 with everything that's been said today in
12 summarizing the NOMEK discussion. I think the
13 emphasis on collaboration and coordination is
14 right on the mark, with NOAA as the lead agency.
15 I think that's great.

16 I come back to what I mentioned
17 yesterday, which is my concern for a mechanism
18 that goes beyond interagency collaboration.
19 There are mechanisms obviously within the
20 Government for interagency collaboration.

21 But I worry that we and NOAA are going
22 to be challenged with finding a mechanism that

1 will allow collaboration and coordination of
2 activities beyond the federal agencies. And I
3 think that's necessary. But I think it will be a
4 interesting effort to try to find a way to do
5 that.

6 CHAIR SAADE: Thanks, Larry. So,
7 we're doing fine on schedule. And the next big
8 item after this discussion period is going to be
9 the next round of our public comments.

10 So, I'd like to ask Julie, and Qassim,
11 and Dave, and Lindsay to make yourselves
12 available, so we can take advantage of this time
13 window, and go ahead and talk a little bit more
14 on the various items related to NOMEK and Alaska.

15 So, I'll go ahead and start on that,
16 and just comment to the fact that one of the key
17 elements of this is everybody's input, as has
18 been repeated many times. And also, the strong
19 focus on what we're trying to do relative to
20 advocate for, you know, public and industry
21 involvement early on in the process.

22 I personally am a big advocate of

1 that. And I'd be glad to see that's part of the
2 discussion. And I would encourage us to keep
3 going down that road as much as possible.

4 And then, also the playback into
5 what's been going on with COVID and the pandemic.
6 And the realization and the success that we're
7 seeing. We commented a number of times that NOAA
8 got a lot of work done in these last six months
9 in the field. And a lot of that is a credit to
10 not just people paying attention, and being
11 faithful, working hard, and working together, but
12 a lot of that is embracing autonomous ways to do
13 things, and remote ways to do things. And I
14 firmly believe the door's wide open for us to
15 really push hard to bring in uncrewed and --
16 uncrewed platforms, and autonomous methods,
17 remote operations as much as possible,
18 particularly in tough to get to places
19 geographically like Alaska.

20 But we've proven it's tough to get
21 anywhere in the U.S. during this pandemic. And
22 that there's great benefits to being able to not

1 have to move everything around, and move people
2 around. So, with that I'll hand it over to you,
3 Julie, if you want to --

4 CO-CHAIR THOMAS: Okay.

5 CHAIR SAADE: -- go ahead and take the
6 lead, and keep this conversation going. Thanks.

7 CO-CHAIR THOMAS: I do. I'm wondering
8 -- I think maybe what we'll do is to take this
9 time to -- if we have a minute here. Do we have
10 -- let's see, the timing. Captain -- or Admiral
11 Smith, I think we have time before the public
12 comments to address Alaska mapping. And Dave
13 Maune can talk a little bit about the changes.

14 And then we can go ahead and see if
15 the Panel really has consensus on this to approve
16 it. And we'll be done with the Alaska mapping
17 then. And then we can focus the rest of the time
18 on NOAA. So, that's what I would suggest right
19 now.

20 Dave, do you want to take it from
21 here? I know you had one more comment last night
22 -- or a couple of comments from one person that

1 you've included here now, and highlighted. Do
2 you want to take it from here?

3 Dave, I'm not sure we can hear you.
4 You might be muted.

5 MEMBER MAUNE: Can you hear me now?

6 CO-CHAIR THOMAS: Yes.

7 MEMBER MAUNE: Okay. This yellow
8 highlight shows one addition that was recommended
9 by Nicole Elko. And it addresses the quality
10 levels, in partnership with the JALBTCX
11 partnership there. And that is non-controversial
12 there.

13 You can then switch to page 9, please,
14 the next yellow highlight. Okay. Right there, I
15 think it was Nicole who also mentioned that these
16 are lower cost sensors that we're talking about
17 for the alternative sensors. So, that's a very
18 minor thing.

19 You can now go to page 12. Okay.
20 There we have -- this one came from Molly
21 McCammon. She thought that we should mention the
22 Hydroball buoy. And it doesn't just serve as a

1 datum center, but she sees it as a single beam
2 echosounder that can do some echosounding off the
3 coast there. This particular photograph shows it
4 being tethered offshore. So, she recommended I
5 add this paragraph -- which we did -- describing
6 the Hydroball buoy. Okay. And it's being used
7 in Canada. And AOOS is testing it for use in
8 Alaska.

9 Okay then, page 13. Page 13 we had a
10 recommendation to engage stakeholders in the
11 process. And we've been talking about that for,
12 all day.

13 Okay. Those were the comments that we
14 got from Molly McCammon and from Nicole Elko this
15 week. I got one other comment overnight, from
16 Fugro's office in Alaska. And it basically
17 referred to the Alaska Coastal Mapping Strategy
18 needing to talk about shallow water echosounding
19 surveys. She was referring to the strategy, not
20 the HSRP paper. Because the HSRP paper has three
21 pages on doing exactly that.

22 So, I think that is a nonissue, and

1 that there's no more recommended changes to this
2 paper. Anybody has any comments they want to
3 add? Otherwise, I think we're ready to vote on
4 this.

5 CO-CHAIR THOMAS: Right. So, let me
6 just go around to each of -- thank you, Dave, for
7 that update. And I feel this paper is ready to
8 be finalized.

9 But let's go around and ask consensus
10 from the Panel. I'm just going to call you out
11 each individually. If you could just say yes,
12 no, or further comments. Ed Saade. Yes, you'll
13 have to unmute yourself here.

14 MS. BLACKWELL: Julie, can I have one
15 other minor change before we go around?

16 CO-CHAIR THOMAS: Of course.

17 MS. BLACKWELL: Yes. I sent this to
18 Dave late. So you probably didn't get a chance
19 to see it. But I had one very minor change that
20 I requested on page 3, where it talks about the
21 NSRS modernization effort.

22 CO-CHAIR THOMAS: Okay.

1 MS. BLACKWELL: And in particular it
2 says -- or states that NGS North American-Pacific
3 Geopotential Datum of 2022 now scheduled for
4 release in 2024.

5 I'm a little hesitant to put a
6 particular year at this point in time with the
7 modernization effort, as I briefed out yesterday.
8 So, I would like to say, instead of in 2024,
9 after 2024, just so that we have a little bit
10 more leeway. Because I'm uncertain as to the
11 final date of the modernization roll out.

12 CO-CHAIR THOMAS: Sure.

13 MEMBER MAUNE: Okay. What page is
14 this on again?

15 CO-CHAIR THOMAS: It's on page --

16 MS. BLACKWELL: Three.

17 CO-CHAIR THOMAS: -- 3, Dave. On page
18 3, and right before the year 2024.

19 MEMBER MAUNE: Okay.

20 CO-CHAIR THOMAS: If you want to --
21 and so we're just replacing the word in with
22 after.

1 MEMBER MAUNE: Okay.

2 CO-CHAIR THOMAS: And if you could
3 make that change then. And then go ahead and
4 send it to Lynne and team. That would be great.

5 MEMBER MAUNE: Okay.

6 MS. BLACKWELL: Thank you.

7 CO-CHAIR THOMAS: Thank you, Juliana.

8 MS. BLACKWELL: Thank you very much.

9 CO-CHAIR THOMAS: Sure. Okay. Let's
10 go around to the whole Panel then. And of
11 course, if you have additional comments, now is
12 your time to speak up. So, Ed Saade.

13 CHAIR SAADE: I wasn't ready. I'm
14 okay. Go ahead.

15 CO-CHAIR THOMAS: Okay. Qassim.

16 MEMBER ABDULLAH: I'm fine, thank you.

17 CO-CHAIR THOMAS: Anuj.

18 MEMBER CHOPRA: I'm fine, thank you.

19 CO-CHAIR THOMAS: Sean.

20 MEMBER DUFFY: I agree with the paper,
21 and thank Dave for all the work in getting us to
22 this point.

1 CO-CHAIR THOMAS: Thank you. Nicole.

2 MEMBER ELKO: Okay. The low cost
3 comment that I added, maybe we should add "low
4 cost, proven". I don't remember exactly the
5 terminology there. But, just wanted to make sure
6 that was clear. Otherwise it looks great.
7 Thanks.

8 CO-CHAIR THOMAS: All right. So,
9 let's go to that page where we have low cost, so
10 we could just catch it right now. I think it's
11 further down.

12 MEMBER MAUNE: It should be on -- I
13 think it's page 9.

14 CO-CHAIR THOMAS: Okay.

15 MEMBER MAUNE: Some of these things,
16 the Alaska Water Level Watch, is evaluating them
17 to determine how well they are proven. The non-
18 vented pressure sensors and the two below it are
19 ones that they are evaluating. I think they are
20 in the process of proving it. And so, that's
21 part of -- that's part of the exercise is to
22 prove them and use them when they work out.

1 CO-CHAIR THOMAS: So, if you could
2 scroll up just a little bit there, Virginia? So,
3 we could say, consider alternative low cost
4 sensors, yet should be finalized or under
5 evaluation?

6 MEMBER MAUNE: How about when proven?

7 CO-CHAIR THOMAS: When proven?

8 MEMBER ELKO: That sounds good.

9 MEMBER MAUNE: Well, but consider
10 right, the word consider --

11 CO-CHAIR THOMAS: Oh, okay. The word
12 is --

13 (Simultaneous speaking)

14 MEMBER MAUNE: -- telling them they
15 are to determine whether it can be proven or not.
16 Maybe the word consider covers that already. If
17 we said use alternative, then we would say, use
18 alternative proven. Right now they are
19 considering the alternatives, which may not yet
20 be proven.

21 MEMBER ELKO: Okay. That addresses my
22 concern. I couldn't remember exactly the

1 structure of that sentence. But you're right. I
2 agree. Thank you.

3 MEMBER MAUNE: Okay. Thank you.

4 CO-CHAIR THOMAS: Okay. Thanks,
5 Nicole. Lindsay.

6 MEMBER GEE: Yeah, I have no comment.
7 It looks good. Thank you.

8 CO-CHAIR THOMAS: Thank you. Ed
9 Kelly.

10 MEMBER KELLY: I'm good.

11 CO-CHAIR THOMAS: Thank you. Ann
12 Kinner.

13 MEMBER KINNER: All sounds good to me.

14 CO-CHAIR THOMAS: Thanks. Dave Maune,
15 you've got it. Anne McIntyre. I think you're on
16 mute, Anne. Anne, we'll come back to you. Ed
17 Page.

18 MEMBER PAGE: Good to go.

19 CO-CHAIR THOMAS: Okay, thanks. Sal.

20 MEMBER RASSELLO: I'm good. Thank
21 you.

22 CO-CHAIR THOMAS: Thank you. Gary

1 Thompson. Are you on mute, Gary?

2 MEMBER THOMPSON: Yes. I'm good.

3 CO-CHAIR THOMAS: Okay, thank you.

4 Anne McIntyre, are you on?

5 MEMBER MCINTYRE: I am. I'm good to
6 go. Sorry, some tech issues.

7 CO-CHAIR THOMAS: Great.

8 MEMBER MCINTYRE: Thank you.

9 CO-CHAIR THOMAS: Sounds good. Let's
10 just make sure that, Andy, do you have any
11 further comments?

12 CAPT ARMSTRONG: No further comments.
13 Thank you, Julie.

14 CO-CHAIR THOMAS: Okay. Larry.

15 DR. MAYER: No. I'm fine with it.
16 Thank you.

17 CO-CHAIR THOMAS: Okay. Rich Edwing.
18 Are you on mute?

19 MR. EDWING: There we go. Okay. Yes,
20 I was trying to comment. Just on the page that
21 we're showing, where we say, lower cost sensors.
22 I would actually say lower cost systems.

1 Because, you know, a sensor is just one piece of
2 a larger system that you need to deploy.

3 CO-CHAIR THOMAS: That's a good point.

4 MR. EDWING: Any sort of measurement,
5 not just water levels. So, it's not just -- the
6 sensors are actually relatively inexpensive no
7 matter which one you get. It's kind of the
8 system you build around it that elevates the
9 cost.

10 MEMBER MAUNE: Okay. I will change
11 that. I will change it to lower cost systems.

12 CO-CHAIR THOMAS: Great. Thank you,
13 Dave. Juliana, any further comments?

14 MS. BLACKWELL: Nothing further.
15 Thank you, Julie.

16 CO-CHAIR THOMAS: Shep.

17 RDML SMITH: Thank you, Julie. Thank
18 you, Dave, and everyone else for a great paper.

19 CO-CHAIR THOMAS: Okay, great. So, I
20 think we have consensus on this with the changes
21 as spoken. And Dave will update this and send
22 out a final draft then to Lynne for inclusion

1 with the recommendation letter to the
2 Administrator.

3 Okay. So, let's move on here. What's
4 our time schedule here? Do we still have -- we
5 have some time, don't we?

6 CHAIR SAADE: Yes. You're doing fine.
7 Don't -- I'll keep you updated.

8 CO-CHAIR THOMAS: Okay, great. So,
9 let's switch over to NOMEK then. And let's start
10 our discussion. Now, Lindsay, are you on?

11 MEMBER GEE: I'm on. My camera? It
12 doesn't matter.

13 RDML SMITH: Julie, can I make one
14 little comment before we get started?

15 CO-CHAIR THOMAS: Of course.

16 RDML SMITH: And then I'll really try
17 to be quiet. And that is that, you know, where
18 are in this, we have the strategy. We know
19 things like we need to be inclusive, and have
20 public-private partnerships.

21 What we need to do now is figure out
22 how to do that. So, we really need advice on

1 how. That's where we are. And so, I -- you
2 know, and so, you know, I think that any ideas
3 that we come up with here could be really helpful
4 in developing that implementation plan.

5 So anyway, that was one thought, you
6 know. We hear you, the coordination, how? How
7 should we do that coordination? Any ideas,
8 right, taking into account the laws and that kind
9 of thing.

10 How should we be thinking about tech
11 and tech development? Do we have the right tools
12 and structures in place? Do we need to just do
13 more of what we're doing? Or do we need to be
14 doing something different?

15 And then, same thing for, you know,
16 for, sort of, partnerships and building capacity.
17 How can we -- do we have the right structures in
18 place, we just need to do more? Or do we need to
19 have new structures and new types of
20 partnerships? And what do those look like?

21 And, you know, I get -- partnership,
22 the word partnership makes me a little twitchy.

1 Because it means different things to everybody.
2 And I just know that if we did what we thought
3 were partnerships, half of everybody would think
4 that wasn't partnership.

5 And so, I think the -- like getting
6 into the level of detail of how, or even just
7 some examples of what success looks like, I think
8 would be very helpful. So, that's my thoughts to
9 sort of kick this off. And back to you, Julie.

10 CO-CHAIR THOMAS: Okay. Great. Thank
11 you, Shep. Lindsay, why don't you give us an
12 overview of the paper as it stands now.

13 MEMBER GEE: Yes, okay. So, let me --
14 I guess with those comments from Shep we're kind
15 of trying to address some of that, I think. But
16 not well in other places.

17 And so, there were a number of points
18 that were outlined. And then I think we need to
19 -- you know, there's more to add on to that right
20 now.

21 One of the things is like supporting
22 the mapping is the foundation of all the

1 eventual, you know, exploration and
2 characterization is pretty clear.

3 And I think there was discussion
4 yesterday in trying to define -- to make sure
5 that we define any implementation, what that is,
6 the different types of parameters that we might
7 want to be observing from the bathymetry
8 backscatter through sub-bottom, other
9 oceanographic, we'll call them parameters.

10 That's something -- and it might not
11 be something that's across the whole EEZ. And it
12 may need a regional focus for different areas.
13 Need different things. But I think it's pretty
14 clear. We've kind of said that, you know, that
15 is essential for forming the basis.

16 And how do we get there? Part of that
17 is obviously standards folk talked about. And
18 there is the symposium coming up. And I think
19 again, it kind of comes back to that discussion
20 Larry mentioned, about how we put those
21 partnerships, or whatever we call them, in place.

22 But there is a mechanism for dealing

1 with that in a legal sense, and what, as the
2 Admiral just mentioned. And I think that's been
3 a key thing throughout this that is a struggle.
4 And it's reflecting that private industry,
5 academia, and the non-Government organizations
6 are very keen to be involved in this.

7 And they want to be involved from the
8 very beginning, and not be just providing input
9 to be told later on when it gets developed, to be
10 real -- have the ownership of things as they
11 develop and go along. And I think this is that
12 kind of all-nation kind of response, to try and
13 do that.

14 So, I think that's a theme that maybe
15 we haven't addressed in the paper. Maybe we'll
16 get back to that in a minute, at the end, as we
17 continue discussion. And I will ask Larry just
18 to kind of have more comment about what he was
19 talking about, mechanisms and that, in the end.

20 One of the other things that I think
21 is -- and related to that, but I think it's worth
22 addressing separately is, we heard from Vicki

1 Ferrini yesterday. And I mentioned the UNOLS
2 vessels, and the work that's done by the UNOLS
3 and academic research fleet, and other non-
4 Government, I think, assets that are out there,
5 that have provided, you know, a lot of that data
6 into the -- into NCEI and the archives already.

7 But importantly I think in that is
8 what Vicki mentioned. There was a number of
9 programs that have been NSF funded, that are
10 really -- address some of the issues that were
11 there. And we should really leverage that. And
12 that should be part of how we do it.

13 I mean, things like, you know, first
14 off, getting the data out of the kind of PIs we
15 mentioned yesterday out of their filing cabinets,
16 and having a program to really drag them out, and
17 a way to do that with a Rolling Deck to
18 Repository. That's kind of important. Making
19 sure that the data -- the ships are well
20 calibrated, and they're going to get good data.
21 And that was the kind of Multibeam Advisory
22 Committee.

1 So, those funded efforts we should --
2 they're federally funded, so we should make sure
3 of that. And that's why I think it probably
4 should stay separate as an item in our
5 recommendations.

6 One of the other areas that we talk about
7 the data being -- we're going to be deluged with
8 the data, and that provides great challenges that
9 I think, again, it's really an opportunity.

10 And this is why I always worry about
11 calling it a map. It's no longer a map and it
12 hasn't been a map for a long time. And the data
13 and systems that are now there provide the
14 visualization and analysis, quantitative analysis
15 really, to be able to get it to that.

16 But importantly, they provide it very
17 intuitively. And that's great when you are
18 trying to present that, not only to establish
19 policy, to show results to those people that are
20 funding, but also as an outreach to the public.

21 It's like, how do we convince all
22 those folk in the inner part of the country that

1 don't have a border to the ocean, that, you know,
2 what we're doing is -- has a benefit to them as
3 well? And I think that's important.

4 So, the data that we've mentioned in
5 there about being able to present that, using the
6 latest systems, it's both for analysis, and
7 getting the data -- you know, getting maximum
8 scientific benefit from that data, but also,
9 there's that really important key kind of
10 outreach and -- for public and the general
11 public, and funders, and policymakers. So, it's
12 simply sort of simplifying that data that was
13 difficult to do.

14 The other one is autonomous systems.
15 And I agree totally with Ed. I think that was
16 the other point. I think it's remote and
17 autonomous systems we're seeing -- I mentioned
18 yesterday I think a real trigger with COVID
19 that's forced us -- like, they've been on, the
20 research has been going. Some people have been
21 using them. And I think that's where again
22 private and other non-Government folk have used

1 it. And it's being driven by economics there,
2 that it makes sense to do that and not have
3 people in dangerous situations.

4 And you can, operating properly, save
5 money and put -- do those operations with the
6 nonmanned, or nonstaffed assets. But I think the
7 COVID situation has really provided the trigger
8 to say, yes, we can do this. And we can move
9 forward. And it makes a lot of sense. So,
10 hopefully we'll see that.

11 So that -- I think that's a summary of
12 the points so far we've got. But I'm not sure
13 we're addressing all of the hows. And maybe
14 that's just a slight change in the text that we
15 put through there in a number of those points.

16 But I would like to ask Larry, he
17 raised -- since he raised it yesterday, about
18 mechanisms that might be possible. And maybe he
19 could kick off our brainstorming of that, if he's
20 thought of any particular ones that he might
21 think that, you know, from a regional, how do we
22 coordinate and collaborate that with the non-

1 Government assets across all the community.

2 Sorry to put you, Larry, but I thought
3 that was a good place to start. Because it could
4 go -- it could be a longish discussion.

5 DR. MAYER: Yes. And I worry, I --
6 you know, I'm constantly thinking about it. But
7 I have no answers. So, I worry that I'll ramble.

8 So I -- maybe we just start with a --
9 kind of a scenario where we imagine that the NOAA
10 leadership has done a phenomenal job, and
11 basically gotten the support from the Government
12 from the funding perspective, in terms of what we
13 would need to complete the NOMECC.

14 But the question is, how can we do it?
15 NOAA doesn't have on its own enough assets.
16 We're going to need to, as I said, put all hands
17 on deck. And I keep wondering, what mechanism is
18 there out there that you can coordinate beyond --
19 - that there are -- this is important, there are
20 interagency working groups all the time. It's
21 still very difficult. And I'm not a fed, so I
22 only hear this by rumor. It's very difficult.

1 It's not impossible to commingle even funds from
2 different agencies.

3 But there are things like the NOPP,
4 the National Oceanographic Partnership Program,
5 which doesn't truly commingle funds, but at least
6 offers a common front for a purpose and lets
7 different agencies contribute to that. And has
8 what I hope is a common direction.

9 But I think we need to go even beyond
10 that if we're really going to address it.

11 Imagine a situation where, you know, just you
12 have a huge area to survey off the east coast of
13 the U.S., and you have whatever NOAA assets you
14 have available.

15 Say, Ed Saade has a couple of assets
16 that might be available. University of Delaware
17 has their vessels sitting there. That might be a
18 vessel, a small server, something that --- you
19 know, all these things can contribute.

20 But how do you, you know, organize in
21 a coordinated way provide a mechanism that would
22 make that effort, that goes beyond federal

1 agencies, you know, to academia, and things like
2 that?

3 You know, if you look at NASA, you
4 know, I keep thinking, well, NASA kind of had
5 this solved a long time ago. But NASA started as
6 being the only player in town. So, NASA
7 certainly has a lot of private sector
8 involvement. NASA has lots of academic
9 involvement, and things like that. There haven't
10 yet been, but there will be philanthropic
11 organizations that want to be involved.

12 But, you know, for all space
13 exploration basically NASA is able to control it.
14 And so, there's a mechanism there.

15 In our case though we've started all
16 these parallel paths with federal agencies,
17 academics, private sector, philanthropic
18 organizations, all kind of generating their own
19 capacity.

20 Now there's a desire to coordinate the
21 activities. But that's why I was hoping, among
22 the HSRP, with all your years of experience in

1 the different sectors, if anybody had some
2 thoughts about mechanisms that could do it.

3 And the closest thing I can think of
4 is NOPP. But even NOPP really doesn't have
5 enough control to coordinate those kinds of
6 efforts.

7 So let me -- I said, that was just a
8 ramble. I haven't really thought much about a
9 response. I was hoping that we can throw this
10 out on the floor, and maybe Ed and Fugro, or
11 Qassim and his experience, somebody who's seen
12 some example of where, from a national need
13 perspective -- and there's a national need here -
14 - a mechanism evolved where you can really,
15 really coordinate multisector activity.

16 CO-CHAIR THOMAS: Thanks, Larry. You
17 know, why don't we go to Qassim right now. He
18 added a lot of good comments in the document last
19 night. And do you want to take it, Qassim?

20 MEMBER ABDULLAH: Yes. Thank you,
21 Julie. I'm glad the Admiral really brought that
22 to our attention. I agree. And we've been kind

1 of emphasizing the issue of -- the importance of
2 the partnership, public, academia, and private.

3 The mechanism, how to do it -- you
4 know, I was involved in a couple of national
5 efforts, like the development of the ASPRS,
6 mapping the -- the new one, digital. That's the
7 only one I can mention yesterday.

8 That was a collection between, you
9 know, different -- between Government and
10 private. We came together. We put our act
11 together. And we worked on it for three years,
12 believe it or not. And we achieved it, and with
13 a good success.

14 So, to answer that question on how,
15 the way I envision it is to have a task force,
16 you know, with the leadership of NOAA, and
17 whoever they want on it from NOAA side.

18 And I have members of the Interagency
19 Working Group, the IWG, for example. It doesn't
20 have to be all Government. The important ones
21 are going to be the Corps of Engineers, JALBTCX,
22 and USGS. And maybe other member. But those two

1 need to be on the table definitely.

2 We need manufacturer. You know, we
3 cannot really decide what technology when we
4 tackle this elephant without having the
5 manufacturer input. Because they can advise us
6 on what can be done, and what cannot be done, and
7 what is coming around the corner with technology.

8 So, I suggest to invite two
9 manufacturer from whatever -- see the
10 manufacturer Optech. Could be other, you know,
11 RIEGL, or Leica, or whatever. We need two of
12 them to sit on the table with us during that
13 discussion.

14 We need data producer. Two, minimum
15 two definitely. You know, like we have a good
16 example, I mean, whoever doing these surveys,
17 Fugro, Woolpert, other company, whoever. Bring
18 two of them, the most sophisticated company. And
19 doing acoustic, you know, sonar, and bathy, to
20 sit on the table.

21 And I would have definitely academia,
22 two or so, like -- so two research institutes or

1 two schools to sit with us. And we'll have
2 software, data processing development, and
3 management, you know. That's important, you
4 know. Because not only processing the data. How
5 are we going to handle this data? How are we
6 going to serve it? Now we are going on the
7 cloud.

8 So, if we form a task force on a
9 voluntary base --- I mean, we're not going to pay
10 anybody. This is all volunteer. I know it is
11 hard to, you know, to steer that herd.

12 But I think with NOAA experience now,
13 and people will love to have -- it's prestigious
14 to be on NOAA's team, you know. So, believe it
15 or not, if you think it is hard, people will rush
16 us -- particularly from the private industry --
17 to serve NOAA, and NOAA causes.

18 And I bring example of with NGS. I
19 mean, I still attribute that success of the
20 transition to the new datum and Juliana team.
21 They started seven, eight years ago. They do the
22 industry workshop.

1 They invited us -- all of us to sit
2 there, you know. And for two days, or whatever,
3 you know, where we discuss the software
4 development company, Trimble, their Esri, their -
5 -- all of them, you know. And the data provide a
6 surveyor. We all put our act together. And we
7 share our vision with NGS, how we want to see it.

8 And so, that was -- everybody felt
9 ownership. That's why there's no criticism, like
10 I mentioned to Juliana yesterday. She should not
11 feel bad about we cannot reach the goal in 2022,
12 for example. Those things happen. We have a
13 bigger plan. We're marching towards it.

14 And that's how I see, I think this
15 important thing, to be launched that way. Task
16 force represented of all the stakeholders. And
17 we can apply that. That's my suggestion, Julie.

18 CO-CHAIR THOMAS: So, Ed Kelly.

19 MEMBER KELLY: Yes. Qassim, I agree
20 with everything you're saying. And flipping back
21 to what the Admiral had requested, I would posit
22 that NOAA already has access to an existing

1 structured network that reaches out and works
2 with public and private organizations, including
3 academia.

4 In fact, perhaps almost too much
5 academia.

6 And I would say that that's through
7 the IOOS network. We have regional associations.
8 And I know several of us even here on this Panel
9 are senior members of those regional
10 associations.

11 I'm a Vice Chair of the Mid-Atlantic.
12 I know Julie is very involved. I know Ed Page is
13 up in Alaska. A lot of us are active in that.
14 And that's an opportunity.

15 The IOOS Regional Associations
16 incorporate academia as well as industry --
17 private industry that comes to us. And the goals
18 there are very similar toward --- leading toward
19 a NOMEK or other situation.

20 The win-win capability for this is
21 that that is already established and funded. And
22 it is voluntarily being worked on by academia and

1 private interests.

2 To pull in more active involvement in
3 the RAs for IOOS, if -- I would put forth that if
4 NOAA were to structure and appoint IOOS and the
5 RAs as these network coordinators that we're
6 looking for, that would help to pull in more
7 private industry and all academia, because no one
8 would want to be left out of the formulation of
9 this type of work.

10 The structure exists. It's already
11 paid for. It's active. And it's functioning.
12 Why not use it? I have a very personal thing on
13 this.

14 I think NOAA has grossly underutilized
15 the capacity and the talent that exists in this
16 national IOOS network, including exactly what
17 we're looking for, the inclusion of private
18 industry and academia to work on establishing
19 standards.

20 And through the IOOS organization
21 these tasks could be broken up among the various
22 regions for either specialty pursuits, or for

1 things that are unique to certain regions.

2 So, you know, we're looking for ways
3 to gather information, structure it, and reach
4 out to the private and academic side. And it
5 already exists. It's just not being adequately
6 used.

7 CO-CHAIR THOMAS: Thanks, Ed, for
8 bringing that up. Yes. There's also -- I use
9 the Joint Institutes. We actually work a lot
10 with industry on fed contracts at Scripps. So, I
11 think that there are some mechanisms here.

12 But let's go ahead. I wanted to call
13 on Ed Saade too. Because Ed Saade, along with
14 Lindsay and Qassim, has done a lot of work on
15 this NOMEK paper. So, Ed, do you want to give us
16 your comments here too before we get too much
17 further?

18 CHAIR SAADE: Sure. Thanks. Thanks
19 a lot, Julie. So, following out on Ed Kelly's
20 response to Shep's request. It's an endless
21 string of examples of successful public-private
22 partnerships already.

1 He already mentioned IOOS. I think we
2 do a terrible job of broadcasting the transfer of
3 technology aspect of everything that we do, all
4 the types of things that can be brought to the
5 table, between NOAA and its partners in the
6 Federal Government, that will ultimately make it
7 into industry, and literally bring in hundreds of
8 millions of dollars of activity, because NOAA
9 took the time and the effort to develop these
10 things properly and accurately, and be able to
11 then turn them loose, and let creative people go
12 find ways to make money with them.

13 I think Seabed 2030, and now Decade of
14 the Ocean, is another example. There's all
15 different parts of U.S. industries and Government
16 activity that's already coordinating with Seabed
17 2030. And that's all about partnerships. And at
18 its core it's what is needed.

19 What could be more of a partnership if
20 people are looking for free data from industry
21 and others? And they'll be spending money on the
22 data as well. The ability to -- for NOAA to have

1 giant databases that we can all contribute data
2 to, that's an ongoing successful partnership.

3 The partnership with --- between
4 industry and UNH, and other universities. I look
5 at HSRP as a partnership, personally.

6 And then the other example is NOAA's
7 ability to advocate for autonomous vehicles, for
8 instance. And really encouraging the contractors
9 to bring out new technology related to uncrewed
10 surface vehicles, and other uncrewed items that
11 are going to be rolling out.

12 When NOAA takes the time to advocate
13 for that, and encourage the industry to bring
14 those to the table, by definition that's a
15 partnership. Because it's new technology. It's
16 new capability to have the potential for a
17 profound impact on the future of the way we do
18 things. And everybody wins.

19 And I would say, don't stop there.
20 There's all kinds of other autonomous systems out
21 there that NOAA can in particular say, you know,
22 bring it on.

1 We -- our company bid on a job up in
2 Canada that was -- actually stated, this will
3 only be done with an autonomous system, with an
4 uncrewed system. I mean, you can go -- the
5 ability to demand that now is acceptable.

6 So, we can push the limits of that,
7 which by definition again increases the whole
8 private sector into really racing out to do
9 things.

10 And going back to Qassim's point about
11 bringing the instrument manufacturers right to
12 the table and getting them involved up front, I
13 think that's a really important point.

14 Because they're dying to know where
15 industry's going, where Government's going.
16 Where is the need? Where are the data density
17 needs? Where is the accuracy needs? What's more
18 important, data collection time, or resolution?

19 They don't -- they're just guessing,
20 unless they're getting really good quality input
21 from the Government agencies like NOAA, or from
22 industry. Does that help?

1 CO-CHAIR THOMAS: Yes, thanks, Ed.
2 Okay, so I can tell a few of you have requests in
3 the chat, so Dave Maune and then Anuj. So, Dave,
4 let's go with you first. Are you on mute?

5 MEMBER MAUNE: Can you hear me now?

6 CO-CHAIR THOMAS: Yes.

7 MEMBER MAUNE: Okay. I have a couple
8 of the lessons learned from how USGS does cost
9 sharing with other people. In 2012, USGS did the
10 National Enhanced Elevation Assessment. It was
11 an assessment from federal and state agencies and
12 private industry around the United States. They
13 collected 602 mission-critical activities and got
14 these various customers to identify what their
15 uses and benefits were from topographic data in
16 various quality levels.

17 That led to the USGS' 3D Elevation
18 Program to collect Lidar nationwide in the United
19 States. But USGS doesn't have enough money to
20 pay for that. So what they have is a BAA process
21 in which different clients say here is a project
22 that we need to collect the Lidar data of our

1 state, our project areas. And if you pay 50
2 percent, we'll pay the other 50 percent of it.

3 And so USGS awards a lot of contracts,
4 and they basically double their capabilities in
5 many areas by soliciting cross-sharing from other
6 people.

7 Now, that NEEA study from USGS is
8 followed by NOAA's ongoing 3D Nation Elevation
9 Requirements and Benefits Study. In that 3D
10 Nation study, we are looking not just at inland
11 topography, but we're looking at inland
12 bathymetry, near-shore bathymetry, and off-shore
13 bathymetry.

14 And we have over 1,000 mission-
15 critical activities in which different people say
16 if I get such and such bathy data, I will realize
17 so many million dollars in benefits. And then
18 NOAA will do a benefit cost analysis to determine
19 what implementation scenario will provide the
20 highest return on investment.

21 And that is another vehicle that if
22 you can demonstrate a good return on investment,

1 you can get other people to contribute funds to
2 that. But NOAA has to have a way to accept funds
3 like USGS does. I don't know if NOAA has that
4 mechanism or not. But USGS has a mechanism for
5 collecting funds from others who are willing to
6 donate to the KITTI.

7 And then lastly, you know that we just
8 finished mapping of Alaska. We had an Alaska
9 mapping roundtable in Washington, D.C. in which
10 the Office of Management and Budget and 22
11 federal agencies were collected. And we gave
12 briefings to them on the importance of IFSAR
13 mapping of Alaska. And we got priorities from
14 OMB, and different Senators and Congressmen, and
15 different --- and 20-something federal agencies,
16 to give priority to the mapping of Alaska.

17 When all is said and done, the IFSAR
18 mapping of Alaska was just completed, and USGS
19 paid 54 percent, and these other people paid 46
20 percent of it. So the USGS has some mechanism
21 for getting other people to contribute funding so
22 that USGS executes a program that benefits a lot

1 of people other than USGS.

2 So those are the main points I wanted
3 to make to see if NOAA has a mechanism for
4 accepting funds from other people.

5 CO-CHAIR THOMAS: Okay, thanks, Dave.
6 And I know it's all about the color of the money
7 coming out of appropriations. But there are ways
8 that I think we can brainstorm and put some
9 comments into this paper.

10 Anuj, why don't you go ahead. And
11 then we'll actually go around all of the members.
12 I think we have time. If we don't finish, then
13 we'll finish up after public comment in the next
14 session. But, Anuj, go ahead.

15 MEMBER CHOPRA: Thank you so much.
16 Thank you, Julie. So my thought was that the
17 NOMEK strategy is a step change in our space.
18 It's impacting the full maritime domain. It's
19 not just in isolation. It covers right across.
20 And as mentioned, it's interagency, and at the
21 same time, we want NOAA to lead it.

22 So in that space, how do we get the

1 public-private word out? My only involvement in
2 that was when MTSA came out. And there were so
3 many town halls which were held. You know, there
4 was a reach-out to industry associations,
5 stakeholders, educational institutions, which
6 made a huge amount of difference where that
7 embracing happened.

8 Today, we have so much happening on
9 the outer continental shelf. All these
10 stakeholders have a dollar stake in this. So
11 they would comment, other agencies would comment.

12 On the technology side, I would say
13 there are organic and inorganic ways. Organic is
14 already in that space. They can do innovation.
15 But I believe it's worth looking at inorganic
16 space like incubators. We have technology
17 incubators out there where there is opportunity
18 in that space.

19 Just as an example, where modeling is
20 concerned, using big data and --- which has been
21 used, there are some new strategies available.
22 And some educational institutions are doing some

1 amazing work in it. So I think there's some
2 exploring there.

3 I would like to second the idea of
4 Qassim when he mentioned that there needs to be a
5 task force which has got an independent
6 structure, as this is very important for our
7 nation going forward, how these assets are used.
8 So we need that structure with resources as an
9 independent task force to take this forward.
10 That's what I have to say. Thank you.

11 CO-CHAIR THOMAS: Thanks, Anuj. Okay,
12 these are great comments. And I'm hoping that
13 they are helpful to Admiral Smith and his team.

14 Let's just go around one by one and
15 take a minute here, and hit everyone. Ed Saade,
16 do you have anything else to comment on this
17 right now?

18 CHAIR SAADE: No, I'm fine. And I do
19 want to thank everybody for picking this up and
20 running with it. The input from the rest of the
21 team, and the broadness of the ideas was really
22 great, and I appreciate it. Good job.

1 CO-CHAIR THOMAS: Okay. Qassim?

2 MEMBER ABDULLAH: Fine, thank you,
3 Julie. I would like to thank Ed on his
4 leadership again on the drafting of the first
5 draft, and what everybody recommended and enrich
6 that document to make it much better. Thank you.

7 CO-CHAIR THOMAS: Right. So the idea
8 is, we are not actually going to probably edit
9 this document right now. What we're going to do
10 is collect ideas and get some key suggestions
11 down, and then we will be sending this out.

12 And hopefully, we were going to turn
13 this around within the next few weeks so that
14 it's really useful with the timing. But let's,
15 okay, let's continue. Anuj, do you have anything
16 further?

17 MEMBER CHOPRA: No, thank you so much.
18 Thank you.

19 CO-CHAIR THOMAS: Sean?

20 MEMBER DUFFY: Nothing to add
21 technically, Julia. I would like to come back to
22 a point that was made yesterday. It's great news

1 to see these efforts included and generated
2 through a presidential directive. And as we move
3 forward, that's critical. We've got to strike
4 while the iron's hot a lot of times. Thank you.

5 CO-CHAIR THOMAS: Great. Thank you.
6 Nicole? You're probably on mute.

7 MEMBER ELKO: There we go. Yes, so I
8 was just jotting down some notes kind of about
9 process to try to try to address the how
10 question. And I don't know how deep we want to
11 go into that, but I think a lot of good
12 suggestions were made.

13 You know, it almost sounded like, do
14 we put out a call to sort of do another project?
15 But then in the past, we just sort of pull in
16 existing data and, you know, populate a database.
17 Or do we sort of go out and collect all new data?

18 And there's probably a nice process
19 that could start out with an interagency task
20 force and flow through some regional teams that
21 could then, you know, go through that process of
22 using the data standards, put out a call, and see

1 where the gaps are, and then work together to
2 develop scopes of work, you know, federal agency
3 X can do this, Y can do this. We need to
4 contract that one out.

5 So I don't know how deep Admiral Smith
6 wants us to go into a process like that, but I'd
7 be happy to help draft something if desired.

8 CO-CHAIR THOMAS: I think my feeling
9 is that the more we can actually go into the
10 weeds with this, as far as these suggestions, and
11 get them down in writing also, but it's great to
12 have them in the public comment here, that that
13 will be helpful. But we'll get to him at the end
14 here. Let's go around the Panel

15 Okay. Thanks, Nicole. Lindsay,
16 anything further right now?

17 MEMBER GEE: No. I think those
18 comments and where we're at with the paper, and
19 Dave, well, everybody that contributed to the
20 Alaska paper, we've got a lot of work to do, I
21 think, in a short time to make sure we can get
22 something useful into this, into the

1 recommendations for implementation and strategy,
2 so lots of work to do. But, you know, I don't
3 have any more to add right now.

4 CO-CHAIR THOMAS: Okay. Ed Kelly, I
5 know you've spoken up about IOOS. Now do you
6 have further comments?

7 MEMBER KELLY: No, I'm good, Julie.
8 But I do think that IOOS is an existing structure
9 that needs to be more utilized than it is right
10 now.

11 CO-CHAIR THOMAS: Right. They
12 definitely do have the mechanism for these
13 private/public partnerships. Ann?

14 MEMBER KINNER: Yes, this is something
15 I sent out in an email a couple of weeks ago when
16 we were talking about this before. Because we've
17 got, in the NOMEK document we've got five goals
18 with metrics. And it's like building a building.
19 How do you start?

20 Well, the first thing you do is, and
21 this is the way I put it, start with designation
22 of a project manager and delineation of specific

1 actions for each of the five NOMECE goals.

2 That project manager then takes the
3 responsibility for pulling in IOOS, pulling in
4 whatever agencies and so on, and beginning to
5 generate a list of steps to be followed to eat
6 the elephant.

7 You've got to start somewhere, and you
8 can talk all day long about how many agencies
9 there are. But somebody has to actually start
10 and say, okay, this is a list, this is what they
11 can do, this is what their resources can provide.
12 This will duplicate if those guys do that.

13 And that has to start with some single
14 entity. As I say, call it a project manager or
15 whatever, but you have to take that first step.
16 We know the agencies are out there, we know that
17 the resources are out there. Somebody needs to
18 begin to make a list.

19 CO-CHAIR THOMAS: Okay, good point.
20 And Dave Maune, anything further here?

21 MEMBER MAUNE: Okay. Whether or not
22 it goes in the NOMECE paper, I would like to know

1 from NOAA, hey, if they have a mechanism for
2 accepting cost-sharing funds from other people.
3 Because I think we're going to need to find
4 alternative ways to come up with the additional
5 money. And USGS has found a way to do it, and I
6 hope that NOAA can find a way to do it as well.

7 CO-CHAIR THOMAS: Okay. We'll let our
8 NOAA folks comment on that in a minute. Anne
9 McIntyre? I think you're on mute. Are you
10 there?

11 Okay, how about Ed Page? We'll come
12 back to Anne.

13 MEMBER PAGE: I agree with Ed Kelly's
14 comments about IOOS and capabilities. We've
15 demonstrated it up here around the country as far
16 as force multiplier, leveraging resources,
17 getting things done with less money, amortizing
18 costs, all of those things.

19 And I've known several public-private
20 partnerships. The VTS and LA-Long Beach was an
21 establishment of the state Coast Guard and the
22 maritime industry. I have the same thing up here

1 in Alaska.

2 So, you know, you're providing
3 services that benefit a lot of the stakeholders,
4 the maritime industry, but other parties. And I
5 think when you leverage and get other people
6 onboard they're all seeing a need for the
7 information and willing to throw in and
8 contribute to a successful outcome.

9 So I think this whole idea of public-
10 private partnership is right. It gets a lot of
11 attention these days. It's recognized that
12 government can't do it all, but it's okay to
13 borrow the maritime industry.

14 I think you can get that word out to
15 request for information to Dennis Bryant's
16 newsletter, to the other maritime logs, as far as
17 the challenge that NOAA has and inviting the
18 maritime industry, work with them and find the
19 best solution. So a lot of good information, and
20 I think it's a huge task. But I also think it's
21 doable.

22 And part of it ought to, I think we

1 talked just briefly about now the Coast Guard's
2 partnering with NOAA to facilitate PORTS
3 dissemination as an example of partnership
4 between agencies that has really leveraged NOAA's
5 need to get things done through using Coast Guard
6 resources.

7 So again, I think it's doable. I'm
8 not disheartened by the enormity of the task.

9 Thank you.

10 CO-CHAIR THOMAS: Great. Thanks, Ed.
11 Sal, what are your thoughts?

12 MEMBER RASSELLO: Yes. I think that
13 another important stakeholder in supporting of
14 these projects could be the Department of Energy,
15 and specifically the Office of Energy Efficiency.
16 You know, in mapping the ocean, they make charts
17 of the floor, or the water column, or also the
18 elements, the way that the currents, the waves
19 can produce energy.

20 And therefore, I think they could be
21 important stakeholders in the project in
22 supporting the blue economy which eventually will

1 improve the economy and preserve the ocean at the
2 same time.

3 CO-CHAIR THOMAS: Okay, thanks. Good
4 thoughts. Gary?

5 MEMBER THOMPSON: All my points have
6 been covered, so no additional comments.

7 CO-CHAIR THOMAS: Okay, thank you.
8 Let's see, we'll go to Andy.

9 CAPT ARMSTRONG: Yes. Thanks, Julie.
10 So this is sort of an odd comment, but Bullet
11 Number 4 says the majority of deep water mapping
12 coverage in the U.S. EEZ comes from academic
13 organizations. That may be true, but that
14 doesn't strike me as something that's actually
15 documented.

16 And I would, you know, either -- I'd
17 suggest that we confirm that or take a look at
18 rewording that if we're not sure of it. Because
19 that's a big bullet. And if it turns out it's
20 not right, I think we might be a little
21 embarrassed.

22 CO-CHAIR THOMAS: Okay. Thanks for

1 bringing that up. We can follow-up on that one.
2 Anything else you have?

3 CAPT ARMSTRONG: No. No, I think the
4 thrust of the paper is great. I think we do have
5 some work to do on organization and wordsmithing
6 to get everybody together. But all in all, I
7 think it's certainly on the right track.

8 CO-CHAIR THOMAS: All right. Larry?

9 DR. MAYER: Yes. I'm glad Andy
10 brought up that point about the academic line. I
11 thought it was strange in a sense. And I don't
12 know if it's true or not. It may be true, but I
13 suspect it may not be particularly in the U.S.
14 EEZ. I think there, you know, a lot of the
15 academic mapping went beyond the EEZ. So I think
16 we have to be careful about that.

17 And I'm not sure that, as a separate
18 point, really adds to the document. You know, I
19 think we talk about the need for collaboration
20 and cooperation, but recognizing that point is
21 going to emphasize the need for collaboration and
22 cooperation. I don't think having that as a

1 separate bullet is an appropriate thing. But
2 again, that's in the weeds, in the details. I'm
3 very happy.

4 CO-CHAIR THOMAS: That's okay. I want
5 to address that right now. Because actually,
6 between Qassim and Lindsay it's now combined with
7 Number 3. You say comment and sense, it was sent
8 out. And I don't know, Lindsay, do you want to
9 make a comment on that particular input?

10 MEMBER GEE: No. Yeah, I think it is
11 something we can check there. And we should be
12 able to that pretty easily, I think, for the
13 number of ship tracks probably within the -- and
14 I'm not sure that that number hasn't been
15 calculated for the kind of EEZ deep water mapping
16 to work out what that percentage is.

17 But yeah, maybe that's just an example
18 that we could include inputs on. I think it's
19 going back either way. We've had the discussion
20 that it's sometimes part of that partnership
21 sometimes, isn't it? I thought it was better
22 being separate, but maybe not.

1 It was more to demonstrate, I think,
2 the programs that have been federally funded that
3 supported the approaches to say there's been a
4 lot of work there that should be leveraged in
5 this program. So whether it's an example or not,
6 I think it's important to highlight it either
7 way.

8 DR. MAYER: I agree.

9 CO-CHAIR THOMAS: Right. And maybe we
10 could just reword it, like you said, where
11 there's a lot of work that we should leverage
12 here rather than making a definite statement that
13 they really collected more data. So we might
14 reword that a little bit.

15 Let's go to Rich Edwing.

16 MR. EDWING: I really have nothing to
17 add. It looks great to me.

18 CO-CHAIR THOMAS: Okay. Thank you.
19 Juliana?

20 MS. BLACKWELL: I think Dave brought
21 up a great point about the Department of
22 Interior's geospatial products and services

1 contract. I just want to, I think that does
2 definitely deserve us looking into, to determine
3 if there are opportunities to utilize something
4 like that if it's through Department of Interior
5 or through our acquisitions and grants office.

6 I will just also mention that, you
7 know, different departments have different
8 authorities and protocols. So I think we should
9 look at it both ways. And I'm sure that there's
10 a lot more details that we have behind the scenes
11 that we can pull out and see about opportunity.
12 So thanks, Dave, for bringing that up.

13 CO-CHAIR THOMAS: Okay. And before I
14 go further, I think Andy has another comment.

15 CAPT ARMSTRONG: Well, I just wanted
16 to add that NOAA does have authority to accept
17 money from outside organizations, to accept
18 funds. You know, it all has to get legal and
19 administrative scrutiny, but the basic underlying
20 authority is there.

21 CO-CHAIR THOMAS: Great. Nice to
22 know. Okay. Let's go to Shep.

1 CHAIR SAADE: Sure. Let me just say,
2 Shep, we only have about three minutes.

3 RDML SMITH: Okay. I'll make it
4 quick. And I won't try to comment on everything.
5 There was a lot of great stuff out there. But
6 Andy covered and Juliana covered our authority,
7 as they said. We have the underlying authority.
8 And in fact, in my intro brief, I gave those
9 examples of us using other federal money for
10 mapping.

11 I wanted, just a couple of thoughts,
12 one is the idea of a task force. If we talk to
13 our lawyers about it, say that we want to start a
14 task force, they're going to say you need to
15 start a federal advisory committee.

16 So I think what you're recommending is
17 that we form a different federal advisory
18 committee to advise NOAA on ocean mapping or that
19 we have a federal advisory committee that sits
20 above the agency level. But those are pretty
21 tough.

22 So anyway, I think it's an interesting

1 suggestion. We do have some, you know, we do
2 have some authorities like that. But I'm trying
3 to figure out how it's different than what we
4 already have in this structure for engaging with
5 all of the outside sectors.

6 CO-CHAIR THOMAS: Shep? Could I just
7 interrupt for a second.

8 RDML SMITH: Yes.

9 CO-CHAIR THOMAS: We're going to come
10 back to this discussion, so we don't need ---

11 RDML SMITH: Okay.

12 CO-CHAIR THOMAS: -- like, we're going
13 to wrap it up right now. We could start with you
14 when we come back to it after our next --

15 RDML SMITH: Okay.

16 CO-CHAIR THOMAS: -- if you'd like.

17 RDML SMITH: Okay. I think that's
18 great. I think it's important to have an
19 opportunity for the public comments as well.

20 CO-CHAIR THOMAS: I do too. So why
21 don't we go back over to Ed now. Because I
22 really want to hear some of your feedback and

1 comments. And then I have a couple of comments
2 too. So let's break right here on this
3 discussion with NOMEK and turn it back over to
4 you, Ed.

5 CHAIR SAADE: Okay. Thanks a lot,
6 Julie, that was a great job and obviously a lot
7 more really meaningful dialogue and ideas that
8 came in.

9 So I'll kind of do a double hand-off
10 here and hand it back to Shep, as he's going to
11 take the lead on moderating today's public
12 comment period. So, Shep, I'm not sure if you
13 want to say anything in the one minute you have
14 before we open up the line?

15 RDML SMITH: No. I just, for those
16 that are joining us today that were not here
17 yesterday, we had a very full public comment
18 period yesterday. We had a dozen or so written
19 comments that I summarized. And then we invited
20 a few folks to give a short summary of their own
21 comments, a couple of minutes apiece. And that
22 worked out pretty well.

1 We'd like to do the same thing today.
2 I think we have about six comments that have come
3 in. And I think we will have an opportunity,
4 there's one of them that the commenter will not
5 be able to speak to. And I agreed to read the
6 comment into the record. But otherwise, I think
7 we will just recognize all of them to make their
8 own points.

9 So without further ado, first on the
10 list is Rada Khadijinova from Fugro in Anchorage,
11 Alaska. Rada, are you on the line?

12 MS. KHADIJINOVA: Yes, I am.

13 RDML SMITH: Hi, welcome.

14 MS. KHADIJINOVA: Yes, thank you. And
15 a big shout-out to two Eds on the Panel, Ed
16 Saade, my boss, and Ed Page, my Alaska associate.
17 And it's great to see many familiar faces that I
18 met in Juneau just a couple of years ago.

19 My comment is twofold. Fugro's been
20 performing project work in Alaska since the '70s,
21 and we know firsthand the geospatial data
22 deficiencies that exist in our state,

1 particularly on the coast where activities of
2 public, commercial, recreational, and indigenous
3 users intersect.

4 That's why Fugro's been advocating for
5 creation of an Alaska coastal mapping program for
6 the last eight years. And we are encouraged to
7 see the great progress since the issuance of the
8 presidential memorandum last November and the
9 good work HSRP has been doing in refining the
10 implementation of the Alaska coastal mapping
11 program.

12 So my comment is on the original
13 Alaska coastal mapping program that initially is
14 focusing on the areas that can be mapped only
15 with airborne and satellite technologies. And
16 this is a great first step in the right
17 direction.

18 But areas where airborne and satellite
19 methods are unfeasible or inefficient due to
20 water clarity, shallow water acoustic sensors, of
21 course, would have to be used. And this type of
22 work mirrors NOAA's OCS hydrographic surveys and

1 could amount to two-thirds of the state, by the
2 current predictions.

3 So since the Alaska Coastal Mapping
4 Strategy does not yet account for these big
5 chunks of coastline, which exactly fall under the
6 national mapping strategy, there is a danger that
7 this effort could end up being managed by two
8 separate mapping programs.

9 So from our perspective, that is not
10 the most efficient approach. And certainly the
11 clarity of water can change spatially and
12 temporally, so it's difficult to predict where
13 these remote sensing technologies would work as
14 intended.

15 So we believe that highly integrated
16 and flexible approach that combines both remote
17 sensing and the shallow water bathymetric sensing
18 technologies is the most efficient and cost
19 effective program rather than two separately
20 executed programs.

21 And I had an opportunity this morning
22 to see a preview of the HSRP's recommendations.

1 So they are quite along the same lines as this
2 comment.

3 And the second, I echo, the second
4 point is the integration of private sector,
5 particularly during the development of the
6 implementation strategy and particularly
7 contributions in the cutting-edge proven
8 technology.

9 Certainly Fugro is already mapping
10 coastlines around the state. And we have
11 developed and are using project cutting edge
12 technologies in the realm of communication
13 centers, platforms, processing, and so forth, so
14 fully leveraging these innovations and these
15 resources.

16 We also believe we are engaged and
17 involved during the formulation of the
18 implementation plan and not just during the
19 comments on the plan. So thank you for the
20 opportunity.

21 RDML SMITH: I was still unmuted.
22 Thank you, Rada, for your great comments, and

1 also thank you for calling out our Eds. We're
2 very proud of all of our Eds on the HSRP. And
3 occasionally we get asked, you know, how many Eds
4 is enough? And we haven't discovered that limit
5 yet.

6 (Laughter.)

7 RDML SMITH: So thank you for your
8 comments. Next, we have Irv Leveson, a
9 consultant and economist. Irv, are you there?

10 MR. LEVESON: I'm here.

11 RDML SMITH: Welcome, Irv, and go
12 right ahead.

13 MR. LEVESON: Okay. Several points,
14 and I submitted written comments earlier. And I
15 just typed in some more, so you have a record of
16 it.

17 One point I want to make is that
18 everybody agrees that NOAA's strength is the long
19 view. But there's always a concern about
20 funding. And we may be as little as six months
21 away from a national infrastructure bill.

22 And I think there's additional work

1 that needs to be done to make clear how the early
2 phases of such a program could be defined and how
3 they might fit into such a bill in order to move
4 quickly on the funding. So that's one major
5 issue.

6 Now, one thing I suggest is that, and
7 it may not be the only way to do it, is to have a
8 kind of a plan to make plan that fits in between
9 these documents and a detailed plan.

10 The second point is I emphasize the
11 importance of fixing the responsibilities, and
12 that was covered very well so far today.

13 Then I wanted to emphasize the fact
14 that any work in the early phases, and it could
15 be done through an accelerated funding mechanism,
16 could be sold as bringing the long term benefits
17 to the environment closer in time so that, for
18 those who think the emphasis should be on long-
19 term benefits, rather than more immediate or
20 practical ones at the moment, they can be seen as
21 something that helps what they want to do as
22 well.

1 Then in terms of technology, I think
2 the point was rightly made that most of the
3 learning about what's coming down the line will
4 come from industry. But there also are agencies
5 and other governments that have similar issues,
6 even though we may have the critical mass and be
7 farther along in many respects.

8 And we have a lot of mechanisms for
9 interaction, so I'd like to see that explicitly
10 mentioned that we can use those mechanisms to try
11 and learn what they know about what technologies
12 are coming or what works currently. That's it.

13 RDML SMITH: All right, thank you. I
14 appreciate you taking the time to put together
15 such thoughtful comments. And I also appreciate
16 your really well thought through written comments
17 which we will incorporate into the public record.
18 So thank you very much.

19 Next is Alice Doyle, the deputy
20 executive secretary from UNOLS. Alice, are you
21 there?

22 MS. DOYLE: I am here. Can you hear

1 me?

2 RDML SMITH: Loud and clear. Go right
3 ahead.

4 MS. DOYLE: First, it's been super
5 interesting to listen and hear. And I appreciate
6 being able to do that. And thank you for
7 allowing me to comment here. As you mentioned,
8 I'm Alice Doyle. And I work with the UNOLS
9 office. And we are an organization which helps
10 facilitate the U.S. academic research fleet.

11 We wanted to point out some of these
12 comments, I think, have been made, so I'm kind of
13 pressing the point again. But the U.S.
14 government agencies have invested significant
15 funding into the fleet's instrumentation and
16 technical support, making them very capable for
17 mapping and characterization.

18 Additionally, as Vicki pointed out
19 yesterday, there have been further initiatives
20 specific to data management and data quality.
21 These initiatives, like R2R and MAC, have
22 significantly increased the quality and the

1 quantity of data that has gone into the national
2 data repositories.

3 And the fleet is managed within a
4 proven framework, right. We manage fleet-wide
5 all of these vessels, everything is put onto the
6 table. And so I could see where there could be
7 some integrations here with this initiative.

8 And it has been pointed out, the
9 implementation of this sort of initiative is
10 going to take significant coordination. And we
11 hope to work with those involved to find the
12 synergies where our fleet can help.

13 This could be on the data side with,
14 and we plan to participate with the SOMP. And
15 then also, even on the mapping and
16 characterization side, little things like moving
17 our tracklines if we're going to a certain area,
18 helping and finding areas where we can fill in,
19 or also with taking advantage if one of our
20 vessels is in a certain area.

21 So thanks again, and feel free to
22 reach out if there are any questions.

1 RDML SMITH: All right, thank you very
2 much, Alice, appreciate it. And I'm so glad that
3 you all are so plugged in to, you know, both the
4 NOMECC council but also the SOMP which is, it's
5 just a really important near-term effort to start
6 to get some of that standardization done. So
7 thank you, and thank you for your comments today,
8 and for participating.

9 Next up we have Kyle Goodrich,
10 president and founder of TCarta Marine, LLC. Go
11 ahead, Kyle.

12 MR. GOODRICH: Hello, can you hear me,
13 Admiral?

14 RDML SMITH: Loud and clear.

15 MR. GOODRICH: Is my mic on? Okay.
16 Thank you very much for the opportunity to read
17 our comments. And I really appreciated listening
18 on the discussion yesterday and today. And I
19 know you, but for those who I have not met, I am
20 president and founder of TCarta.

21 And TCarta Marine is a 15-person small
22 business based in Denver, Colorado, specializing

1 in marine remote sensing and satellite-derived
2 bathymetry, and awardee of a Phase II National
3 Science Foundation Small Business Innovation
4 Research grant, and are seen as global innovators
5 in the satellite-derived bathymetry field.

6 We're a woman-owned small business,
7 HUBZone certified, and on several U.S. government
8 IDIQ geoservices contracts as a subcontractor.
9 Yet we somehow still have an utter struggle with
10 working with the U.S. government at times.

11 And at times we've had an easier time
12 working with the British and international
13 governments, not necessarily due to the
14 contractual vehicles but largely due to the U.S.
15 government's less-than-pragmatic approach when it
16 comes to utilization of our satellite-based
17 technologies and often relegating our products to
18 a research product or the bottom of the priority
19 pile.

20 And so from TCarta's experience, the
21 messaging and partnering with small businesses
22 and fostering industry partnerships is stated at

1 this very high level, but we're not necessarily
2 seeing it at the ground level where we're trying
3 to push our innovative technologies through to a
4 capability.

5 TCarta invested considerably in the
6 technology development, and building business
7 relationships with bioimagery suppliers, and
8 countless hours fording into U.S. government
9 agencies with these nascent technologies as a
10 small business over the past five years.

11 We have made a lot of inroads and
12 gained technical approval at NOAA, and NGA, and
13 the U.S. Navy, and on many levels we see and hear
14 of a tremendous need for our products and
15 utilization of our capabilities.

16 Yet in each of these cases, we
17 encounter obstacles that often take months or
18 even years to overcome, including lack of access
19 to these entities, government entities who will
20 not engage with TCarta, or point to other
21 agencies as the true gatekeepers of this
22 technology to unlock the commercial potential.

1 Now, since 2008, I'm sorry, 2018, the
2 National Science Foundation has awarded TCarta
3 nearly a million dollars in grant funding to
4 pursue these hydrographic technologies. We've
5 had international governments and hydrographic
6 organizations take up these technologies to use
7 them in their charting operations.

8 The whole while we're waiting on these
9 various U.S. agencies to evaluate our data and
10 work through the legacy in-house technologies or
11 perspectives on these technologies.

12 And meanwhile, the commercial high
13 resolution satellite industry providers, which
14 are vital to the success of this technology, are
15 the last to continue to support this satellite
16 bathymetry, if the U.S. government continues to
17 be slow in adopting this technology and seeing
18 that larger need of using satellites to map the
19 sea floor.

20 We've developed a proven workload in
21 past experience as required to do this work at
22 scale, and we can contribute to the national

1 bathymetric surveying effort and complete vast
2 areas of essential coverage.

3 There's no COVID in space, so we're
4 fully operational, and satellites are still
5 collecting imagery. And so TCarta can contribute
6 significantly to the national bathymetry mapping
7 effort while other technologies are idle.

8 And I'm sitting here right in front of
9 the NOAA nautical chart that has satellite
10 bathymetry published on it in 2012. And the map
11 has been a target in the eyes of TCarta to, you
12 know, to be a supplier for satellite derived
13 imagery for NOAA's operations.

14 And by the way, I had pictured this
15 having data on the map should provide the pathway
16 for commercial entities to follow those
17 specifications and regulations to provide this
18 technology to help NOAA.

19 So the technology of satellite derived
20 bathymetry has evolved by several orders of
21 magnitude since 2012. And yet NOAA's acceptance
22 and implementation of the technology from

1 commercial providers has not progressed.

2 And so from our view, in order to
3 foster small business relationships, government
4 has to work faster to meet the pace of the
5 technology that small businesses are developing
6 and the operational cadence of small businesses
7 that, by our nature, we have to be nimble and
8 quick to deliver a final product for a client.

9 And government researchers should be
10 focused on how to work with these solutions, not
11 to prevent them through indecision and inaction.
12 Those are my comments, and thank you very much
13 for your time.

14 RDML SMITH: Thank you, Kyle. I
15 appreciate you joining us. And thanks for your
16 comments and for the written version as well.

17 So next, we have Jessica Podoski from
18 the Army Corps of Engineers. Go ahead, Jessica.

19 MS. PODOSKI: Hello, thanks for the
20 opportunity to comment. Aloha, this is Jessica
21 Podoski from the U.S. Army Corps of Engineers,
22 Honolulu District. I'm sorry that we're not

1 hosting you here in Honolulu, but hope to see you
2 all here next year.

3 RDML SMITH: As are we.

4 MS. PODOSKI: I wanted to bring --

5 (Laughter.)

6 MS. PODOSKI: I wanted to bring to the
7 Panel's attention a specific data collection need
8 in the U.S. Territory of American Samoa.
9 Bathymetry data has recently been collected by
10 NOAA in other U.S. territories in Guam and CNMI.
11 And we're very much looking forward to getting
12 that information. But none has been collected in
13 American Samoa.

14 This is a need for many reasons, one
15 of which is that subsidence from recent
16 earthquakes has caused the island to experience
17 extreme sea level rise, many times the global
18 average. And we think that this is causing
19 increased coastal inundation.

20 So bathymetry data such as lidar,
21 airborne lidar, specifically would work well here
22 because of the clear water and shallow waters.

1 And it would help to evaluate that sea level rise
2 vulnerability that they're experiencing.

3 And this is a heavy lift in terms of
4 logistics and cost. But perhaps this is an
5 opportunity for the Corps of Engineer and NOAA to
6 collaborate on that cost or implementation.

7 Thanks for the opportunity to comment.

8 RDML SMITH: Thank you, Jessica. It
9 sounds like a big problem. And I will be sure
10 that our operations folks become aware of that
11 requirement and get in touch with you. Thank
12 you, Jessica.

13 MS. PODOSKI: Thank you.

14 RDML SMITH: Next, also from Hawaii,
15 is Joyce Miller. Go ahead, Joyce.

16 MS. MERSFELDER-LEWIS: Joyce, you're
17 muted.

18 RDML SMITH: Yes, Joyce, you're still
19 muted.

20 DR. MILLER: Okay, is that good?
21 Hello?

22 RDML SMITH: Loud and clear, Joyce.

1 Go ahead.

2 DR. MILLER: Okay. Yes, also from
3 Hawaii, Island of Oahu. I kind of feel like the
4 corporate memory --

5 (Audio interference.)

6 MS. MERSFELDER-LEWIS: Joyce, you're
7 muted again.

8 DR. MILLER: Okay. I kind of feel
9 like the corporate memory here, having been
10 involved with IOCM since 2002, and with the HSRP
11 starting in, I think, 2011, I believe. At any
12 rate, one comment was that the HSRP, I believe,
13 in one of our letters about five or six years
14 ago, asked about interagency funding. And if
15 indeed action has been taken on that, that's very
16 good news.

17 Secondly, my first comment was I sent
18 in two documents dating back to 2011 and 2012.
19 And some of the Panel members said they could
20 find no records of mapping standards. I sent the
21 documents to Lynne Mersfelder-Lewis. They are
22 titled NOAA IOCM Seafloor Mapping Standards 2.0.

1 And those are on the internet.

2 And I also sent in Use of External
3 Source Data for Nautical Charting Policy, Version
4 4. I pulled it off my computer, basically, from
5 that time period. So please don't reinvent those
6 wheels, particularly for deep water mapping where
7 technology really has not changed much recently.
8 We've been following those standards for years.

9 And the third comment is on the
10 statement about academia funding research. At
11 least here in the Pacific, in the last decade,
12 most of the funding for mapping, inside the U.S.
13 EEZ as well as outside, has come from private
14 organizations such the Schmidt Ocean Institute
15 and others. There's been several, particularly
16 in the northwest Hawaiian Islands.

17 Schmidt, using the Falkor, provided
18 millions of dollars worth of funding to map up in
19 the northwestern Hawaiian Islands, 70 days of
20 free ship time about four years ago.

21 So that, and the other major chunk has
22 come through UNH from the Department of State for

1 the extended coastal mapping. So the statement
2 about academic funding inside the U.S. EEZ, I
3 would agree, is probably not accurate.

4 And I'll be sending in comments once
5 I've read the draft paper on the comments about
6 NOMEAC. I'll send comments to Lynne. Thank you.

7 RDML SMITH: Thank you, Joyce,
8 appreciate your comments. Next up, we have Guy
9 Noll. Go ahead, Guy.

10 MR. NOLL: Hi, thank you for allowing
11 me to speak about the Geospatial Data Act of 2018
12 and the value that is inherent in leveraging
13 that, I think, by the HSRP for this NOMEAC
14 requirement.

15 One example I wanted to point out to
16 the Panel is that the GDA mandates inventory and
17 assessment of geospatial data assets as part of
18 an annual budget submission. And that this
19 should address long standing issues about the
20 evaluation of geospatial data and the associated
21 infrastructure in each agency.

22 So this may be a way for the HSRP to

1 stress the need for the NCEI integration, for
2 instance, but also highlight the need for sharing
3 that information to others. And that could be a
4 public-private partnership experience.

5 You know, Esri has their living atlas,
6 there are other mechanisms as well, and academic
7 as well as non-academic sharing should be
8 encouraged. That's all, thank you.

9 RDML SMITH: Thank you, Guy,
10 appreciate you flagging that. I think that's an
11 important piece of the policy puzzle that we need
12 to be putting together. And that's the first
13 time it's been raised. So thank you.

14 Okay, now we have two comments from
15 folks who are not available to read them, to make
16 their own statements. The first is from Denis
17 Hains, and he had two comments.

18 The first is, if it's not being
19 clarified in writing in the presidential
20 memorandum on NOMEK yet, it should be stressed
21 and written down officially that NOAA-NOS has the
22 lead role and the accountability for funds

1 distribution and the delivery of outcomes and
2 outputs of the whole NOMEK program through U.S.
3 federal agencies and departments.

4 And the second comment is that, it's
5 important to make sure that capacity-building
6 strategy be developed through means such as
7 crowdsourced bathymetry and by transfer of
8 traditional knowledge taking place with
9 aboriginal communities of the Alaska coast and
10 remote communities everywhere in the U.S. to
11 mobilize and engage all and in strategic
12 alliances.

13 Thank you, Denis, for raising
14 particularly the role of the indigenous
15 communities, but I think the larger point is even
16 more broadly available, as we get closer to the
17 coast, that the locals know a whole lot about the
18 waterways that could inform our work. So I
19 appreciate you adding those into the public
20 record.

21 And the second comment is from Jeff
22 Douglas. Jeff is the founder and CEO of

1 Mythos-AI, artificial intelligence. Let's see,
2 the comment is, the founders of Mythos-AI have
3 managed autonomous surface vehicle, ASV, programs
4 and the self-driving car autonomy development for
5 Uber, Lyft, and Argo-AI, which is Ford and
6 Volkswagon.

7 Mythos-AI's developers apply state of
8 the art self-driving car technology to create a
9 robust scale of autonomous solutions for the
10 maritime sector. At Mythos-AI, we are developing
11 a next-generation autonomy framework we believe
12 will revolutionize the hydrographic industry by
13 enabling the adoption of advanced machine
14 learning and true automation in the sector.

15 Our ambition is to create the first
16 autonomy framework vertically integrated from the
17 ground up focused on hydrography and coastal
18 survey. We are confident that our technology
19 will solve many of the challenges associated with
20 the hydrographic workflow.

21 Our plan is to use this technology to
22 gather and provide data more efficiently than

1 current technologies allow. Given this business
2 model, the government is one of our largest
3 customers.

4 As a tech startup, we find it
5 difficult to obtain and leverage government
6 funding in the hydrographic technologies and
7 services space. The contracting process is
8 burdensome and can span over several months.

9 We could partner with research
10 institutions, but in that we may have to share
11 some of our IP. It would be very helpful for
12 tech startups developing neighboring technologies
13 in this space to have efficient access to
14 funding.

15 So thank you, Jeff. Jeff Douglas and
16 John Houston provided that for Mythos-AI.

17 So I'm checking my notes here. Do we
18 have another comment as well from ---

19 MS. MERSFELDER-LEWIS: Yes, Shep, you
20 have one more comment from Eric Fischer if he
21 wants to speak. I don't know if he does or not.
22 Otherwise you could just summarize it. I put it

1 in your annotated agenda.

2 RDML SMITH: Okay. Eric, are you
3 there? I don't hear anything so far.

4 MS. STODDARD: Just one moment.

5 RDML SMITH: Okay. You got him up,
6 okay. Thank you, Jill.

7 Eric is on his way, I'm assured.

8 MS. STODDARD: I believe Eric is
9 there. There we go.

10 RDML SMITH: Hi, Eric. Go ahead.

11 MR. FISCHER: Hey. I wasn't sure if
12 this got touched on earlier. Would you envision
13 some type of kind of a joint chiefs of staff kind
14 of a scenario with organizations and leadership
15 from the top, but also including folks like from
16 the Navy? I think there could be value in
17 coordinating with different military and
18 intelligence needs that are going on at the same
19 time?

20 RDML SMITH: Yeah. Well, I'll comment
21 really quickly. Because I think we didn't cover
22 this in very much detail. Although it's buried

1 in the NOMEK strategy that they're at the
2 beginning of an inter-government, a cross-
3 government interagency governance structure being
4 setup.

5 And it does include representatives
6 from, there's a lot of Navies it turns out, from
7 ONR, and the sort of operational side, and then
8 there's the more security side. And they're all
9 represented.

10 And in addition, there's a
11 coordinating function that's operating on the
12 classified side that will coordinate these
13 activities with the National Security needs of
14 the nation.

15 MR. FISCHER: Excellent.

16 RDML SMITH: I'm happy to give you a
17 little more detail if you'd like it some other
18 time.

19 So I've added what I see for public
20 comments. Thank you all for some excellent
21 public comments. And with that, I'll turn the
22 floor back to our Chairman, Mr. Saade.

1 CHAIR SAADE: Thanks, Shep. Thanks to
2 everyone that took the time to provide public
3 comments and get engaged. We really appreciate
4 that. And we consider it a big success during
5 the HSRP when there's a lot of feedback and
6 interaction.

7 With that, I now am going to introduce
8 Captain Brennan and Captain Chopra who will give
9 us an update from the Technical Working Group
10 activity. So if the two of you can pop up and
11 turn on your mics, we'll hand it over to the two
12 of you to take the lead. Thank you.

13 CAPT BRENNAN: Hi, good afternoon.
14 Can everyone hear me?

15 MS. MERSFELDER-LEWIS: You're good.

16 CAPT BRENNAN: This afternoon, we're
17 going to be talking about a billion dollar
18 problem. And that's just a billion dollar
19 problem as we see it in the Port of
20 Houston-Galveston.

21 And so I think the panelists that
22 you're going to hear this afternoon, and Maria

1 will explain that very well, and I'm excited for
2 you all to hear what she has to say. I've had a
3 chance to preview that, and I think you'll find
4 it very interesting.

5 I know NOAA stands by to assist in
6 this situation, not just in the Port of Houston-
7 Galveston but, you know, as an issue, fog as an
8 issue across the country. Because I think, as
9 you'll see, it does have a significant impact.

10 So as Rich Edwing said earlier today,
11 you know, we are in, you know, we are actively
12 working on the observations required to assist
13 with fog, the predictions of that through the
14 probability of visibility models that are
15 currently being created at the National Weather
16 Service, all of our various charting products and
17 water-level information.

18 And so I think we are standing by to
19 bring the full force and weight of NOAA's
20 maritime data enterprise to this problem. So
21 without any further ado, I'll pass the mic on
22 that. And I appreciate the opportunity to sit on

1 this panel.

2 MEMBER CHOPRA: Thank you, Captain
3 Brennan. Good afternoon to all of you. I hope
4 all of you and your teams and families are doing
5 well in these COVID times.

6 I would like to especially thank a
7 very big thank you to Lindsay, to Qassim, to
8 Captain Brennan, and many other members of the
9 HSRP for the comprehensive technology workshop
10 group meeting where we have carried out robust
11 discussion on the marine traffic interruptions
12 for our ports and commerce caused by restricted
13 visibility, specifically fog, in the winter
14 months, especially in Texas ports. And like
15 Captain Brennan said, we were looking at Houston-
16 Galveston in specifics.

17 We looked at commercial and economic
18 impacts to understand the scope of the problem.
19 We also reached out to other major ports as to
20 how they were successfully dealing with the fog
21 issue without causing a serious interruption to
22 the cargo flows by using precision navigation and

1 technology.

2 To better understand the impact caused
3 by port closures due to fog, and specifically the
4 economic impact, it is indeed my privilege and
5 pleasure to introduce Professor Maria Burns from
6 the University of Houston to share her thoughts
7 and findings.

8 I understand her bios already
9 available to all of you. Thank you, Maria, very
10 grateful if you can come on with your
11 presentation.

12 MS. MERSELDER-LEWIS: You guys, Maria
13 is self-muted. So if she could unmute herself,
14 and we sent her a webcam request.

15 MS. BURNS: Thank you very much,
16 everyone. First of all, I feel grateful to be
17 invited in your amazing media and NOAA's annual
18 event. I really appreciate this. I was hoping
19 to be able to be a part of the solution in this
20 billion-dollar problem.

21 So we're going to talk about the
22 Houston-Galveston area and the challenges of

1 restricted visibility. Again, I would like to
2 thank each one of you on the committee.

3 I would just mention that the impact
4 of fog in the maritime industry, everything that
5 we're going to say here can be applied in many
6 other fog-related ports in the country and the
7 world.

8 In this presentation, I will estimate
9 the financial and commercial losses across the
10 logistics network and underline the need for new
11 fog sensors. So we're talking about fog and
12 visibility detectors of a new generation.

13 And we can move on to the next slide,
14 please. Thank you. So the ports of Rotterdam
15 and Hamburg are among the leading ports, some of
16 the many leading ports globally. And as you can
17 see, they combine very intricate configurations.
18 And at the same time, they suffer from fog.

19 So what they've done proactively, they
20 have adopted new fog sensors. They have
21 transformed their shipping and logistics
22 operations. As a result, they have minimized

1 delay-driven costs which include operational,
2 capital costs, the growth within the region in
3 general.

4 And we can go on to the next slide
5 telling us that everything that they have
6 implemented, we might need to consider, because
7 we are having a problem. Houston, we have a
8 problem.

9 So the Houston-Galveston region
10 expands through 52 miles. Just the Port of
11 Houston comprises 25 miles and 200 terminals. It
12 experiences closures for over 22 full days every
13 year, and we have noted that the number, you
14 know, close to 22, like it can be 20, 23, but
15 pretty much there is a consistency for the past
16 few years.

17 Just understand what is at stake here
18 during those 22 days. We are evaluating the role
19 of Texas and the U.S. Gulf region in terms of
20 economic growth. But we have heavy traffic as
21 well, and many berths.

22 First of all, maritime contributes to

1 seven percent of our regional GDP with two
2 million transportation jobs across the country.
3 At the same time, over 90 percent of the U.S.
4 energy comes from the U.S. Gulf. And Houston,
5 Texas, Galveston, are very close to (audio
6 interference). We are the U.S. Gulf, you know, a
7 big chunk of it.

8 And of course, we have many millions
9 of jobs that are at jeopardy every time there is
10 no corrective action or stance when it comes to
11 the fog. This is a common problem when we talk
12 to industry professionals and, of course, other
13 entities, dominant entities. Because fog-related
14 delays are very tough to explain to our
15 customers, let's say the industry people.

16 When they're expecting their cargo,
17 and the cargo has a five-day delay, we have to
18 consider the entire logistics network from raw
19 materials, so semiprocessed goods, to refineries,
20 whatever the cargo is, value-added stages of the
21 supply chain, finally the distribution, the
22 warehousing systems. So five days of idleness or

1 five days of delay are making a big difference.

2 Another particularity, especially in
3 this region, is that fog doesn't just last for
4 one day and then it goes. Typically we have
5 three days in a row, five days in a row. And we
6 can google that, and it's very easy to see all
7 those front page news.

8 And we can move on the next slide,
9 please. So basically, the newspapers, the media
10 talk about this financially, about the ship
11 channel and the problems. But the articles we've
12 seen so far just focus on the ship side, like how
13 much has been lost on behalf of the ship owners.

14 If we consider the client of the ship
15 owners, the higher logistics network, this amount
16 is vast. And you can just see the whole supply
17 chain network right here.

18 And we can move on to the next slide.
19 You can see many of the different layers or
20 dimensions of the fog disruptions and the impact.
21 So we're talking about safety problems, the ship
22 collisions.

1 And I have to quote Captain Anuj
2 Chopra, you know, like we're waiting for an
3 accident to happen. Environmental pollution, we
4 can't even imagine what would happen if there was
5 one major accident within 52-mile channel. That
6 would be very damaging.

7 And we have to consider the economic
8 losses. Thinking of Galveston, the cruise ships,
9 just consider the many thousands of people that
10 are navigating. You know, they are taking their
11 vacations. Those mega cruise ships can have
12 10,000 people at a time, 7,000 people at a time.
13 So the impact is vast. Because in the past, we
14 had people stranded at the Port of Galveston.

15 And then the social impact, we have to
16 mention coronavirus. We know that a lot of the
17 supply chain pertains to urgent items. And these
18 items cannot wait. It's a life or death issue,
19 medical supplies, first aid, and so on. Plus
20 tourism, of course. Lockdown is not out of the
21 equation yet, so we don't know what will happen.

22 And we can move on to the next slide,

1 please. So these are just some pictures to
2 illustrate what we're trying to see here, any
3 kind of collision, any kind of, you know, people
4 stranded. We see thousands of container boxes
5 being stopped at ports.

6 And finally, let us consider the
7 trucking industry, all of these trucks being
8 stuck on bridges, making a U-turn, creating havoc
9 within the city. We have seen this again and
10 again.

11 And we can move on. So this slide in
12 particular, and the next two, very short and
13 sweet, pertain to U.S. Coast Guard primary data.
14 And it's referenced underneath. So this is from
15 U.S. Coast Guard VTSA. And this data pertains to
16 2019.

17 The previous years are pretty
18 comparable. We don't have huge fluctuations.
19 And the yellow boxes very simply mention the
20 megaships, the first, the top box, and the bottom
21 box pertains to barges. So this is how we have
22 classified them.

1 The interesting thing is because
2 barges, sometimes they don't have cargo,
3 sometimes these are pilot ships, sometimes
4 they're empty. Sometimes they are OSV ships,
5 offshore support vessels for the offshore
6 industry. It's very difficult at this point to
7 bring a dollar value to the losses. So what
8 you're going to see, ladies and gentlemen, is
9 just the megaships.

10 And we can move on to the next slide.
11 So here we can see basically that from 2015
12 onward every single month, the synchronicity or
13 the fluctuation, year after year, month after
14 month, don't deviate too much. So in our
15 estimation, we can't be very much off, because we
16 see the numbers every single year when it comes
17 to the traffic at the port, you know, Houston-
18 Galveston area.

19 Next please. Right, and so we see all
20 the risks within port limits for dredging
21 operations, incidents, and so on. What I have
22 highlighted here in yellow is fog. It is by far

1 the prevailing challenge, this is what is
2 interesting, every month. Oh.

3 And here, basically we're just doing
4 the math, very simple based on the U.S. Coast
5 Guard VTS information. You can see on the top
6 left the daily traffic, the ocean-going vessels.
7 We have, as an average, 135 ships every single
8 calendar day. And of course, on the high side,
9 212.

10 But when it comes to smaller ships,
11 and again we don't even have that information,
12 the number is very high, more than 500, close to
13 700 ships every single day.

14 And then when it comes to the full day
15 we are, as a median number, the average number,
16 it's close to 22, so you would agree. And for
17 the past years it's been pretty much like that.

18 And we can move on. This is the
19 essence of the situation. Basically, we can see
20 that for a single ship, according to a number of
21 previous researches, some of these research
22 projects I have undertaken, but many other

1 colleagues, including the Texas A&M University,
2 they agree, we all agree that the median loss per
3 vessel per day is \$1 million.

4 However, according to Texas A&M, the
5 number goes even higher, high values because some
6 of these cargos are very expensive. And of
7 course, we expand through the supply chain. So
8 we're talking about \$4 million per day, per ship.
9 This number is just so impressive, for a day,
10 okay.

11 And then if we multiply this, and I
12 have to make an acknowledgment here, although I
13 work with big data analytics and, you know, our
14 studio Python, like, I could have created some
15 impressive algorithms. I chose to make it
16 simple, because just simple mathematics for
17 everyone to have no doubt about the root cause of
18 the matter.

19 For one day the impact of fog, we're
20 talking about the entire fleet kind of stuck,
21 stranded within port limits, \$135 million, this
22 is the, you know, a very average number. But

1 then when we have more ships, then this number
2 goes up. And of course, the high values that
3 expand throughout the supply chain can reach up
4 to \$848 million, approximately, for a single day.

5 Then we move on, we multiply this by
6 the 22 days that we are impacted every single
7 year. And you see this number, again, it's an
8 exorbitant number, very simple mathematics. We
9 can't go wrong. We go into almost \$3 billion as
10 an average loss for our region. And the maximum,
11 and we don't wish this to happen, could be up to
12 \$18.5 billion for that year, for those 22 days.

13 And we move on. This is the final
14 slide, ladies and gentlemen, this is just the
15 observation. How come we didn't know this yet?
16 How come, you know, the front page news don't
17 talk about it. This is because companies don't
18 take pride when they lose money. It doesn't
19 sound good for the client, for the public image,
20 so they don't talk about this.

21 And then, of course, the losses don't
22 affect just the Port of Houston, just one ship-

1 owning company. It is all of these companies
2 that are having a very bad year or a very bad,
3 you know, fog year.

4 And at the same time, we have to take
5 into consideration the counter parties, according
6 the acts of God, weather conditions, a lot of
7 this is actually covered by the insurance plans.
8 So nobody talks about it. But this is the
9 reality, ladies and gentlemen. Thank you very
10 much for having me.

11 MEMBER CHOPRA: Thank you, Maria.
12 Thank you very much. I really appreciate your
13 bringing to light the numbers and the research
14 which you've done on this. And I'm a Houstonian,
15 and I just wanted to say the idea was not that
16 you want to put Houston on the front, this was
17 just as an example of one port, which is
18 impacted, a major port in the United States,
19 which is impacted.

20 There are other ports as well, which
21 face this impact and if we look at the collective
22 economic impact for the region, it does -- the

1 numbers are astounding, and this is the reason we
2 feel that this needs to be brought to your
3 attention.

4 Needless to say, fog occurs in various
5 parts of the world and they have found a way to
6 work in fog, to keep their supply chain working.
7 So maybe it's time for us to relook at this issue
8 and explore avenues. How we can get our economy
9 working during those fog days.

10 With that in mind, I'd really to
11 invite Dr. Qassim Abdullah on the technology side
12 and look forward to his comments. Thank you.

13 MEMBER ABDULLAH: Thank you very much,
14 Anuj. What a beautiful introduction Dr. Burns
15 put me in and made my life easier to prove it to
16 you that the problem, the seriousness of the
17 problem absolutely.

18 And if I see my slide, please? Thank
19 you.

20 And we'll talk about this problem, the
21 problem of restricted visibility during inclement
22 weather, fog especially. You know, what does it

1 mean to us? I don't -- next slide, please?

2 MEMBER CHOPRA: I think we've lost the
3 slides. I'm guessing, yes, there they are.

4 MEMBER ABDULLAH: Oh, here they --

5 MEMBER CHOPRA: Back again.

6 MEMBER ABDULLAH: Got them back.

7 MEMBER CHOPRA: Thank you.

8 MEMBER ABDULLAH: Next one, please.

9 Thank you.

10 So the statement of problem like Anuj
11 and Dr. Burns stated that, you know, that the
12 problem of the fog. We've been dealing with a
13 port closure and you saw the impact, the
14 economical impact, when you talk about billions
15 of the dollars, four million per ship, we have
16 200 average a day. Just a big one, and so on.

17 But when we look at what can we do
18 about it? I think we are in a better position
19 than any time, you know, to alleviate this
20 problem and provide the technology that will help
21 the pilot to navigate their ships in the channel
22 with minimal risk.

1 There is risk in anything we do, you
2 know? So if nobody going to assign a 100 percent
3 solution, but if we go to the 99, 98th percent, I
4 think we are there.

5 Next slide, please?

6 So our example, our role model in
7 this, in this jetliner. Jetliner, I mean look up
8 here. What do you think the pilots see when they
9 go through this cloud at night and things like
10 that?

11 Nothing. I mean they merely rely on
12 instrument navigation, definitely. I mean, they
13 might take over on the last few seconds before
14 touchdown, but a lot of the flight nowadays even
15 in good weather, they do it with the instruments
16 here.

17 Next slide, please?

18 So the aircraft navigation, it is
19 always foggy up there. I mean, like the fog we
20 experience at airports. It is always there. We
21 are in the middle of a cloud.

22 So they utilize a few navigation

1 systems to help guide the flight from point A to
2 B. And this navigation system could consist of a
3 Global Positioning System, GPS, and that's the
4 main, primary navigation source nowadays for the
5 jetliner, Inertial Reference Systems, radio aids,
6 you know, with our VORs, DMEs, ADFs. They're
7 different technology for beacons they have in the
8 airport.

9 But the combination of it, just for
10 redundancy, for the safety if one fail, you can
11 rely on the other sensor or technology.

12 So the pilots really don't get lost
13 very often, right? I mean, nobody will fly if we
14 hear about the pilot lost their way because of
15 fog or cloud or the rain or something like that.

16 And that's the philosophy when I build
17 in this capability to overcome this problem of
18 the fog in ports.

19 Next slide, please?

20 The other example is autonomous and
21 connected vehicles. We are way into it now,
22 people expect them in three years. We going to

1 see level five car, the driving of the road or a
2 trucks platooning going on their freeway. And I
3 believe it, I'm involved with it very heavily and
4 I think it's coming. You see it's now in your
5 new car. You going to have level three. I mean,
6 with this, you know, all these technologies they
7 implemented in a \$30-\$40,000 car.

8 But we know it is capable. We know
9 probably navigating a ship in the port could be
10 much easier than the task of navigating a car in
11 a downtown area situation with construction going
12 on on the road and things like that.

13 The next slide, please?

14 So we know there is a technology can
15 -- or can enable us to do that. To give an aid
16 to the pilot, who has an instrument next to him
17 if he can't see visibly with his eyes, naked
18 eyes, he can look at the screen and he or she can
19 see where they are and where are things around
20 them. How far they are, you know?

21 And next slide, please?

22 So the good example is Rotterdam, Dr.

1 Burns mentioned it and that's one of the most
2 advanced ports in the world and is the largest
3 one in Europe. And look what this manager says,
4 this will be the next man on the moon for the
5 Port of Rotterdam.

6 And that's what they're counting on.
7 The autonomous navigation of the port and moving
8 things around too, you know?

9 And happens to be this port --
10 Netherlands has the port infrastructure in the
11 world. That's what a witness according to the
12 World Economic Forum and the Global
13 Competitiveness Report 2016 and 2017.

14 And now in the last few years, even
15 better. So no wonder, I mean, Rotterdam can do
16 it because they are very progressive in their
17 thinking and their updated infrastructure and
18 sensors and so on.

19 Next slide, please.

20 So here all we're really, the thinking
21 is very simple about it. You know, how can you
22 bring the Google of your car, Google Maps, into

1 a ship?

2 So there, is there -- if the pilot can
3 see his way/her way through the fog, the screen
4 will show him where they are, how far things are
5 around, and we are very sophisticated in GIS now,
6 the 3D modeling very accurate. You talk about
7 lidar accurate to a few centimeters, positional
8 or horizontal and vertical, bathymetric as well a
9 better quality.

10 And we have great 3D GIS
11 infrastructure of any port now. We just need to
12 update it more frequently.

13 Next slide, please.

14 And that's what you see, the
15 bathymetric we talking about in the last,
16 yesterday and today. The mapping with the
17 sounding, we might be sounding in the port
18 because of sometime the water is murky and
19 turbid; the bathymetric lidar maybe doesn't work,
20 but we need the combination of the two to give
21 the pilots that look. You know, there's no
22 telling horizontal of where you are. We need to

1 or he need or she need to navigate the canal or
2 that port channel from the depths too.

3 Next slide, please.

4 So those are technology we are
5 proposing for this solution to happen, which is a
6 real time kinematic GPS/GNSS. This is no
7 brainer, I mean, we use it every day in our
8 business and thanks to NGS and NOAA for providing
9 all these CORS station and Juliana talked about
10 the Foundation CORS. That's what we going to
11 need in the ports.

12 Most the ports they have it, what if
13 they don't have it, we're going to need to
14 install and we have a receiver as well as dual
15 frequency receiver on the ship, for example,
16 could be multiple of them, depending on the size
17 of these tankers for example.

18 Inertial Reference System for small
19 boats is optional, but for bigger boats, when you
20 talk about four billion dollar a day lost? I
21 mean, put in a system costs 10, 20,000 is not a
22 big deal at all.

1 Radar and cameras and again, for small
2 boats probably will be hard to implement. But
3 for these big ships, radar, they're all equipped
4 I'm sure, with radar and cameras.

5 And port high definition
6 infrastructure map is a 3D GIS database. Almost
7 all maps, all ports have that but now we moving
8 to the Smart City, the smart infrastructure. If
9 it's not developed, we can develop it overnight.
10 This is very easy to do.

11 And port bathymetric map between the
12 Corps and NOAA, I think they have done good job
13 on dredging and bathy and acoustic surveying,
14 survey of there, we might need to do it just more
15 frequent if we're going to do the solution.

16 And we need application software from
17 technology, whether Google, whether Garmin, we
18 need an app, we need a screen, and that's all it
19 takes. There's nothing really out of the reach of
20 our capability. It's very simple approach and it
21 can be done to save the economy those billions of
22 dollars.

1 What Dr. Burns showed is one port.
2 Look at, think about all other ports. You know,
3 when you put all these together. We can do that
4 NOMEK strategy with that savings if we do that.

5 Thank you very much and that's all I
6 have.

7 MEMBER CHOPRA: Thank you, Qassim. I
8 think that was a very comprehensive view of the
9 technology capabilities which exists and which
10 may be harnessed and that's something for all of
11 us to explore after the economic view.

12 I'd like to invite comments from
13 Captain Brennan and all the rest of the HSRP on
14 the presentations and any discussion you would
15 like to lead this forward.

16 Captain Brennan, would you like to
17 comment anything on the two presentations or any
18 comments as you started this panel?

19 CAPT BRENNAN: Sorry, I think Lynne
20 and I had been hitting the mute/unmute,
21 mute/unmute button.

22 So first, I guess the only thing I

1 would like to say is just to thank Dr. Burns for
2 her presentation. I think it was very compelling
3 and that was the question that I think everybody
4 had coming into this problem was what was the
5 magnitude of the problem.

6 And I think when we look just at the
7 Port of Houston, it's very clear what the
8 magnitude of the problem is and it's not hard to
9 extrapolate out to the rest of the nation.

10 So I would think it's best that we
11 pass the baton and let the other members comment
12 on this and I think that's what we're here for.

13 Not to hear me on that.

14 So, Lynne, I will let you pass it around to our
15 other members.

16 MEMBER CHOPRA: Thank you, Captain
17 Brennan. Thank you for this, for your comments.
18 We can go around the room and ask the rest of the
19 HSRP members. To our Chairperson Ed, would you
20 have any comments?

21 CHAIR SAADE: Let's go ahead and
22 continue on with everybody then, Anuj. I don't

1 have any comments myself. But I think it's a
2 good idea to go ahead and pulse everybody and
3 maybe come back to me.

4 MEMBER CHOPRA: Thank you, sir. Thank
5 you so much. Julie, would you like to add a few
6 comments?

7 CO-CHAIR THOMAS: Yes. Can you hear
8 me? Yes, I think I'm unmuted.

9 That was a great presentation from all
10 three of you and I really appreciate it. I've
11 seen this in action in San Francisco. I guess on
12 the West coast is our port that has a lot for me
13 and Anne McIntyre can chime in here too.

14 I have, I mean it all makes sense to
15 me. This concern, I'm sure Ann Kinner will speak
16 up about the small boats too. Like, how do you
17 control small boats in the harbor? You want to
18 make sure that they have some type of transmitter
19 on them or something that will get picked up.

20 So that would just be one comment
21 which I know everyone has thought about. And my
22 other comment is I am interested in the one

1 million dollar per vessel. Not because I
2 question it, and I don't know how proprietary
3 this is.

4 I would love to know what goes into
5 that figure only because we've done it for the
6 Port of Long Beach a few times and I'm always
7 interested in how far down the supply chain do
8 you actually count.

9 It becomes very blurry to me at some
10 point. So that would be my only item of interest
11 and I don't know if, though Anuj or whatever, if
12 we could actually get a breakout of that. Just
13 out of personal interest.

14 But I understand if it's not
15 available. That's all I have to say. Thank you.

16 DR. BURNS: Thank you. Oh, go ahead.
17 Sorry.

18 MEMBER CHOPRA: Absolutely, Maria,
19 please go ahead.

20 DR. BURNS: Thank you. So there was
21 breakdown and there is a study actually. After
22 September 11, when the Port of New York-New

1 Jersey closed down, and based on that I added
2 some other components across the supply chain.

3 So what happens is we have port use,
4 this is one component. The second component has
5 to do with reservations for warehousing systems,
6 distribution centers, trucks, and other
7 multimodal transportation areas, and options that
8 are on a standby basis until that cargo becomes
9 available.

10 So we also have some clients that are
11 purchasing something in advance and they're
12 waiting for their cargo and what, you know,
13 things like, wholesalers, retailers, sometimes we
14 have mass cancellations and things like that.

15 I have the details, you know, a couple
16 of my books actually have a breakdown, but I can
17 provide it to you as well.

18 CO-CHAIR THOMAS: Oh, that would be
19 great. I would be really interested in that.
20 Thanks so much. Appreciated.

21 DR. BURNS: Thank you.

22 MEMBER CHOPRA: Thank you so much,

1 Maria. I think that explains it so well. So I
2 had the privilege of working in the petroleum
3 industry in the Houston corridor for about 25-
4 plus years and I've seen the numbers, actual
5 numbers on the loss of export from a terminal.

6 So I would treat a BERG maybe
7 exporting from Houston as an energy -- as a hotel
8 room. That if that night, if one night a hotel
9 room is empty, that is economic loss to that
10 hotel. That can never be recovered. It's
11 exactly the same when we convert it to a port.

12 That capacity to export that time
13 period because of that loss. That is the one
14 which we are talking about, which plays in this
15 space.

16 And I completely agree with the
17 numbers of one to four million depending on the
18 value of the cargo, which is there and I'm sure
19 we share that at a later time.

20 CO-CHAIR THOMAS: Thanks, Anuj.

21 MEMBER CHOPRA: I was going to call
22 out Captain Ann Kinner. Ann, would you like to?

1 Appreciate your comments?

2 MEMBER KINNER: Yeah. Am I -- okay,
3 I think I'm connected.

4 My concern of course, is small
5 vessels. That's my main connection and there are
6 lots of them and a lot of them, well, we don't
7 have AIS. They may have a GPS system that is
8 sort of working maybe they don't. Even a lot of
9 the smaller ones don't have radar.

10 And personally, I wouldn't, at this
11 point I wouldn't have a boat that did not have
12 both radar and AIS, but I know that they're not
13 cheap. Even inexpensive systems are sometimes
14 beyond the reach of a small boat operator.

15 And I know from my own personal
16 experience in San Diego, when the fog comes in,
17 you can't see anything.

18 And it's a combination of issues. One
19 is knowing that the fog is out there, the other
20 is knowing who is in the fog, and being able to
21 communicate what they are doing.

22 And I've come in and out of San Diego

1 in a pea soup and believe me, when they gave me
2 AIS, I felt like I had been given the magic wand,
3 because on my radar, I could see someone. On my
4 AIS now I know who they are, how big they are,
5 how fast they're going, and whether we're going
6 to get acquainted.

7 The challenge is going to be, and
8 particularly in a port like San Diego, which does
9 have a fair chunk of fog, even though we don't
10 have the heavy commercial traffic that LA-Long
11 Beach has, we do have some pretty intense fog.

12 And I can relate to the airlines
13 because I have had to sit in the airport in San
14 Francisco waiting to find out if they were going
15 to open San Diego so I could go home one night.

16 It's an issue. It has a big impact on
17 the little guys who, frankly, they go fishing
18 whether they can see where they're going or not
19 and that's part of the problem is how do you get
20 this kind of information and this kind of tool to
21 those kinds of boaters?

22 I think it's something like 60,000

1 boats in the Port of San Diego, small craft.

2 Not that everybody's out there and
3 doing anything, but at any given day, there are a
4 lot of boats out there and particularly
5 maneuvering around the entrance coming into San
6 Diego Bay.

7 So it's, yeah, technology is a part of
8 the problem, cost is going to be a big issue too.

9 MEMBER CHOPRA: Oh, absolutely. I
10 think that's very well brought out, Captain
11 Kinner, and I would say it's the Ports of
12 Rotterdam, Hamburg, Antwerp, the English Channel
13 are where, which is very fog-borne for a
14 significant part of the year.

15 Did also have similar issues and maybe
16 we can learn as to what technology's bringing,
17 like Qassim mentioned, and what other practices
18 others are doing so that explore the opportunity
19 if there is a solution, while not sacrificing
20 safety in this picture. That would be my
21 thought.

22 But invite, Captain McIntyre?

1 MEMBER MCINTYRE: Hey, I think I'm
2 unmuted. Can everybody hear me?

3 CO-CHAIR THOMAS: Yeah.

4 MEMBER MCINTYRE: Yeah, you know thank
5 you for that. It's interesting. I'm going to
6 echo a little of what the other Ann just said.
7 It's, you know, having been a working pilot for
8 23 years, my concern is that, technologically I
9 kind of see how it works, like in a closed
10 system, but when you have like an open system,
11 again with all types of boats, traffic coming
12 from different directions, particularly in the
13 United States where there is not such a
14 structured kind of port authority within the
15 other ports, but there's a lot of coordination
16 that would have to occur to make this type of
17 navigation a reality.

18 You know, there is a lot of
19 variability in the quality of commercial ship, in
20 the quality of the crews, in the quality of the
21 equipment and, you know, again academically, I
22 see how it works. Practically, I see it as being

1 difficult.

2 And, you know, just generally, and I
3 know that you have and if you're working with
4 this I think it's a super important to be
5 involving stakeholder pilot groups on this issue.

6 MEMBER CHOPRA: Absolutely, Captain
7 Anne and our initial discussions were based on to
8 find out what capability we have and whether
9 there is a technology solution and then invite
10 partners and stakeholders and say hey, this is
11 what we've laid out and leave it to them.

12 But let's get some more comments.
13 Captain Sal. I know you're an interested party.
14 You understand Galveston very well. Very
15 interested in your comments.

16 MEMBER RASSELLO: Yes. How long do I
17 have? I've been a cruise ship captain porting
18 Galveston for 18 years and Baltimore and New York
19 and every port here poses a challenge. But they
20 do respond in different ways. And I think that
21 the problem goes a little bit beyond the
22 technology available.

1 The ships navigate in fog since post
2 the Second World War with the radar in the
3 communication with the UHF.

4 So the problem comes now with the
5 coordination and I think that Captain Anne
6 touched a point. For a pilot to feel comfortable
7 to use the technology, assuming that he knows how
8 to use the technology available, it is important
9 to have a backup of coordination from the VTS and
10 from the Port Authority to make sure that all the
11 traffic is under control.

12 The issue we have in Galveston was not
13 matter of much of technology, it was matter of I
14 would say decision making by one person to close
15 the port, which wasn't part of at that time.

16 And now things have been changed a
17 little bit. So based on what? Based on is he
18 comfortable to navigate in fog or not getting
19 enough of technology in the hand? All because of
20 there is a non-control of traffic. So it's the
21 coordination of all these entities and the
22 technology is very important to -- I'm talking

1 about the precise navigation.

2 Rotterdam, I've been there.

3 Amsterdam, been there. They're the different
4 port, there the port is prepared to accept a ship
5 in fog. Therefore, they coordinate the traffic,
6 they send out warnings for small craft so they
7 should not go out through the fog and everything
8 is set in place to make the operation safer.

9 Therefore, a solution we hear,
10 technology. We brought this issues in the Panel
11 three or four years and still I am glad that we
12 are still talking about. There are technology
13 like Dr. Qassim listed, there is a lot of stuff
14 on the market to make sure that the person can
15 see through the fog.

16 And now, it's just a matter of moving
17 some way, somewhere and I think it's on the
18 Mississippi and Sean can confirm, but we solved
19 the problem with fog.

20 But the river was closed with the fog
21 ten years ago. Now we haven't been closed
22 anymore for cruise ships, especially at -- and

1 going back on the loss, economical loss, I want
2 to back up, Dr. Burns on the numbers she gave us.

3 Thank you very much, but I can confirm
4 that the one cruise ship lost more than a million
5 dollars a day standing outside the port.

6 Because of the exponential loss is not
7 just all of the people losing flights or losing
8 daily activities. It's economical loss was at
9 the airport, at the transportation, a complex --
10 it's not just the cruise line. It was a big
11 problem and big test that management faced with
12 thousands of people complaining of why the port
13 is closed.

14 I have a lot more to say but --

15 MS. MERSFELDER-LEWIS: I'm sorry. You
16 guys only have about five more minutes, at the
17 most and there are --

18 MEMBER RASSELLO: I know.

19 MS. MERSFELDER-LEWIS: And Lindsay Gee
20 also asked to speak.

21 MEMBER RASSELLO: Yeah, yeah. I
22 finish.

1 MEMBER CHOPRA: Thank you so much
2 Captain Sal. I know that came from the heart and
3 you're actual experience. Lindsay as chair,
4 appreciate your comments.

5 MEMBER GEE: Yeah, thanks very much.
6 And again, I have to apologize again for not
7 being around when you guys were developing this
8 and thank you to Dr. Burns for that presentation.

9 I think when we started this, I think
10 from the last session talking about restricted
11 visibility, we knew that the discussion would go
12 beyond just the technology and that's something
13 that not for this discussion to deal with.

14 I think, unfortunately, it is
15 something to be dealt with, but I think what we
16 wanted to concentrate on, I appreciate Qassim's
17 presentation, is, one, to look at the technology
18 that is available and then what can be done about
19 those recreational boaters.

20 And again, I think it's what Ann --
21 I'll take Ann's saying before about, you know,
22 it's a big elephant and we got to take just those

1 little bites and do what we can, I think, as it
2 goes.

3 And technology is always a way of
4 solution. It is part of the solution, it's not
5 the full solution, it's part of the solution here
6 and one of the reasons I think by doing this
7 workshop was also to say, okay, technology's is
8 going to be part of the solution down the track
9 and what do we see that NOAA has to have
10 available to support that.

11 And that's a key, that's as the HSRP,
12 I think that's our role to say, hey the
13 technology's coming, it's going to help solve the
14 problem and we want to make sure that NOAA has
15 all of the technology that's necessary to support
16 that.

17 So that's partly, you know, the bathy
18 source, to be able to update that, to produce
19 those models that Qassim was showing. It's the
20 PORTS system and extensions of the PORTS system.
21 Where did it work, where doesn't it work, how do
22 you expand it and those sorts of things.

1 So I think that would my general
2 comment and the thrust of where we started with
3 why the Technology Group was taking this on in
4 the beginning. And yes, we acknowledge all of
5 those other issues, but our focus was trying to
6 stay on where's that little bit that technology
7 can help and what does NOAA have to do to be
8 ready to have that technology to support it?
9 Thanks.

10 MEMBER CHOPRA: Thank you. Lindsay.
11 I know we have, we are on a break time.

12 CHAIR SAADE: Okay. I'm going to go
13 ahead and jump in, if you don't mind. Thank you.
14 So thanks everyone. Really great to see this.
15 Actually --

16 MS. MERSFELDER-LEWIS: Hey, Ed --

17 CHAIR SAADE: Ashley --

18 MS. MERSFELDER-LEWIS: Hey, Ed, can we
19 let Ed Kelly to go ahead and make his comment
20 because it will be very brief?

21 CHAIR SAADE: Okay, Ed Kelly. Only
22 because he's an Ed.

1 MEMBER KELLY: Okay.

2 CHAIR SAADE: It's only because he's
3 an Ed.

4 MEMBER KELLY: There we go. Hey,
5 three Ed's is even better than two.

6 So yeah, a couple of comments. I'm
7 looking forward to seeing the numbers. In my
8 prior life I was CEO of the number 12 container
9 carrier in the world porting North America and if
10 I had ships with a million dollars' worth of I'd
11 be astounded.

12 I know there's a lot of economic
13 dropdown. The other thing is I never made it
14 past my Second Mates Certificate, so I defer to
15 all of the captains in the group, but I think the
16 key thing here is question where technology will
17 lead and that the actual practice will have to
18 follow.

19 The reality is fog is only an issue in
20 close proximity areas, namely inside ports and
21 that's where there is the most cross-traffic
22 small vessels, nonprofessional mariners involved,

1 and that's where the risk factors come in.

2 So I think, you know, the technology
3 is certainly doable. Technology will lead
4 practice. We've seen that over and over.

5 You know 20 years ago nobody would've
6 thought that we'd be operating the way we do
7 right now with cellphones and computer
8 technology.

9 So I am positive there'll be a
10 technological solution to this. But the question
11 will have to be, it'll have to be demonstrated to
12 be safe to people like the International Maritime
13 Organization, to the U.S. Coast Guard, to all of
14 the governing places because, you know, I'm
15 pretty sure that Captain Anne McIntyre would
16 agree, right now, I would not risk my pilot's
17 license by completely relying on technology.
18 There'd be too many risk factors involved.

19 So I think it's a very positive thing,
20 the technology is outpacing the practice and I
21 think the focus on this has to be how to make the
22 industry be willing to rely on the actual

1 technology itself.

2 Because you only get to make a mistake
3 once when you're operating a large tanker and you
4 pollute the entire area.

5 CHAIR SAADE: Great stuff, Ed.

6 Thanks. We have plenty of time for other

7 comments, you know, before the end of the day.

8 So if we need to come back on this, it's great to
9 see the energy on it.

10 We're going to take a break now and be
11 back at 3:45, 15 minutes before the hour,
12 depending on which time zone you're on. And see
13 you soon. Thanks.

14 (Whereupon, the above-entitled matter
15 when off the record at 3:32 p.m. and resumed at
16 3:46 p.m.)

17 CHAIR SAADE: The bell. I heard the
18 bell. Okay. Welcome back everyone. That will
19 be our last break for the day. I'm going to hand
20 it over to Julie here in just a moment.

21 Just as a reminder, we've got about 45
22 minutes to talk about all types of HSRP

1 priorities and issue papers and the working
2 groups and then we'll slide right from that into
3 the wrap-up session and the roundtable with
4 closing remarks.

5 So over to you, Julie. Thanks and
6 you're in control.

7 CO-CHAIR THOMAS: Okay, thanks so much
8 Ed. So I think we want to just get a closing
9 remark from Qassim. I know that on the fog
10 section he just had one response there that he
11 wanted to make.

12 So Qassim, if you're there, please
13 feel free to go ahead.

14 MEMBER ABDULLAH: Yeah, all right
15 thank you.

16 Julie, yeah, probably I need to
17 respond to Anne's concern about the technology.

18 We totally agree. We don't think that
19 the closure is going to be interviews and be
20 thrown on the ports to implement. This is going
21 to take some legislation or regulation changes.

22 I figure it's going to be to the

1 priority of closing the port totally versus maybe
2 regulating on a small fisherman, for example.

3 Do I prefer tanker, I mean, this going
4 to be what's going to weigh. Is it 10 billion
5 dollar industry or \$10,000 industry?

6 So it's going to take some regulation,
7 definitely. And of technology, I mean I just
8 want to bring to that attention of everybody
9 there. The FAA now implemented what we call
10 remote ID on the drones. You know, I mean we're
11 talking about drones like thousand dollars.

12 So this technology is getting very,
13 very, low expense, very cheap. So Garmin, like
14 all the small aircraft cannot fly without a
15 Garmin system. We just said it could be a
16 thousand dollar something. So the technology is
17 there.

18 I think it's going to come to the
19 regulation. How are we going to regulate the
20 small boats to be equipped with these, with a
21 Garmin with a transport or the transponder is
22 very small, cheap, very cheap like the drones and

1 that was put on the drones.

2 So that's all my comment on that, on
3 the fog.

4 CO-CHAIR THOMAS: Thank you Qassim.
5 I think we'll come back, if we have any time at
6 the end of the day we can always come back and
7 discuss this more. But that was a great session,
8 so I appreciate it. Thanks to you and Anuj for
9 putting that together.

10 MEMBER ABDULLAH: Thank you.

11 CO-CHAIR THOMAS: Let's move on then.
12 Ed Page, you should -- wait a second. Okay, you
13 have a few minutes here to update us on the
14 Arctic.

15 MEMBER PAGE: Okay. Good. Okay, well
16 there's still ice in the Arctic and so we still
17 have maritime issues to address.

18 So basically we're just going to do a
19 quick, I'm just going to do a quick update that
20 kind of follows up with our HSRP policy paper or
21 document on the Arctic that we generated about
22 two years ago now, I think.

1 And we updated that from a previous
2 version and the key thing is it's still relevant.
3 And the things we outlined as far as things to be
4 taking action on, there has been action
5 undertaken.

6 So I think it's relevant and I'm just
7 talk real briefly what's, so what is happening at
8 the Arctic and just go through the slides.

9 Virginia, do you do that or do I do
10 this?

11 Next slide. Do I do that?

12 CO-CHAIR THOMAS: No, they will
13 control it for you, Ed.

14 MEMBER PAGE: Okay, so anyway the
15 traffic is not going spanning that significantly
16 up in the Arctic as it is in the Russian side.
17 The type you are seeing, you are seeing tankers -
18 - these are pictures of tankers and that's all
19 the activity in three months near Utqiagvik or
20 Barrow, the very top of the Arctic in the
21 Beaufort Sea.

22 You can that the black is just tanker

1 lightering operations, transfer of a larger
2 tanker to a smaller tanker. Those heavy lift
3 ships go to Tuktoyaktuk, which is Canada, which
4 is far west of the Northwest Passage.

5 You see small landing craft and you
6 see, you know, lots of tug boats with barges. So
7 the traffic's not that significant.

8 You're going to see some erratic
9 traffic because the ice conditions where they're
10 trying avoid the ice, so the standard route
11 sometimes you expect to see are changed because
12 the ice impediment and that's an issue for us as
13 NOAA and National Weather Service. We expect to
14 get any information on ice conditions and of
15 course Polar Code weighs into that also.

16 So but anyway, that's just gives you
17 a brief example of the traffic, and see which is
18 not that great. But it's increasing and the idea
19 of being prepared so when there's additional
20 traffic in the future that we do it safely and
21 don't impact the fragile environment of the
22 Arctic.

1 Next Slide.

2 There are some plans to increase
3 Arctic operations here. Shell is going to come
4 back again. I realize they had a rough shot at
5 it the last time. They spent billions and
6 billions and billions on offshore development
7 plans going back to '85, I think it was.

8 When I was up there near Navarin Basin
9 and a whole bunch of off-shore rigs and platforms
10 and ships that were exploring the Chukchi Sea for
11 oil and they came back 20 some odd years later
12 and then of course, because of marine casualty,
13 the whole thing went dry.

14 Billions of dollars that were shut,
15 all that effort shut down and so that, to me,
16 highlights the importance of having safe maritime
17 operations and of course NOAA plays a role of
18 providing information to help ensure safe
19 maritime operations.

20 But Shell is coming back but not at
21 the far off-shore. They're staying closer to
22 shore this time, not as ambitious effort, but

1 they do have plans to come back to the Arctic and
2 start producing oil again.

3 So that leads to some more maritime
4 activity obviously.

5 Next slide.

6 There's also a project underway right
7 now for producing LNG, which there is a lot of
8 LNG up there in the North Slope but to bring it
9 to market the talk has been building another
10 pipeline, which is somewhere in the neighborhood
11 of about 50, 60 billion dollar project and 10 to
12 15 years out.

13 Nothings moved on that because of the
14 enormity of the cost, et cetera. But now they're
15 saying let's just do a look-look. Case in point,
16 up there on the North Slope and then have the
17 ships take the LNG to international markets.

18 So that's moving along it'll be a
19 couple of years but it doesn't, it is an
20 indication of increased maritime activity and
21 different types of maritime activity in the
22 future.

1 Next slide.

2 All right, so the Qilak and some of
3 the issues with that happen to be with
4 subsistence activities, they're trying to make
5 sure they do it right so they're not interfering
6 with indigenous communities as far as hunting
7 whales or other subsistence activities.

8 And that ensuring they have areas that
9 have been warning to keep the vessels out of it
10 and so that's an issue that also NOAA weighs in
11 on.

12 Next slide.

13 And the people that are making some
14 noise about it or concerns, raising concerns,
15 Alaska Eskimo Whaling Commission and other
16 parties. And they're basically saying this is
17 our water, we've been operating for years. Now
18 that ships are coming through, how to make sure
19 that we don't get run over.

20 And so next slide.

21 We've been exploring issues as far as
22 portable AIS units and we talked about this a

1 minute ago about the problem with recreational
2 boats being in the way of ships.

3 Well, we've actually been
4 demonstrating, and that's my kayak on the left, I
5 sacrificed it on a sunny day. Instead of staying
6 in the office where I want to be, I went out in
7 my kayak to test out this technology, sacrificed
8 this for the team, took it for the team.

9 But you can see that little portable
10 AIS is actually powered by a USB power device
11 from a power drill, no less.

12 But we've gotten more sophisticated
13 than that subsequently, but nevertheless, it
14 tracked my kayak fine and we've been able to put
15 it in a Pelican case and say, you put this in
16 your boat, you can see where you are.

17 You can see where other vessels are,
18 excuse me, wirelessly because it goes to your
19 iPhone and my iPhone display shows other vessels
20 and then also other vessels will see you, and the
21 Coast Guard will see you, and they can put up
22 dynamic marine protected areas around your

1 whaling activities and notify the vessels through
2 AIS AtoNs of your presence and vessels can avoid
3 you.

4 So this will be like a dynamic Coast
5 Pilot, but right now the Coast Pilot talks about
6 whalers being out, that they should call a local
7 community on the telephone to see if they're out
8 there that day.

9 Well, this is a better way to get
10 information out than that. So using technology.

11 Next slide.

12 Also the Coast Guard now is exploring
13 a Port Access Route Study, they've done so for
14 the Bering Strait beforehand. So it's evaluating
15 traffic and trying to figure out the best routes
16 or corridors, if you will. So that is going to
17 lead to areas to avoid, traffic lanes, et cetera.

18 Once again, NOAA gets involved in that
19 because any traffic lanes, the surveying needs to
20 be well done to ensure that we're not sending
21 them into the area where's there's unsurveyed
22 waters or poorly surveyed waters or outdated

1 surveyed waters.

2 So that's a process that's going on
3 and I think it's next September is when it's
4 supposed to have all the public comment and it'll
5 move further on.

6 Next slide.

7 And that will lead to traffic
8 separation, seen as possibly two-way routes,
9 recommended routes, tracks, deep water routes,
10 routing systems, you name it. Not sure because
11 it hasn't been done yet, but again, those are
12 things that impact NOAA on the charting and other
13 services, ports, et cetera.

14 Next slide.

15 Are we running out of slides? I
16 think, hopefully.

17 Just more on the same, as far as the
18 different things that may come out of this Port
19 Access Route, which overlap with NOAA once again.

20 Next slide after that.

21 And the last thing, before I mentioned just this
22 mapping of the Arctic Ocean that UNH is involved

1 in international effort to increase the charting
2 and mapping and surveying of the Arctic and so
3 there's an international effort, a kumbaya I
4 guess you would call it.

5 Anyway, it went from 6.7 percent to
6 like a 20 percent of the Arctic waters mapping,
7 Arctic Ocean.

8 I think the goal is 2030 to have this
9 done, but you know, eventually everyone's
10 anticipating that the Arctic will be
11 significantly more traffic as you can save
12 thousands and thousands of miles by going across
13 the Arctic versus going around through the
14 canals, et cetera. The Suez Canal or Panama
15 Canal, et cetera.

16 This was just press-released about
17 this as far as the ambitious effort. So we're
18 getting a lot of attention about mapping and
19 charting as we've even discussed earlier in this
20 meeting.

21 So you kind of monopolized the
22 conversation these days. I apologize, but not

1 profusely.

2 Next slide.

3 And that's it. That's all and that's
4 our effort up in Alaska. That's called social
5 distancing and how we handle social distancing in
6 Alaska is to keep more than 6 feet away from
7 whales. Sorry.

8 CO-CHAIR THOMAS: At its best. Okay,
9 thank you Ed. We appreciate it. We appreciate
10 the update on this important area. We've gotten
11 lot of attention to Alaska and through the Arctic
12 on this meeting, so it's been great. Okay,
13 thanks Ed.

14 MEMBER PAGE: Yep.

15 CO-CHAIR THOMAS: Okay. So I want to
16 just say that we have one-half hour left to do a
17 lot of work.

18 I think we need to talk about NOMEK
19 again. I know we owe Shep time here, we cut him
20 off from his comment and then we'd like to go
21 around.

22 I wanted to just summarize a little

1 bit myself on what we've heard with NOMEK and
2 then we'll see how much time.

3 But we do want to leave the last 15
4 minutes or so, maybe ten minutes to, with Sean,
5 talk about recommendation. He's been getting a
6 lot of good ideas and then we'd love to touch
7 base about the priority matrix. So let's see how
8 far we get.

9 So, Shep, could you, are you there to
10 be on so that you can just finish up your
11 comments on NOMEK from before?

12 RDML SMITH: Sure, can you hear me?

13 CO-CHAIR THOMAS: We can hear you, we
14 can't -- there we are. Good.

15 RDML SMITH: So I didn't have -- I
16 just really thought it was a very thoughtful
17 discussion. There's a lot of you know little,
18 you know each of those big ideas that I took a
19 couple of pages of notes of big ideas.

20 You know, need some working out and if
21 any of them were easy, we would've already done
22 it. Right? Just like the fog issue.

1 Right, if that was an easy problem, we
2 would've solved it already. It's worth billions
3 of dollars.

4 So anyway, I think my comments on
5 NOMEAC for just is to really thank you for your
6 thoughtful comments and there's a lot of things
7 that we need to follow up internal to Coast
8 Survey and also a lot of things that I think can
9 really inform the larger national strategy as
10 well.

11 You know, specifically on the -- I
12 still keep coming back to this taskforce thing.
13 It sounds as though you think we need a different
14 federal advisory committee. And that all we need
15 to figure out a structure that's not a federal
16 advisory committee because federal advisory
17 committee's wouldn't be good at this.

18 And that is why, you know, I kind of
19 keep getting stuck on that because whenever we
20 try to set up something like this it would be,
21 this is really why I talked about at the
22 beginning of the whole meeting, is our lawyers

1 will tells that if you want to have public input
2 like that you need to do it in a structured way
3 and that structured way is defined by law in the
4 Federal Advisory Committee Act.

5 And so, you know, there are -- clearly
6 we dance around it sometimes, but, you know, for
7 something formal and high-level like this, we
8 need to figure out what that structure looks
9 like.

10 Obviously, within the government, we
11 can coordinate in ways that are not but for the
12 public comment and public engagement and
13 government policy part that isn't flexible, that
14 where the Federal Advisory Committee law is.

15 So anyway, I ask you to give a little
16 bit of thought to that and if we have to have a
17 federal, you know, if a federal advisory
18 committee is relevant, is a relevant part of this
19 coordination, I think that HSRP should ask itself
20 whether the HSRP wants to have any of that role
21 or whether we should do it through the Ocean
22 Exploration Advisory Board or come up with a

1 different mechanism entirely.

2 So I understand what it is that we're
3 trying to do with this taskforce, but we do have
4 this structure defined by law for how to do these
5 types of things.

6 So and I would also be happy if
7 somebody can tell me I'm wrong and that we don't,
8 we can do something like you suggest that is not
9 subject to FACA somehow. But my understanding is
10 it would be.

11 So anyway that's sort of been my
12 biggest comment and I just want to thank you all
13 for your thoughtful work and I look forward to
14 your recommendations.

15 CO-CHAIR THOMAS: Right. Okay, thanks
16 Shep. I know Anne you have a comment? You know,
17 before we go there, just in the essence of time,
18 I want to just summarize what I've heard because
19 we need to make sure these are in the public
20 comment and in this document.

21 So then I'm going to go around to
22 everybody and just ping you and see where I've

1 captured it wrong or what other ideas you have.

2 But I've heard that NOAA should be the
3 lead on this. I've heard that it would be good
4 for the appropriations, the color of money, if we
5 would have the flexibility to take advantage of
6 some of the existing mechanisms through federal
7 agency and partnership, such as IOOS, there's the
8 Joint Institute.

9 I know at Scripps, I run through CDIP,
10 which here the Army Corps is the lead but we do
11 it through the Cooperative Studies Unit, CSU. We
12 do not have a separate FACA.

13 I would tend to say my opinion is not
14 to suggest having a second FACA, because of the
15 overhead and expense for that. But if the
16 appropriations allow the discretionary funding,
17 NOAA could take more advantage of vessels of
18 opportunity.

19 And then I guess, the one last thing
20 that I don't know if we really covered, and maybe
21 if somebody has a comment on this, but are the
22 U.S. ships really, vessels really prepared? Do

1 they have the technology for this project or, it
2 has been expressed that foreign flagged ships are
3 better prepared.

4 So we just want to make sure that it
5 would be interesting to enjoy your comments here
6 as far as the capacity of the U.S. ships for the
7 mapping.

8 Okay, I'm going to go around and ping
9 everybody as last comments here on this. And we
10 will be sending around a revised document for a
11 NOMECC. So Ed Saade?

12 CHAIR SAADE: Sure. Let's start with
13 the last first. I think it would be short-
14 sighted to be worried about ships when, certainly
15 within ten years and most likely within five
16 years we're going to have a lot of autonomous
17 platforms doing this type of data collection.

18 Getting hung up on the flag of the
19 ship is a non-issue in my mind, unless we're just
20 worried about tomorrow. And I don't think that
21 where we should go, the whole point of this is to
22 talk about the next ten years.

1 CO-CHAIR THOMAS: Great. Okay.
2 Anything else to add?

3 CHAIR SAADE: No, I think it's, you
4 know, let's let the group keeps going.

5 There's a lot of topics in here
6 somebody commented to me, you know it'd be nice
7 if we could close this out. But let's say that
8 it's the biggest thing going because
9 geographically, the rest of it all, there's a lot
10 of really good opinions here and their saying all
11 of them are valid at one level or another.

12 So my main recommendation is let's not
13 cut this off for time, let's cut it off when we
14 got it right.

15 CO-CHAIR THOMAS: All right. Thank
16 you. Qassim? Are you on, Qassim? All right.
17 Let's go to Anuj, come back to Qassim. Maybe we
18 need to unmute here.

19 MEMBER CHOPRA: Okay. Thank you. No
20 comments for this. Thank you, please go ahead.
21 I'm completely aligned with the NOMECC strategy at
22 this time. Thank you so much.

1 CO-CHAIR THOMAS: Thank you. Sean?

2 MEMBER DUFFY: Nothing to add. I was
3 just unmuted. So nothing to add. I'll just
4 follow the guidance of the Panel members who are
5 better able to speak on this.

6 CO-CHAIR THOMAS: Okay. Nicole? Are
7 you unmuted?

8 MEMBER ELKO: Yes, can you hear me?

9 CO-CHAIR THOMAS: Yes, we can now.

10 MEMBER ELKO: Okay. Only comment is
11 that we, I do have some experience in working
12 with interagency groups that are able to engage
13 stakeholders and academia as well as federal
14 agencies that aren't FACAs, and I know we don't
15 have time to go into that right now but I'd be
16 happy to contribute that to the contents of the
17 paper if desired.

18 CO-CHAIR THOMAS: That would be great.
19 Okay. Yeah, if you could follow-up with me on
20 that that would be great. Okay, Lindsay?

21 MEMBER GEE: Yeah, it's interesting.
22 I think what the Admiral just said is, like, yeah

1 there is that. Is there a way to do it without a
2 task force, without another FACA or the
3 legislation to do that? If there isn't and it
4 came down to it, I guess the question would be
5 well, could we kind of get people from the
6 various FACA.

7 He mentioned OEAB and HSRP, well,
8 maybe it's both contributing to that and maybe
9 there's other FACAs that could be, that are
10 related, that could be done as well.

11 I mean, I was interested about IOOS
12 and I won't dwell on it here, but that sounds
13 really interesting and I don't know the structure
14 of how IOOS works well.

15 I know we've worked with some of the
16 members on that, but I was really interested in
17 that because from a regional perspective, it was
18 really interesting, I think, to hear Jessica, I
19 didn't get a last name, from Honolulu Corps of
20 Engineers --

21 CO-CHAIR THOMAS: Podoski.

22 MEMBER GEE: Podoski, okay and that

1 was really interesting and as a comment about how
2 these things get coordinated kind of backwards.
3 This was a check that we were on last year out in
4 American Samoa with the National Marine -- and
5 it's related to what Joyce said as well.

6 We were on a project with National
7 Marine Sanctuaries and partnered with CCOM and it
8 was the Ocean Exploration Trust. And they had
9 they're autonomous boat down in doing, preparing
10 for some work we did together and it was funded
11 by the National Marine Sanctuaries.

12 And in Pago Pago Harbor, they did some
13 setup and tests and actually it has been surveyed
14 recently. There was some work that Joyce had
15 done on the reef around there and we did some of
16 that work as well with ASV. And just to close
17 that out, it was also submitted to the external
18 source data at Coast Survey.

19 So it kind of happened but this is
20 where I think we're saying those kind of
21 happenings need to be, kind of, people need to
22 know how to do that and then it gets done.

1 So I guess that was the comment about
2 how do we make that and take Shep's point and how
3 do those kind of things just always happen and
4 people know about it in advance and it goes
5 forward.

6 Yeah, I look forward to the work we've
7 got to do, I guess in getting this strategy and
8 the comment on the strategy through. Thanks, and
9 that's all.

10 CO-CHAIR THOMAS: Great. Ed Kelly?

11 MEMBER KELLY: Yeah, I also, I don't
12 think we need to have another, you know, FAC. I
13 think, once again, I throw it back to IOOS. And
14 I think, you know, we are in a position with
15 IOOS, with the various Regional Associations,
16 that that could probably bring the right number
17 and the type of persons to the table for
18 individual and then building it up under the IOOS
19 platform.

20 I don't believe HSRP is the place to
21 do this. I don't think we have the depth and
22 breadth of participation and I would certainly,

1 you know, I think our papers are great, the ideas
2 are great, the implementation for further
3 development I would recommend goes through the
4 IOOS network.

5 CO-CHAIR THOMAS: Thank you. Ann
6 Kinner? Are you muted? You're muted. Muted.
7 Still muted.

8 MEMBER KINNER: Okay, it says I'm
9 unmuted now. On page roman numeral III of the
10 NOMEK document there is at the bottom half almost
11 50 names in an existing task force and I would
12 think that out of that existing task force, of
13 which NOAA is co-chair and also is executive
14 secretary.

15 You've got people already there, NOAA
16 leading, and I would think that that could be the
17 beginning step for creating what you call it a
18 working group or whatever of that task force.
19 Somebody's already put a task force in place, so
20 it's not like you have to create a new one.

21 Why not take advantage of something's
22 that's been called out in the document itself and

1 then, as I said, put together a working group of
2 whoever it needs to be to get this thing started.

3 CO-CHAIR THOMAS: Okay, good comment.
4 Have anything else?

5 RDML SMITH: Can I ask a clarifying
6 question? What was the list was that the -- is
7 that the list of the IWG-OCM or what is the list
8 of?

9 CO-CHAIR THOMAS: It's on the screen
10 Shep. It's UNOLS, MAC, R2R. Do you see it there
11 on the screen? In caps? Before the bottom, yep.

12 RDML SMITH: Yeah, so I don't --

13 MEMBER GEE: No, Ann was talking about
14 the strategy document itself. I think the
15 listing --

16 CO-CHAIR THOMAS: Right.

17 MEMBER GEE: -- is the people that
18 were in the task force and but they're all,
19 again, all government people. I think whether
20 you could establish a nongovernment working group
21 with them I think was the question.

22 CO-CHAIR THOMAS: Okay. Right.

1 Right, so it's how to get nongovernment people
2 into this working group here.

3 Okay, let's move on. Dave Maune?

4 MEMBER MANUE: I'm interested in
5 seeing what autonomous surface vessels are going
6 to be doing. I'm impressed to see what NOAA is
7 doing on the North Slope with the Saildrone
8 fleet.

9 They can deploy dozens of these
10 Saildrones, all operated from central control,
11 and go out there for weeks at a time and start
12 mowing the lawn in a systematic manner, could be
13 a single beam or multibeam.

14 So I see great potential from that
15 technology for addressing the needs for mapping
16 the EEZ. That's my major comment.

17 CO-CHAIR THOMAS: Great, thank you.
18 Anne McIntyre?

19 MEMBER MCINTYRE: Yeah, nothing to
20 add. Nothing to add just thanks everybody for
21 the work on this, it's a huge project and I
22 appreciate everybody's time.

1 CO-CHAIR THOMAS: Okay, thank you. Ed
2 Page? You're muted.

3 MEMBER PAGE: Now I'm not. I'll just
4 explore maybe the Committee on the Marine
5 Transportation System as an interagency group
6 that basically should be, have some concerns and
7 issues to support a NOMEAC and have tentacles and
8 all kinds of connections with the private
9 industry and the other agencies.

10 Helen Brohl talked to us briefly the
11 other day and obviously they support what we're
12 doing. That's the only thing I'm thinking of
13 when we talk about -- I think we do without
14 another advisory committee.

15 I think there's other mechanisms, ways
16 of -- or a task force whatever to address these
17 issues in that forum and CMTS can be part of that
18 solution perhaps. And that, everything sounds
19 great, thank you.

20 CO-CHAIR THOMAS: Okay, good thank
21 you. Gary?

22 MEMBER THOMPSON: I'll go back on

1 Lindsay's comment about the Federal Advisory
2 Committee. I serve on the PNT Advisory Committee
3 and we have a lot of discussion about land-based
4 autonomous vehicles, so I think that committee
5 could provide some input to this committee on GPS
6 technology and position.

7 CO-CHAIR THOMAS: Okay. I think what
8 would be really good is if you could capture some
9 of these comments particularly the ones that
10 haven't been mentioned, or I didn't read back.

11 You could capture them and send them
12 in to us, Lindsay and Qassim and myself, maybe.
13 And let's try to -- we'll finalize the document
14 here now.

15 MEMBER ABDULLAH: Julie, I didn't have
16 a chance. I will get --

17 CO-CHAIR THOMAS: Oh, yes. And I was
18 going to come back to you. Yes.

19 MEMBER ABDULLAH: Okay, thank you.
20 Thank you.

21 CO-CHAIR THOMAS: You're the last one
22 here I didn't catch.

1 Go ahead.

2 MEMBER ABDULLAH: Yes, I mean just to
3 respond to Admiral Shep about, you know,
4 mechanism. Whatever we do, we need the team of
5 doers, definitely. This is -- we need to keep it
6 away from bureaucracy and bring agency. We need
7 people who can roll their sleeves and do that
8 tour. You know, they could be executives. They
9 could be technical, but we need -- whatever you
10 call it, I don't want to be stuck with the names
11 or -- I know that you are limited within the
12 regulation, and you ask whether HSRP cover that.

13 I think if we don't find anyway within
14 NOAA capability to form an active dynamic team to
15 help the execution of this strategy, I think HSRP
16 should take responsibility over it but form a
17 team within that just to go around the
18 regulation.

19 You know, I mean, there is -- not
20 necessarily all can be done by the HSRP member,
21 but we can oversee a new working group where we
22 bring all these private, academia, government,

1 federal into it. I mean, I just to -- as a
2 suggestion.

3 For funding, you know, we're looking
4 at whether there is funding, you know, protocol
5 or more though, for NOAA to take over money to
6 execute.

7 I think we should encourage the other
8 way too. I mean, NOAA to support several program
9 or some other agency where they have more
10 capability or availability. We need to consider
11 that, instead just not bring in money but also
12 giving them money to task somebody else to do it.

13 That's really what I have on it.
14 Otherwise, I think it's great -- we can keep it
15 growing if there's no -- and I agree with Ed, we
16 shouldn't rush it. This is a huge thing, sort of
17 initiation. We should take our time to think it
18 over if we're not ready. Thank you.

19 CO-CHAIR THOMAS: Thanks, Qassim and
20 then, Sal, I do need to catch you here too.

21 MEMBER RASSELLO: Hi. Like my comment
22 before, I think the -- besides the of the

1 seafloor and the depth of the mapping and current
2 penetration, I think it's actually, now, using
3 the energy of the water to produce electricity
4 like the wind farms or wave farms like they have
5 in the Netherlands, and along the coast of U.K.
6 as well.

7 I think that's a good driver to take
8 interest of stakeholders into the project.

9 CO-CHAIR THOMAS: All right. Okay.
10 Let's go to Andy. Are you there, Andy?

11 CAPT ARMSTRONG: Yes.

12 CO-CHAIR THOMAS: Okay. Great.

13 Thanks.

14 CAPT ARMSTRONG: Double-punching
15 buttons, sorry.

16 CO-CHAIR THOMAS: Yes.

17 CAPT ARMSTRONG: Yes, so I have, I
18 mean, I wasn't going to raise this, but you said
19 that you'd like to finish up this document and so
20 that prompted me to make a remark.

21 And Number 5 is actually up on the
22 screen there now. There's a sentence in there

1 that said these updated methods are hampered by
2 outdated slow-moving regulatory framework.
3 That's just an invitation for us to go down a
4 rabbit hole with the people who read this and if
5 we just took that sentence out, I think we'd be
6 better off because we'll be -- somebody will say
7 well, what framework? Or what do we need to do?
8 So, just a suggestion, and I don't think that's a
9 helpful.

10 It may be true, but I don't think
11 it'll be helpful in this case.

12 CO-CHAIR THOMAS: All right. Thank
13 you. Anything else?

14 CAPT ARMSTRONG: No, no thanks.

15 CO-CHAIR THOMAS: Larry?

16 DR. MAYER: Yes, I think we got some
17 great discussions. But I think we're really
18 getting -- beginning to focus on critical issues
19 we're going to face in trying to implement NOMECS.

20 I come back to Lindsay's story about
21 what happen in American Samoa. And I think one
22 of the keys is to see if you can turn a situation

1 like that which kind of happened by chance, that
2 people were able to get some critical mapping in
3 a very remote area, even if it wasn't remote, and
4 make it happen by design.

5 And I think that's the key from these
6 mechanisms that can explore all the potential
7 assets when used efficiently and effectively.

8 And, so, I'm very intrigued. I don't
9 know much about how IOOS works if that, you know,
10 kind of on the regional organization basis might
11 be a mechanism or what Nicole has in mind in
12 terms of experiences that she's had. But I think
13 we should really explore those and see if we can
14 maybe help NOAA in trying to identify a mechanism
15 that really can go beyond, just even in our
16 agency, collaboration but using multiple sectors.

17 CO-CHAIR THOMAS: Okay, thank you.

18 Okay, let's go to Juliana.

19 MS. BLACKWELL: I don't have any
20 comments, Julie. Thank you.

21 CO-CHAIR THOMAS: All right. Rich?

22 MR. EDWING: Yes, I don't really have

1 any comments either, Julie. You know, we're
2 really in a, primarily, in a support role in this
3 effort so.

4 It's been a great discussion by the
5 HSRP and Shep and Juliana. I've gotten a lot of
6 valuable input from you guys. So, appreciate
7 that.

8 CO-CHAIR THOMAS: And, okay, thanks,
9 Rich. And Shep?

10 RDML SMITH: Thank you. Thank you,
11 all. No, I don't have any additional comments.
12 I look forward to the final version.

13 CO-CHAIR THOMAS: Okay. Great. All
14 right. So, in the interest of time, and we're
15 going to stop the discussion with this. And,
16 Sean, I'm going to turn it over to you to talk
17 about some of the recommendations that have come
18 in for the Letter to the Administrator.

19 MEMBER DUFFY: All right. Well, thank
20 you, Julie.

21 So I'm going to do this. And
22 something I say a lot in my normal job is, while

1 waterways management is a team sport and it's
2 very true here today, sometimes I'll add that my
3 TEAM acronym is together everyone achieves more.
4 So, when we go through this, I'll hit some of
5 high points of the comments that I've captured so
6 far but then I'm going to go around the Panel.

7 So, there was several comments about
8 recognizing, acknowledging Congressman Don Young.
9 And, I think, that's, you know, hit a lot.

10 There's, of course, a lot of
11 discussion about the NOMECS strategy and the
12 Alaska Coastal Mapping Strategy, and one
13 including making either a recommendation to
14 approve it. I think we've covered that today, so
15 I will adjust that later.

16 A comment that we heard a couple of
17 times was about Saildrone mapping of the Arctic.

18 Lots of discussion about interagency
19 partnership, public-private partnership, so
20 again, that teamwork kind of logic flows through
21 a lot of it.

22 And a lot of discussion that NOAA

1 should be one of the leading agencies in this.

2 And I won't say lead, but that's what was say.

3 Connections here are related to blue
4 economy, economic prosperity, promoting maritime
5 commerce, protecting the environment and
6 ecological resources.

7 Compliments came in on PORTS sensor
8 information being broadcast over AIS, something
9 that's been being worked on for a long time.

10 Standardization, back to NOMECS'
11 standards, nearshore/deep ocean type discussions,
12 consider requirements and potential benefits of
13 high resolution, nearshore bathymetry for storm
14 surge, run-off, run-up inundation, 3D currents,
15 coastal resilience studies.

16 Other than that, there were a lot of
17 different comments about COVID-19 and, you know,
18 adapting to the present system.

19 Looking at, you know, again, being on
20 a webinar and not in person and how industry has
21 responded in a lot of different ways, outside-
22 the-box thinking.

1 With that, that's the majority of the
2 comments I received. But I really would like to
3 go around and, I'm going to just say it, I'll
4 start off a list I have of alphabetical order
5 going backwards. So, I will put Gary Thompson on
6 the spot and, Gary, if you would hit anything
7 that I didn't mention or that you would like to
8 make clear.

9 And, again, this will be used for
10 helping put in that recommendation letter in a
11 format where everybody will be able to comment.
12 And we'll work through as you all are familiar
13 with the editing process to make sure we have a
14 final product that represents everybody.

15 So, Gary Thompson, you there?

16 MEMBER THOMPSON: Yes. Yes, can you
17 hear me?

18 MEMBER DUFFY: Yes, sir.

19 MEMBER THOMPSON: All right. Since
20 I've been on the HSRP seems like, almost every
21 meeting I hear about small boats and technology
22 to help them determine their position at low

1 cost.

2 So I think that be something that NOAA
3 or our group needs to take a look at. There's
4 technology out there, low-cost technology that
5 can probably be utilized for this and may be
6 already being used. But I think that would be an
7 area of some research looking at to help with the
8 small boats and their position especially in port
9 areas.

10 MEMBER DUFFY: All right, Gary, I
11 thank you. Next up's you, Julie.

12 CO-CHAIR THOMAS: You called out
13 everything I sent into you, so I'm good. Thank
14 you.

15 MEMBER DUFFY: All right. Thank you.
16 Captain Sal?

17 MEMBER RASSELLO: Sean, I think you
18 covered everything. I don't have any further
19 comment. Thank you.

20 MEMBER DUFFY: Thank you, Captain.
21 Captain "Be Like Ed" Page?

22 MEMBER PAGE: Yes. I think that with

1 the precision navigation happening, I think we
2 should mention we're making progress on many of
3 the factors that come into facilitating, you
4 know, efficient marine transportation, but, I
5 think, we should say we're moving in the right
6 direction and that we've got a better
7 appreciation of the financial impacts, rippling
8 impact from adverse, impacts of the economy when
9 Mother Nature or particular other conditions can
10 interfere and that we can mitigate those adverse
11 impacts by some of the tools that NOAA can
12 provide to the precision navigation.

13 I think that pretty good story about
14 Houston and that small area and impacts. And I
15 realized many other factors, variables that come
16 into play as was brought up, this whole small
17 boat issue, but that can be addressed -- there's
18 better ways of addressing that.

19 But you have to put all the pieces
20 together: type of vessel's a factor, there's the
21 size of the channel, and other wind conditions
22 and current conditions, et cetera, et cetera.

1 But the better the information the
2 mariners have the more likely they can proceed
3 even with those other factors in play. So I
4 think that, maybe, we want to mention that to
5 some extent. Okay, that's all I got.

6 MEMBER DUFFY: Thank you, Ed. Captain
7 Anne McIntyre?

8 MEMBER MCINTYRE: Hey, nothing to add.
9 I thank you.

10 MEMBER DUFFY: Thank you. Dave Maune?

11 MEMBER MAUNE: Hi. I will be anxious
12 to see how NOAA reacts to the Alaska Coastal
13 Mapping Strategy comments that we provided.

14 We have several dozen recommendations
15 in there, and I hope they are practical
16 recommendations that can be implemented rather
17 than something that just sounds like a good idea
18 that may be impractical for some reason.

19 So I'll be anxious to find out if our
20 recommendations are beneficial or not.
21 Otherwise, you've covered all my topics. Thank
22 you.

1 MEMBER DUFFY: All right. Thank you,
2 Dave. Ann Kinner?

3 MEMBER KINNER: Yes, I just want to
4 echo what Gary Thompson said because, again,
5 small craft are my focus.

6 And I know what they're willing to do,
7 whether they can afford it or not. I know what
8 they would like to do, let's put it that way.

9 And I think there's going to have to
10 be some mechanism to -- whether, I don't know
11 what it is, communication of some sort to let
12 them know if things are going into this
13 electronic whatever-you-want-to-call-it dealing
14 in restricted visibility, which isn't just fog by
15 the way.

16 The little guys just don't know, they
17 don't know what they don't know. They don't know
18 what they don't have.

19 And I can see some issues if the big
20 ships are all equipped, but they haven't stopped
21 to talk to the little guys, the 26-foot center
22 console fishing boat or the 30-foot sailboat who

1 has no electronics on board.

2 I think that's going to be an issue
3 that we've got to be looking at the little guys
4 too.

5 MEMBER DUFFY: All right. Well, thank
6 you. Ed Kelly?

7 MEMBER KELLY: Yes. Ann, I hate to
8 say it, but we can't face the world on the people
9 that are least equipped to live in it.

10 So I think it has to be, across the
11 United States, a significant effort to upgrade
12 the capability of smaller boats and the people
13 who operate them.

14 There are still some states, you know,
15 New York and others included, that still don't
16 even require a license to operate motorized
17 craft. So, you know, that's my comment on small
18 boats.

19 But I think overall, Sean, you've done
20 a great job in capturing the big hit points, and
21 I think I've got nothing else to add to that.

22 MEMBER DUFFY: Thank you. Lindsay,

1 you're up next.

2 MEMBER GEE: Yes. Thanks, Sean. I
3 think we're beating it to death, that NOMECS a
4 huge challenge, and it's bigger than our normal
5 HSRP responsibilities.

6 And when I commented to Shep yesterday
7 about we didn't want him to move away from the
8 shallow water, and he said, well, sometimes you
9 get a money with a note.

10 Well, I think, what we should look for
11 in here is a positive comment as we should use
12 the leverage what's in the NOMECS strategy to say,
13 well, you know, any funding that comes for that
14 shallow area really should be accelerated because
15 not only is it the general NOMECS, wanting to map
16 the ocean, you know, map the seabed, it has
17 specifically for the task they have for marine
18 navigation and support. And, I think, we
19 shouldn't lose sight of that. Thanks.

20 MEMBER DUFFY: Thank you, Lindsay.
21 Dr. Elko, you're up.

22 MEMBER ELKO: Thank you. Two things.

1 The concept of NOAA leading and then the concept
2 of interagency collaboration.

3 I think that it might be nice to put
4 those under one bullet or in the same paragraph
5 or however you're structuring it.

6 So, you know, we recommend NOAA leads
7 while, you know, still encouraging and
8 facilitating interagency collaboration.

9 And, then, just my other comment is
10 that I think that we should put a big thank you
11 in there that Dr. Jacob attended the meetings and
12 was so engaged. And NOAA senior staff, you know,
13 let's really play that up and encourage them to
14 continue doing that in the future.

15 MEMBER DUFFY: Well said, thank you.
16 So, I will just keep going down the list and come
17 back at the end if there's time on my points.
18 So, Captain Anuj?

19 MEMBER CHOPRA: Oh, thank you, Sean.
20 All I wanted is already there. Thank you so
21 much. You've covered it. Thank you for the
22 opportunity.

1 MEMBER DUFFY: Thank you. Qassim
2 Abdullah, sorry.

3 MEMBER ABDULLAH: Thank you, Sean. I
4 just want to -- I think you hinted to it, but I
5 really want to emphasize that standardization.

6 I really want to push the development
7 of a national standard for coastal mapping and
8 hydrographic survey.

9 The statement, the lady who came
10 earlier on the comment and mentioned about that
11 existing standard. She is right.

12 There is a document called a standard,
13 I went to it. It's a three and a quarter pages.
14 Two pages is a table, and you read inside it's
15 telling you this is guideline.

16 The standard is not a guideline. This
17 is a confusion, you know, people dealing with
18 this issue.

19 Protocol they call best practices, a
20 project specification, we have a lot of them.
21 None of them come to the level of national
22 standard, and as that what I want NOAA to please

1 listen to that.

2 There is so many things around. None
3 of them is a standard and especially the lady
4 claim there is a standard. We should do whatever
5 about it. It is totally false. It wasn't a
6 standard, it's a guideline, a one-page text, and
7 the rest are table. Thank you.

8 MEMBER DUFFY: Thank you, Qassim. So,
9 that's the Panel members I've gone to. The
10 Directors now starting with Dr. Mayer?

11 DR. MAYER: I'm good, Sean. I think
12 you've got this.

13 MEMBER DUFFY: All right. Thank you,
14 I appreciate that. Mr. Edwing, are you
15 available?

16 MR. EDWING: I am here. And, Sean, on
17 your long list, you have a very comprehensive
18 list. But do you have anything in there about
19 the fog discussion that went on today?

20 MEMBER DUFFY: No one, and I will tell
21 you that's a good point. I didn't mention it,
22 but a lot of what happened today is still kind of

1 like being processed. But it will be
2 incorporated into the draft that we will post for
3 everybody to comment on. But very good catch.

4 MR. EDWING: Yes. No, well, I agree,
5 and I think the discussion today, while it
6 answered a few questions, probably raised a lot
7 more that still need to be explored but just
8 giving past HSRP emphasis on the topic, you might
9 just want to acknowledge that somehow.

10 MEMBER DUFFY: Very good point. Thank
11 you. Okay, Ms. Blackwell, are you available?

12 MS. BLACKWELL: I'm here, and I want
13 to say I support the recommendation that you all
14 have already identified.

15 I don't know if you want to say
16 anything related to the delay of the NSRS
17 modernization. I don't think it's necessary, but
18 if you had thoughts on that that you wanted to
19 include, that would be welcome feedback. Thank
20 you.

21 MEMBER DUFFY: Yes, ma'am. I
22 appreciate that. Captain Andy Armstrong?

1 CAPT ARMSTRONG: Yes, thank you,
2 nothing to add. Sean, a really nice job on
3 rounding all of this stuff up and running this
4 comments process. So, thanks for that.

5 MEMBER DUFFY: Okay. Well, I
6 appreciate that. And that's a good segue because
7 I'll say something about the fog.

8 I want to be kind of, I'll say polite
9 and not careful, but I think this is a great
10 effort. And I think -- I look forward to having
11 some discussions with some of the members later
12 on.

13 And fog's a really tricky issue. I
14 mean, on Mississippi River, we have almost 260
15 miles of a ship channel. So sometimes when you
16 have fog in one area and not in another and
17 depending on where it is, it could impact the
18 whole channel, or it may only impact a very
19 limited number.

20 But looking at the small boats, that's
21 a real issue. The Sportsman's Paradise in the
22 lower Mississippi River in that delta, we have a

1 lot of fishing boats, a lot of hunters, a lot of
2 different craft transiting across a very busy
3 ship channel.

4 But with that, I'll just leave it
5 that, again, we will have a draft set up where
6 everybody can comment. And we'll whittle away on
7 getting everything right. Hopefully, pretty
8 quickly for these comments back to Dr. Jacobs.

9 And I appreciate everybody's support
10 and comments. Thank you.

11 CO-CHAIR THOMAS: Sean, I'm not sure
12 we got Shep's comment.

13 MEMBER DUFFY: You know, you are
14 right. And I will say Admiral, you are not on my
15 list, sir.

16 (Laughter)

17 But I should know better, so thank
18 you, Julie.

19 CO-CHAIR THOMAS: It's okay.

20 RDML SMITH: Thanks. I do have just
21 a couple of thoughts.

22 And one is that, you know, with the

1 more we talk about the NOMECS, I keep remembering
2 that we have for about 20 years had a structure
3 in place to coordinate ocean mapping. The, you
4 know, IOCM program authorized by OCMIA.

5 And that there already is quite a bit
6 of established precedent for a lot of the things
7 that we're asking for at a larger scale.

8 I think the thing that's different is
9 that was about coordinating activities to avoid
10 duplication and finding synergies, as opposed to
11 a structure to run a big program that where we
12 might expect to have increase in resources.

13 So a lot of those pieces are the same
14 but the fact that there might be money has
15 changed everybody's calculus about how to engage
16 with this program.

17 So, for instance, the IOCM, IWG-OCM
18 group that Ashley is involved with is hosting the
19 Standard Ocean Mapping Protocols Forum with full
20 public synchronization, speakers, everything, in
21 just a couple of weeks. And it is exactly the
22 type of forum that I think you all were

1 describing.

2 Now, it didn't stall, it's not a -- it
3 doesn't nest under a larger structure, but it's
4 similarly inclusive with officers and stuff that
5 are from other sectors. But I think it is
6 illustrative of some opportunity that we already
7 have.

8 And that, similarly, the IOCM has
9 sponsored regional workshops for gathering
10 priorities regionally. And we'll -- it's
11 obviously a little bit awkward to do that right
12 now with COVID, but I know that they're working
13 on coming up with a model of doing that, even in
14 just this way.

15 But I think we're working within
16 existing structures. And I think if we're
17 looking at the opportunity to enhance our
18 existing structures and programs in addition to a
19 consideration of whether we need something larger
20 and grander.

21 And that big change of having money is
22 a big game changer for sure.

1 And then second is just, you know,
2 boy, Qassim, I would love to have the same sort
3 of standards control over mapping that my peers
4 around the world have.

5 You need to get a permit in most parts
6 of the world to do any mapping and you need to do
7 it to the standard and you must provide the data
8 to the hydrographic office.

9 We don't have any of those
10 authorities. And, you know, this is freewheeling
11 'Murica here, right? So, we don't like lots of
12 government rules.

13 But if that's what we're talking
14 about, we have probably, you know, 50 models
15 around the world of exactly how to put a standard
16 in place that requires a, you know, kind of a set
17 way of doing things.

18 And, so, I think it's certainly worth
19 considering. As you might imagine, everybody's
20 in favor of a standard as long as everybody does
21 it my way.

22 Soon as we start saying, well it's got

1 to meet hydrographic office standards then the
2 Fisheries' people will complain that they got to
3 put tides and sound speed into their system and,
4 you know, et cetera, et cetera. And, so, we have
5 -- we tried in the past, and we've gotten a lot
6 of pushback.

7 Now, that's not to say that we
8 shouldn't try again, and the moment is different
9 now. And, maybe, the time is right to make
10 another tilt at that windmill. So, I really
11 appreciate you reminding us of the value of that.

12 And, so, I will stop my comments
13 there. But thank you, all, for a great
14 discussion.

15 CO-CHAIR THOMAS: Okay. So, Sean,
16 maybe, I'll pick it up from here.

17 And, actually, Ed, I know that we're
18 at the time -- overtime for this particular
19 session.

20 You know we could we -- but we haven't
21 had a chance to look at is a priorities matrix.
22 But we could dedicate -- excuse me, what is it --

1 the next P&E session to really go through the
2 priorities matrix because it will set the topics
3 for the next meeting. I don't know, Lynne, Ed,
4 what do you think?

5 CHAIR SAADE: I think that's fine
6 because we are coming up against the wall.

7 MS. MERSFELDER-LEWIS: I would just
8 show it because I think everybody just went
9 through what would have normally been your
10 closing comments. You just had them. So you
11 have a little time.

12 CO-CHAIR THOMAS: Show the priorities
13 matrix?

14 MS. MERSFELDER-LEWIS: Okay. And I
15 would just ask do any of the members have things
16 that are giving them heartburn that they want to
17 see discussed or talked about?

18 I know Qassim wants to discuss what
19 you guys have an issue paper. Are people
20 interested in talking, one, about standards?

21 And they're might be other things as
22 well. And I think Nicole Elko might want to talk

1 more about that nearshore bathymetry or, you
2 know, whatever those things are.

3 I don't want to speak for anybody or
4 not speak for somebody and miss something. But
5 if you guys had something burning that you want
6 on the record now is the time.

7 CHAIR SAADE: Okay, so let's do this,
8 Julie. We've only got 15 minutes, and I think we
9 can put the priority matrix up. And in the
10 meantime, go quickly through this.

11 There's been a couple of emails
12 running around with ideas on other topics to
13 cover. But we haven't done those bi-monthly or
14 once every few months meetings that are designed
15 to do a little bit of background and are open to
16 the public and people can -- can at least get the
17 ball rolling on some of these new ideas.

18 That sort of, since Dr. Jacobs brought
19 it up yesterday, about coastal mapping and all
20 the reasons to do that. Of course, we want to
21 follow-up on that, but that needs its own
22 background technical clarification for

1 everybody's benefit.

2 And, then, we can go down that road.
3 But if anybody wants to throw something on the
4 table right now for meetings that are coming up
5 that we can organized and have a discussion and
6 do some technical deep-dive on that then let's
7 get that out on the table right now.

8 CO-CHAIR THOMAS: All right. Let me
9 just say that I do have Qassim's email, so we
10 don't have to do that one again. And, yes, but
11 go ahead then. If you want to go around or if
12 you want to ask people.

13 CHAIR SAADE: Dr. Nicole, do you have
14 -- do you want to, at least, voice your ideas, so
15 we can capture it and come back to it?

16 MEMBER ELKO: I actually am not sure
17 what Lynne was referring to, so I'll pass for
18 now.

19 CHAIR SAADE: Okay, then. And that
20 side too because we communicate enough on the
21 side.

22 I really liked the, you know, I

1 personally would like to follow-up on Dr. Jacob's
2 ideas and then some of the things that were
3 bantered around this morning as we were
4 communicating with each other.

5 Between Ed Number 1 and what Qassim
6 was saying, we have another list that would be
7 very good to have some more deep-dive backgrounds
8 in it, you know.

9 I kind of missed the fact that we
10 haven't been doing any of those technical
11 presentations on the sides because I think
12 they're very beneficial and I think they're easy.
13 And in the environment that were in right now
14 with everybody, it's easy to dial in and get
15 involved, we can probably do a lot more of that.

16 So, I guess my recommendation is to
17 have some more technical presentations in the
18 interim between these public, formal public
19 meetings.

20 Shep, if you want to say anything
21 else, you know, we got a bit of a gap, and
22 everybody's kind of coming to the end here,

1 energy-wise and everything else.

2 RDML SMITH: Yes. Sean was either
3 muttering under his breath or muted.

4 (Laughter)

5 CHAIR SAADE: Take your pick.

6 RDML SMITH: Sean, did you want to say
7 what you were going to say?

8 CO-CHAIR THOMAS: Muted.

9 CHAIR SAADE: And, Ed Kelly, is that
10 an old comment or did you already --

11 MEMBER DUFFY: Ed, yes, so, I
12 appreciate that and was indeed muted.

13 So, I'd like to just talk real quick
14 about the partnership, I think that gets back to
15 the interagency. And I think even looking at the
16 AIS over -- the PORTS system over AIS is part of,
17 maybe, combining those two under interagency.
18 Now, I'll leave it at that.

19 CHAIR SAADE: Okay.

20 CO-CHAIR THOMAS: Sean, I know that
21 you wanted to -- so this brings up a discussion
22 that we had going forward.

1 You were thinking, maybe, the HSRP
2 could talk about sensor partnerships, different
3 agencies having different resolutions or formats
4 for sensors, et cetera.

5 MEMBER DUFFY: So, I don't know if
6 that's even ready for a topic. I would like to
7 bring it up later.

8 I'm kind of like looking at something
9 and it falls under that category or umbrella of
10 interagency cooperation.

11 But I do plan to, I think, go like to
12 the Planning and Engagement Committee with that
13 as just an idea, see what other members think and
14 if they're willing to support that. And, then,
15 there will be definitely a connection to the tech
16 folks.

17 So I'll leave that for a later date,
18 but I think the partnership combining those types
19 of things kind of takes a couple items and kind
20 of focuses them on what we've talked about with
21 interagency efforts.

22 CO-CHAIR THOMAS: Great. Okay, there

1 is an interagency on our priority's list, so we
2 can expand that if needed.

3 MEMBER ABDULLAH: Julie, may I add,
4 maybe, kind of add in a comment in regard to this
5 please.

6 CO-CHAIR THOMAS: Sure.

7 MEMBER ABDULLAH: And, I think, is it
8 -- might be as useful for our future meeting,
9 whether this biannual or the regular meeting, to
10 dedicate time, maybe 45 minutes, an hour, for
11 technology showcase, for example, where we bring
12 technology manufacturer.

13 I know Larry's doing a great job.
14 Larry, you're doing on -- briefing us on what
15 you're doing.

16 But it's nice to have the manufacturer
17 to come and brief us on the latest technology.
18 And that's session also can be dedicated to bring
19 other interagency members like Corps of
20 Engineers, JALBTCX, to brief us on what they
21 doing, you know, to complement NOAA activity, you
22 know.

1 I mean it will be good for us just to
2 see what's going on outside NOAA, you know, for
3 us as HSRP. That's just a suggestion.

4 CHAIR SAADE: No, that's a good
5 suggestion, and we do it. Historically, we've
6 done it a lot. I mean, maybe, we kind of drifted
7 away from it. Probably directly related to the
8 fact that our meetings are only four hours long
9 now. And we don't have a morning session and a
10 lunch session, and we used to push it to about
11 three days of eight-hour days.

12 But part of it is the schedule,
13 Qassim, to fully support the idea, we'll work on
14 future agenda.

15 MEMBER ABDULLAH: But, Ed, we don't
16 have to really to do it for this big meeting, for
17 example. We can schedule a virtual one, you
18 know, in between, you know.

19 CHAIR SAADE: Right. And we've done
20 before, and we invite the public just to have a
21 topic on the level of interest relative to
22 technology.

1 MEMBER ABDULLAH: Yes. That's good
2 for everybody, yes. Thank you.

3 CO-CHAIR THOMAS: It's been asked --
4 both Ed Kelly and Gary Thompson want to make a
5 comment.

6 MEMBER KELLY: Yes, Ed Kelly here.
7 You know, this is my eighth year, and this is
8 probably my last public meeting.

9 So I just -- while I've got the public
10 record, I'd just like to go on record in saying
11 it's been a great run. I've been tremendously
12 amazed and gratified by the great work done by
13 the NOAA leadership and staff.

14 And over the years, I've consistently
15 found all the HSRP members to be dedicated,
16 extremely skilled in their fields, and a real
17 pleasure to work with.

18 So, just a thank you to everyone.
19 It's been a tremendous experience to me. And I
20 just want to also be on record that NOAA still
21 owes me a trip to Hawaii.

22 And the second part is that PORTS

1 should be federally funded. And I hope somebody
2 out there, I see Sean shaking his head, and I
3 hope a few others will be in the same way along
4 there. When I was hearing about how the Navy was
5 getting PORTS, that means the federal -- if the
6 Navy is paying, the federal government is paying
7 and that puts my port at a competitive
8 disadvantage because of things like that.

9 But enough about that, I hope someone
10 will shake up the obstruction and carry that
11 forward.

12 But thanks to everybody involved, and
13 it's been a real pleasure. Thank you all.

14 CHAIR SAADE: Thanks, Ed.

15 MS. MERSFELDER-LEWIS: This is Lynne.
16 This is Lynne. I just have to jump in and say,
17 Ed, you're retiring too early. You have another
18 year.

19 MEMBER KELLY: Oh really.

20 (Simultaneous speaking)

21 CHAIR SAADE: Nice try, Ed. Nice try.

22 MS. MERSFELDER-LEWIS: I'm sorry. You

1 have to push us hard to get there before December
2 31st.

3 CHAIR SAADE: There's no early outs on
4 the HSRP.

5 MS. MERSFELDER-LEWIS: Yes, that's
6 exactly. We're keeping you for another year.
7 And Sal Rassello's, the same.

8 MEMBER KELLY: Okay. My mistake.

9 CHAIR SAADE: We're going to record
10 that speech, so you can use it in a year.

11 MEMBER PAGE: Too many Eds.

12 (Simultaneous speaking)

13 MEMBER KELLY: My beard will be quite
14 good by that time.

15 RDML SMITH: He was just trying to
16 figure out how to get that full federal funding
17 for PORTS into the discussion when it wasn't on
18 the agenda, you know.

19 MEMBER DUFFY: Full federal funding
20 floats all boats.

21 CO-CHAIR THOMAS: And, Gary --

22 MEMBER THOMPSON: So, one of the

1 topics I would like to see at our future meetings
2 is about GNSS reflectometry. I can't even say it
3 this afternoon. I think it has potential. We
4 could see a lot of use here on our coast for
5 measuring water elevations. So, I know there's
6 been some research done on it.

7 But I'd like to see the next
8 presentation on that and possibly more research.

9 CHAIR SAADE: Good. Okay. If there's
10 no other comments or required topics that we need
11 to cover, Julie, anything else from your
12 perspective?

13 CO-CHAIR THOMAS: NO, I marked down a
14 couple things to add a line to the priorities
15 list.

16 And I think we really need to go
17 through this and clean it up. Some of this stuff
18 is pretty old. And it's not that the topics, per
19 se, but the comments for the topics are pretty
20 outdated. But, amazingly enough, a lot of the
21 topics are still relevant.

22 So I think I'll take a first pass, go

1 through and try to clean it up and send it out.
2 And, maybe, we can take some time during the next
3 P&E meeting to really discuss it because we want
4 to get topics for the next meeting is the point
5 of this. And it's a good tool to get them in the
6 priorities list so that we can then focus on them
7 during the next meeting.

8 CHAIR SAADE: So then the next meeting
9 is late March or early April, correct?

10 MS. MERSFELDER-LEWIS: Yes, I was
11 muted. I'm still laughing about Ed Kelly trying
12 to get off too early. Yes.

13 And, Ed Kelly, I hope we all see each
14 other before you leave, and we can all like have
15 a, you know, a glass of soda or water together,
16 so.

17 MEMBER KELLY: Absolutely, I'm looking
18 forward to it.

19 MS. MERSFELDER-LEWIS: That's correct.
20 Maybe even Hawaii. So, Ed, yes.

21 We'll come up with dates soon. And
22 one thing you guys plan is -- I mean you have

1 five more minutes, and we really can't hold the
2 transcriptionist over.

3 So if you could weigh in those two
4 half-days about what we did okay, I'd welcome
5 feedback. It doesn't have to be right now. It
6 can be anytime.

7 MEMBER KELLY: Okay, Lynne.

8 MS. MERSFELDER-LEWIS: Because, I --
9 sorry. If you haven't already turned in your
10 timesheet, please turn in your time.

11 MEMBER KELLY: How about our travel
12 vouchers?

13 MEMBER MAUNE: I want to thank Lynne
14 in Virginia and all their staff for putting this
15 together. I think you did a wonderful job.

16 CO-CHAIR THOMAS: Yes. I think we all
17 clapped at that one.

18 CHAIR SAADE: Yes. I agree.

19 MS. MERSFELDER-LEWIS: I want to thank
20 specifically, Amanda Phelps, Christine Burns,
21 Virginia Dentler, Jill Stoddard, you guys was the
22 amazing, best moderator I've ever seen behind the

1 scenes. And Galen, who you know already, and
2 David Barglow did a hundred million updates on
3 the website for us. So, thanks to everybody.

4 CO-CHAIR THOMAS: Thank you. And also
5 to the Directors. I think --

6 MS. MERSFELDER-LEWIS: Sorry, and
7 Christine Burns.

8 CO-CHAIR THOMAS: Okay. I was just
9 going to say, I know the Directors have spent a
10 lot of time, too, reading through our different
11 notes, so I really appreciate it all. And to Ed
12 Saade.

13 MS. MERSFELDER-LEWIS: Maybe still for
14 the next working group meeting, we can go into a
15 lot more detail on that and on, you know, wish
16 lists for speakers --

17 CO-CHAIR THOMAS: Lynne, you're
18 dropping --

19 CHAIR SAADE: Okay. I'm going to go
20 ahead and end the meeting and thank everyone.

21 This has already been noted, but I
22 thought the meeting on a technical level was

1 seamless. It was really, really excellent.
2 Really easy with the exception of all of us that
3 forget to unmute, but that's a technical
4 deficiency as human. And we'll figure that one
5 out one of these days.

6 So with that, I want tell everybody,
7 stay safe. Stay healthy. We'll look for you out
8 on the web. Let's keep the energy going because
9 we are really doing some great things and
10 tackling some incredibly big issues that are
11 really, really meaningful.

12 So, have a good evening and afternoon,
13 and everyone take care.

14 (Whereupon, the above-entitled matter
15 went off the record at 4:58 p.m.)

16
17
18
19
20
21
22

A	
A&M 113:1,4	acronym 180:3
Abdullah 1:15 5:6 6:6 24:16 42:20 59:2 116:11,13 117:4,6,8 145:14 147:10 173:15 173:19 174:2 190:2,3 205:3,7 206:15 207:1	act 43:10 46:6 94:11 160:4
ability 50:22 51:7 52:5	action 92:15 107:10 127:11 148:4,4
able 18:22 36:15 37:5 41:13 50:10 69:12 75:5 82:6 104:19 131:20 140:18 153:14 165:5,12 178:2 182:11	actions 3:18 63:1
aboriginal 96:9	active 47:13 48:2,11 174:14
above-entitled 144:14 214:14	actively 102:11
absolutely 116:17 128:18 133:9 135:6 211:17	activities 17:2 41:21 53:13 54:15 76:1 100:13 138:8 152:4,7 154:1 195:9
academia 5:13 34:5 41:1 43:2 44:21 47:3 47:5,16,22 48:7,18 93:10 165:13 174:22	activity 42:15 50:8,16 101:10 148:19 151:4 151:20,21 205:21
academic 35:3 41:8 49:4 67:12 68:10,15 82:10 94:2 95:6	acts 115:6
academically 134:21	actual 5:20 130:4 139:3 142:17 143:22
academics 41:17	adapting 181:18
accelerated 80:15 188:14	add 11:15 21:5 22:3 25:3 32:19 59:20 62:3 70:17 71:16 127:5 164:2 165:2,3 171:20 171:20 180:2 185:8 187:21 193:2 205:3,4 210:14
accelerator 12:4	added 25:3 42:18 100:19 129:1
accept 55:2 71:16,17 137:4	adding 96:19
acceptable 52:5	addition 20:8 100:10 196:18
acceptance 88:21	additional 24:11 64:4 67:6 79:22 149:19 179:11
accepting 56:4 64:2	Additionally 82:18
access 46:22 86:18 98:13 154:13 155:19	address 19:12 32:15 35:10 40:10 60:9 69:5 94:19 147:17 172:16
accident 109:3,5	addressed 34:15 184:17
account 31:8 77:4	addresses 20:9 26:21
accountability 95:22	addressing 34:22 38:13 171:15 184:18
accuracy 52:17	adds 68:18
accurate 94:3 122:6,7	adequately 49:5
accurately 50:10	ADFs 119:6
achieved 43:12	adjust 180:15
achieves 180:3	ADMINISTRATION 1:3
acknowledge 141:4 192:9	administrative 71:19
acknowledging 180:8	Administrator 30:2 179:18
acknowledgment 113:12	Admiral 2:8 4:10,13 5:7 6:12 19:10 34:2 42:21 46:21 58:13 61:5 84:13 165:22 174:3 194:14
ACMS 3:4,7	ado 75:9 102:21
acoustic 44:19 76:20 124:13	adopted 105:20
acquainted 132:6	adopting 87:17
acquisitions 71:5	adoption 97:13
	advance 129:11 168:4
	advanced 97:13 121:2
	advantage 17:12 83:19 162:5,17 169:21
	adverse 184:8,10
	advice 30:22
	advise 44:5 72:18
	advisory 35:21 72:15 72:17,19 159:14,16 159:16 160:4,14,17 160:22 172:14 173:1 173:2
	advocate 17:20,22 51:7 51:12
	advocating 76:4
	affect 114:22
	afford 186:7
	afternoon 6:4 7:14 8:2 12:21 14:3 101:13,16 101:22 103:3 210:3 214:12
	agencies 17:2 40:2,7 41:1,16 52:21 53:11 55:11,15 57:11 63:4,8 63:16 66:4 81:4 82:14 86:9,21 87:9 96:3 165:14 172:9 181:1 204:3
	agency 9:3,7 16:14 61:2 72:20 94:21 162:7 174:6 175:9 178:16
	agenda 99:1 206:14 209:18
	ago 41:5 45:21 62:15 75:18 92:14 93:20 137:21 143:5 147:22 153:1
	agree 5:7,21 6:6 10:4 11:18 16:10 24:20 27:2 37:15 42:22 46:19 64:13 70:8 94:3 112:16 113:2,2 130:16 143:16 145:18 175:15 192:4 212:18
	agreed 75:5
	agrees 79:18
	ahead 4:11 5:5 6:16 17:13,15 19:5,14 24:3 24:14 49:12 56:10,14 79:12 82:3 84:11 89:18 91:15 92:1 94:9 99:10 126:21 127:2 128:16,19 141:13,19 145:13 164:20 174:1
	201:11 213:20
	aid 109:19 120:15
	aids 119:5
	airborne 76:15,18 90:21
	aircraft 118:18 146:14
	airlines 132:12
	airport 119:8 132:13 138:9
	airports 118:20
	AIS 131:7,12 132:2,4 152:22 153:10 154:2 181:8 203:16,16
	Alaska 6:14 8:5,21 9:20 11:7 13:15 15:2 16:8 17:14 18:19 19:12,16 21:8,16,17 25:16 47:13 55:8,8,13,16,18 61:20 65:1 75:11,16 75:20 76:5,10,13 77:3 96:9 152:15 157:4,6 157:11 180:12 185:12
	algorithms 113:15
	Alice 81:19,20 82:8 84:2
	aligned 164:21
	all-nation 34:12
	alleviate 117:19
	alliances 96:12
	allow 17:1 98:1 162:16
	allowing 82:7 94:10
	Aloha 89:20
	alphabetical 5:3,4 182:4
	alternative 20:17 26:3 26:17,18 64:4
	alternatives 26:19
	Amanda 212:20
	amazed 207:12
	amazing 58:1 104:17 212:22
	amazingly 210:20
	ambition 97:15
	ambitious 150:22 156:17
	America 142:9
	American 90:8,13 167:4 177:21
	American-Pacific 23:2
	amortizing 64:17
	amount 57:6 77:1 108:15
	Amsterdam 137:3
	analysis 36:14,14 37:6 54:18
	analytics 113:13
	Anchorage 75:10
	Andy 2:2 14:12,19

28:10 67:8 68:9 71:14
72:6 176:10,10
192:22
Ann 1:18 9:22 10:2 11:2
27:11 62:13 127:15
130:22,22 134:6
139:20 169:5 170:13
186:2 187:7
Ann's 139:21
Anne 1:19 11:13,20
27:15,16,16 28:4 64:8
64:12 127:13 135:7
136:5 143:15 161:16
171:18 185:7
Anne's 145:17
annotated 99:1
annual 94:18 104:17
answer 43:14
answered 192:6
answers 39:7
anticipating 156:10
Antwerp 133:12
Anuj 1:16 6:3,5 24:17
53:3 56:10,14 58:11
59:15 109:1 116:14
117:10 126:22 128:11
130:20 147:8 164:17
189:18
anxious 185:11,19
anybody 22:2 42:1
45:10 200:3 201:3
anymore 137:22
anyplace 9:20
anytime 212:6
anyway 12:16 31:5
72:22 148:14 149:16
156:5 159:4 160:15
161:11 174:13
AOOS 21:7
apiece 74:21
apologize 7:1 139:6
156:22
app 124:18
application 124:16
applied 105:5
apply 46:17 97:7
appoint 48:4
appreciate 7:8,11 11:16
13:21 58:22 81:14,15
82:5 84:2 89:15 94:8
95:10 96:19 101:3
102:22 104:18 115:12
127:10 131:1 139:4
139:16 147:8 157:9,9
171:22 179:6 191:14
192:22 193:6 194:9
198:11 203:12 213:11
appreciated 84:17

129:20
appreciation 184:7
approach 77:10,16
85:15 124:20
approaches 70:3
appropriate 69:1
appropriations 56:7
162:4,16
approval 86:12
approve 19:15 180:14
approximately 114:4
April 211:9
archives 35:6
Arctic 147:14,16,21
148:8,16,20 149:22
150:3 151:1 155:22
156:2,6,7,10,13
157:11
area 11:17 40:12 83:17
83:20 104:22 111:18
120:11 144:4 154:21
157:10 178:3 183:7
184:14 188:14 193:16
areas 33:12 36:6 54:1,5
76:14,18 83:18 88:2
129:7 142:20 152:8
153:22 154:17 183:9
Argo-AI 97:5
Armstrong 2:2 14:12
14:13 28:12 67:9 68:3
71:15 176:11,14,17
177:14 192:22 193:1
Army 89:18,21 162:10
art 97:8
Artic 180:17
articles 108:11
artificial 97:1
Ashley 141:17 195:18
asked 79:3 92:14
138:20 207:3
asking 195:7
aspect 50:3
ASPRS 43:5
assessment 53:10,11
94:17
assets 35:4 38:6 39:1
39:15 40:13,15 58:7
94:17 178:7
assign 118:2
assist 102:5,12
associate 75:16
associated 94:20 97:19
associations 47:7,10
47:15 57:4 168:15
assuming 136:7
assured 99:7
astounded 142:11
astounding 116:1

ASV 97:3 167:16
atlas 95:5
ATMOSPHERIC 1:3
AtoNs 154:2
attended 189:11
attention 12:6 18:10
42:22 65:11 90:7
116:3 146:8 156:18
157:11
attribute 45:19
audio 4:12 92:5 107:5
authorities 71:8 73:2
197:10
authority 71:16,20 72:6
72:7 134:14 136:10
authorized 195:4
automation 97:14
autonomous 18:12,16
37:14,17 51:7,20 52:3
97:3,9 119:20 121:7
163:16 167:9 171:5
173:4
autonomy 97:4,11,16
availability 175:10
available 17:12 40:14
40:16 57:21 95:15
96:16 104:9 128:15
129:9 135:22 136:8
139:18 140:10 191:15
192:11
avenues 116:8
average 90:18 112:7,15
113:22 114:10 117:16
avoid 149:10 154:2,17
195:9
awarded 87:2
awardee 85:2
awards 54:3
aware 91:10
awkward 196:11

B

B 119:2
BAA 53:20
back 4:21 16:16 27:16
32:9 33:19 34:16
46:20 52:10 59:21
64:12 69:19 73:10,14
73:21 74:3,10 92:18
100:22 117:5,6 127:3
138:1,2 144:8,11,18
147:5,6 150:4,7,11,20
151:1 159:12 164:17
168:13 172:22 173:10
173:18 177:20 181:10
189:17 194:8 201:15
203:14
background 7:1 200:15
200:22
backgrounds 202:7
backscatter 33:8
backup 136:9
backwards 167:2 182:5
bad 46:11 115:2,2
ball 200:17
Baltimore 135:18
bantered 202:3
barges 110:21 111:2
149:6
Barglow 213:2
Barrow 148:20
base 45:9 158:7
based 84:22 112:4
129:1 135:7 136:17
136:17
basic 71:19
basically 21:16 39:11
41:13 54:4 93:4 108:9
111:11 112:3,19
147:18 152:16 172:6
Basin 150:8
basis 33:15 129:8
178:10
bath 44:19 54:16
124:13 140:17
bathymetric 77:17 88:1
122:8,15,19 124:11
bathymetry 33:7 54:12
54:12,13 85:2,5 87:16
88:6,10,20 90:9,20
96:7 181:13 200:1
baton 126:11
Bay 133:6
Beach 7:15 64:20 128:6
132:11
beacons 119:7
beam 21:1 171:13
beard 209:13
beating 188:3
Beaufort 148:21
beautiful 116:14
beginning 34:8 63:4
100:2 141:4 159:22
169:17 177:18
behalf 108:13
believe 6:7 18:14 43:12
45:14 57:15 77:15
78:16 92:11,12 97:11
99:8 120:3 132:1
168:20
bell 144:17,18
beneficial 185:20
202:12
benefit 37:2,8 54:18
65:3 201:1
benefits 18:22 53:15

54:9,17 55:22 80:16
80:19 181:12
BERG 130:6
Bering 154:14
berths 106:21
best 6:21 65:19 126:10
154:15 157:8 190:19
212:22
better 59:6 69:21 104:2
117:18 121:15 122:9
142:5 154:9 163:3
165:5 177:6 184:6,18
185:1 194:17
beyond 16:18 17:2
39:18 40:9,22 68:15
131:14 135:21 139:12
178:15
bi-monthly 200:13
biannual 205:9
bid 52:1
big 7:9 8:11 10:12 17:7
17:22 57:20 67:19
75:15 77:4 91:9 101:4
103:7 107:7 108:1
113:13 117:16 123:22
124:3 132:4,16 133:8
138:10,11 139:22
158:18,19 186:19
187:20 189:10 195:11
196:21,22 206:16
214:10
bigger 46:13 123:19
188:4
biggest 13:4 161:12
164:8
bill 79:21 80:3
billion 101:17,18 114:9
114:12 123:20 146:4
151:11
billion-dollar 104:20
billions 117:14 124:21
150:5,6,14 159:2
bioimagery 86:7
bios 104:8
bit 17:13 19:13 23:9
26:2 70:14 135:21
136:17 141:6 158:1
160:16 195:5 196:11
200:15 202:21
bite 10:14
bites 140:1
black 148:22
Blackwell 2:3 14:21
22:14,17 23:1,16 24:6
24:8 29:14 70:20
178:19 192:11,12
blue 9:12 66:22 181:3
blurry 128:9

board 160:22 187:1
boat 131:11,14 153:16
167:9 184:17 186:22
boaters 132:21 139:19
boats 123:19,19 124:2
127:16,17 133:1,4
134:11 146:20 149:6
153:2 182:21 183:8
187:12,18 193:20
194:1 209:20
books 129:16
border 37:1
borrow 65:13
boss 75:16
bottom 85:18 110:20
169:10 170:11
box 110:20,21
boxes 110:4,19
boy 197:2
brainer 123:7
brainstorm 56:8
brainstorming 38:19
breadth 168:22
break 74:2 141:11
144:10,19
breakdown 128:21
129:16
breakout 128:12
breath 203:3
Brennan 2:11 101:8,13
101:16 103:3,8,15
125:13,16,19 126:17
bridges 110:8
Bridgewater 9:19
brief 72:8 141:20
149:17 205:17,20
briefed 23:7
briefing 205:14
briefings 55:12
briefly 66:1 148:7
172:10
bring 18:15 44:17 45:18
50:7 51:9,13,22 90:4
90:6 102:19 111:7
121:22 146:8 151:8
168:16 174:6,22
175:11 204:7 205:11
205:18
bringing 49:8 52:11
68:1 71:12 80:16
115:13 133:16
brings 203:21
British 85:12
broadcast 181:8
broadcasting 50:2
broadly 96:16
broadness 58:21
Brohl 172:10

broken 48:21
brought 7:18 42:21
50:4 68:10 70:20
116:2 133:10 137:10
184:16 200:18
Bryant's 65:15
budget 55:10 94:18
build 29:8 119:16
building 31:16 62:18,18
86:6 151:9 168:18
bullet 67:10,19 69:1
189:4
bunch 150:9
buoy 20:22 21:6
burdensome 98:8
bureaucracy 174:6
buried 99:22
burning 200:5
Burns 2:15 104:5,15
116:14 117:11 121:1
125:1 126:1 128:16
128:20 129:21 138:2
139:8 212:20 213:7
business 84:22 85:3,6
86:6,10 89:3 98:1
123:8
businesses 85:21 89:5
89:6
busy 194:2
button 125:21
buttons 176:15

C

C-O-N-T-E-N-T-S 3:1
cabinets 35:15
cadence 89:6
calculated 69:15
calculus 195:15
calendar 112:8
calibrated 35:20
call 6:18 22:10 33:9,21
49:12 60:14,22 63:14
130:21 146:9 154:6
156:4 169:17 174:10
190:19
called 157:4 169:22
183:12 190:12
calling 36:11 79:1
camera 30:11
cameras 124:1,4
Canada 21:7 52:2 149:3
canal 123:1 156:14,15
canals 156:14
cancellations 129:14
capabilities 54:4 64:14
86:15 125:9
capability 47:20 51:16
86:4 119:17 124:20
135:8 174:14 175:10
187:12
capable 82:16 120:8
capacity 31:16 41:19
48:15 130:12 163:6
capacity-building 96:5
capital 106:2
caps 170:11
CAPT 14:13 28:12 67:9
68:3 71:15 101:13,16
125:19 176:11,14,17
177:14 193:1
captain 1:16,18,19,20
1:20 2:11 5:5 6:3,22
7:8 9:22 11:3,12,20
12:19 14:11 19:10
101:8,8 103:2,8,15
109:1 125:13,16
126:16 130:22 133:10
133:22 135:6,13,17
136:5 139:2 143:15
183:16,20,21 185:6
189:18 192:22
captains 142:15
capture 173:8,11
201:15
captured 162:1 180:5
capturing 187:20
car 97:4,8 120:1,5,7,10
121:22
care 214:13
careful 68:16 193:9
cargo 103:22 107:16,17
107:20 111:2 129:8
129:12 130:18
cargos 113:6
Carolina 7:15 14:4
carried 103:10
carrier 142:9
carry 208:10
case 41:15 151:15
153:15 177:11
cases 86:16
cast 12:15
casualty 150:12
catch 25:10 173:22
175:20 192:3
category 204:9
cause 113:17
caused 90:16 103:12
104:2
causes 45:17
causing 90:18 103:21
CCOM 167:7
CDIP 162:9
cellphones 143:7
center 2:2,4,5,6,12 21:1
186:21

- centers** 78:13 129:6
centimeters 122:7
central 171:10
CEO 96:22 142:8
certain 49:1 83:17,20
certainly 41:7 68:7
77:10 78:9 143:3
163:14 168:22 197:18
Certificate 142:14
certified 85:7
cetera 151:14 154:17
155:13 156:14,15
184:22,22 198:4,4
204:4
chain 107:21 108:17
109:17 113:7 114:3
116:6 128:7 129:2
chair 1:12,14 4:3,4 5:1
6:2,22 7:12,22 8:15
9:22 11:2,12,20 12:1
12:19 13:10 14:1,11
14:19 15:7 16:2 17:6
19:5 24:13 30:6 47:11
49:18 58:18 72:1 74:5
101:1 126:21 139:3
141:12,17,21 142:2
144:5,17 163:12
164:3 199:5 200:7
201:13,19 203:5,9,19
206:4,19 208:14,21
209:3,9 210:9 211:8
212:18 213:19
Chairman 100:22
Chairperson 126:19
challenge 65:17 112:1
132:7 135:19 188:4
challenged 16:22
challenges 3:11 8:12
36:8 97:19 104:22
chance 22:18 102:3
173:16 178:1 198:21
change 22:15,19 24:3
29:10,11 38:14 56:17
77:11 196:21
changed 93:7 136:16
149:11 195:15
changer 196:22
changes 19:13 22:1
29:20 145:21
channel 108:11 109:5
117:21 123:2 133:12
184:21 193:15,18
194:3
characterization 33:2
82:17 83:16
charge 10:15
chart 88:9
charting 87:7 93:3
102:16 155:12 156:1
156:19
charts 66:16
chat 53:3
cheap 131:13 146:13
146:22,22
check 69:11 167:3
checking 98:17
Chief 2:11
chiefs 99:13
chime 127:13
Chopra 1:16 6:3,4,5 7:8
24:18 56:15 59:17
101:8 103:2 109:2
115:11 117:2,5,7
125:7 126:16 127:4
128:18 129:22 130:21
133:9 135:6 139:1
141:10 164:19 189:19
chose 113:15
Christine 212:20 213:7
Chukchi 150:10
chunk 93:21 107:7
132:9
chunks 77:5
city 110:9 124:8
claim 191:4
clapped 212:17
clarification 200:22
clarified 95:19
clarifying 170:5
clarity 76:20 77:11
Clary 8:10
classified 100:12
110:22
clean 210:17 211:1
clear 16:9 25:6 33:2,14
80:1 82:2 84:14 90:22
91:22 126:7 182:8
clearly 160:5
client 89:8 108:14
114:19
clients 53:21 129:10
close 106:14 107:5
112:12,16 136:14
142:20 164:7 167:16
closed 129:1 134:9
137:20,21 138:13
closer 80:17 96:16
150:21
closest 42:3
closing 145:4,8 146:1
199:10
closure 117:13 145:19
closures 104:3 106:12
cloud 45:7 118:9,21
119:15
CMTS 172:17
CNMI 90:10
Co-Director 2:2,6
coast 2:9,12 21:3 40:12
64:21 66:1,5 76:1
96:9,17 110:13,15
112:4 127:12 143:13
153:21 154:4,5,12
159:7 167:18 176:5
210:4
coastal 2:5 3:4 11:7
15:2 21:17 76:5,10,13
77:3 90:19 94:1 97:17
180:12 181:15 185:12
190:7 200:19
coastline 77:5
coastlines 78:10
Code 149:15
collaborate 38:22 91:6
collaboration 16:13,18
16:20 17:1 68:19,21
178:16 189:2,8
colleagues 113:1
collect 5:22 53:18,22
59:10 60:17
collected 53:13 55:11
70:13 90:9,12
collecting 55:5 88:5
collection 43:8 52:18
90:7 163:17
collective 115:21
College 2:15
collision 110:3
collisions 108:22
color 56:6 162:4
Colorado 84:22
column 66:17
combination 119:9
122:20 131:18
combine 105:17
combined 69:6
combines 77:16
combining 203:17
204:18
come 5:16 16:16 27:16
31:3 59:21 64:4,11
73:9,14 75:2 81:4
93:13,22 104:10
114:15,16 127:3
131:22 143:1 144:8
146:18 147:5,6 150:3
151:1 155:18 160:22
164:17 173:18 177:20
179:17 184:3,15
189:16 190:21 201:15
205:17 211:21
comes 33:19 47:17
67:12 85:16 107:4,10
111:16 112:10,14
131:16 136:4 188:13
comfortable 136:6,18
coming 33:18 44:7 56:7
81:3,12 120:4 126:4
133:5 134:11 140:13
150:20 152:18 159:12
196:13 199:6 201:4
202:22
comment 3:6 13:2,2
14:8 17:16 19:21
21:15 25:3 27:6 28:20
30:14 34:18 56:13
57:11,11 58:16 61:12
64:8 67:10 69:7,9
71:14 72:4 74:12,17
75:6,19 76:12 78:2
82:7 89:20 91:7 92:12
92:17 93:9 96:4,21
97:2 98:18,20 99:20
125:17 126:11 127:20
127:22 141:2,19
147:2 155:4 157:20
160:12 161:12,16,20
162:21 165:10 167:1
168:1,8 170:3 171:16
173:1 175:21 180:16
182:11 183:19 187:17
188:11 189:9 190:10
192:3 194:6,12
203:10 205:4 207:5
commented 18:7 164:6
188:6
commenter 75:4
comments 4:9 6:6 8:4,8
8:12 10:5 11:19 13:16
14:16 17:9 19:12,22
21:13 22:2,12 24:11
28:11,12 29:13 32:14
42:18 49:16 56:9
58:12 61:18 62:6
64:14 67:6 73:19 74:1
74:1,19,21 75:2 78:19
78:22 79:8,14 81:15
81:16 82:12 84:7,17
89:12,16 94:4,5,6,8
95:14,17 100:20,21
101:3 116:12 125:12
125:18 126:17,20
127:1,6 131:1 135:12
135:15 139:4 142:6
144:7 158:11 159:4,6
163:5,9 164:20 173:9
178:20 179:1,11
180:5,7 181:17 182:2
185:13 193:4 194:8
194:10 198:12 199:10
210:10,19
commerce 1:1 103:12

181:5
commercial 76:2 86:22
 87:12 88:16 89:1
 103:17 105:9 132:10
 134:19
commingle 40:1,5
Commission 152:15
committee 35:22 72:15
 72:18,19 105:2
 159:14,16 160:4,14
 160:18 172:4,14
 173:2,2,4,5 204:12
committee's 159:17
common 40:6,8 107:11
communicate 131:21
 201:20
communicating 202:4
communication 78:12
 136:3 186:11
communities 96:9,10
 96:15 152:6
community 39:1 154:7
companies 114:17
 115:1
company 44:17,18 46:4
 52:1 115:1
comparable 110:18
compelling 126:2
competitive 208:7
Competitiveness
 121:13
compiling 13:19
complain 198:2
complaining 138:12
complement 205:21
complete 39:13 88:1
completed 55:18
completely 6:5 130:16
 143:17 164:21
complex 138:9
Compliments 181:7
component 129:4,4
components 129:2
comprehensive 103:9
 125:8 191:17
comprises 106:11
computer 93:4 143:7
concentrate 139:16
concept 189:1,1
concern 16:17 26:22
 79:19 127:15 131:4
 134:8 145:17
concerned 57:20
concerns 152:14,14
 172:6
conditions 15:16 115:6
 149:9,14 184:9,21,22
confident 97:18

configurations 105:17
confirm 67:17 137:18
 138:3
confusion 190:17
Congressman 180:8
Congressmen 55:14
connected 119:21
 131:3
connection 131:5
 204:15
connections 172:8
 181:3
consensus 19:15 22:9
 29:20
consider 26:3,9,10,16
 101:4 106:6 107:18
 108:14 109:7,9 110:6
 175:10 181:12
considerably 86:5
consideration 115:5
 196:19
considering 26:19
 197:19
consist 119:2
consistency 106:15
consistently 207:14
console 186:22
constantly 39:6
construction 120:11
consultant 79:9
container 110:4 142:8
contents 165:16
continental 57:9
continue 8:22 9:1,9,15
 34:17 59:15 87:15
 126:22 189:14
continued 4:9 15:3
continues 3:3,6 87:16
contract 61:4 71:1
contracting 98:7
contractors 51:8
contracts 49:10 54:3
 85:8
contractual 85:14
contrary 16:4
contribute 40:7,19 51:1
 55:1,21 65:8 87:22
 88:5 165:16
contributed 61:19
contributes 106:22
contributing 166:8
contributions 78:7
control 41:13 42:5
 127:17 136:11 145:6
 148:13 171:10 197:3
conversation 19:6
 156:22
convert 130:11

convince 36:21
cooperation 9:4 68:20
 68:22 204:10
Cooperative 162:11
coordinate 38:22 39:18
 41:20 42:5,15 100:12
 137:5 160:11 195:3
coordinated 40:21
 167:2
coordinating 50:16
 99:17 100:11 195:9
coordination 13:7
 16:13 17:1 31:6,7
 83:10 134:15 136:5,9
 136:21 160:19
Coordinator 2:13
coordinators 48:5
core 50:18
corner 44:7
coronavirus 109:16
corporate 92:4,9
Corps 43:21 89:18,21
 91:5 124:12 162:10
 166:19 205:19
correct 211:9,19
corrective 107:10
corridor 130:3
corridors 154:16
CORS 123:9,10
cost 20:16 25:2,4,9
 26:3 28:21,22 29:9,11
 53:8 54:18 77:18 91:4
 91:6 133:8 151:14
 183:1
cost-sharing 64:2
costs 64:18 106:1,2
 123:21
council 84:4
count 128:8
counter 115:5
counting 121:6
countless 86:8
country 36:22 64:15
 102:8 105:6 107:2
couple 4:17 9:13 19:22
 40:15 43:4 53:7 62:15
 72:11 74:1,21 75:18
 129:15 142:6 151:19
 158:19 180:16 194:21
 195:21 200:11 204:19
 210:14
course 22:16 24:11
 30:15 76:21 107:8,12
 109:20 112:8 113:7
 114:2,21 131:4
 149:15 150:12,17
 180:10 200:20
cover 99:21 174:12

200:13 210:11
coverage 67:12 88:2
covered 67:6 72:6,6
 80:12 115:7 162:20
 180:14 183:18 185:21
 189:21
covers 26:16 56:19
COVID 18:5 37:18 38:7
 88:3 103:5 196:12
COVID-19 181:17
craft 133:1 137:6 149:5
 186:5 187:17 194:2
create 97:8,15 169:20
created 102:15 113:14
creating 110:8 169:17
creation 76:5
creative 50:11
credit 18:9
crew 12:11
crews 134:20
critical 54:15 60:3 81:6
 177:18 178:2
criticism 46:9
cross- 100:2
cross-sharing 54:5
cross-traffic 142:21
crowdsourced 96:7
crucial 5:14
cruise 109:8,11 135:17
 137:22 138:4,10
CSU 162:11
cue 7:16
current 77:2 98:1 176:1
 184:22
currently 81:12 102:15
currents 66:18 181:14
customers 53:14 98:3
 107:15
cut 157:19 164:13,13
cutting 78:11
cutting-edge 78:7

D

D.C 55:9
daily 112:6 138:8
damaging 109:6
dance 160:6
danger 77:6
dangerous 38:3
data 5:22 9:8 35:5,14
 35:19,20 36:7,8,12
 37:4,7,8,12 44:14
 45:2,4,5 46:5 50:20
 50:22 51:1 52:16,18
 53:15,22 54:16 57:20
 60:16,17,22 70:13
 75:21 82:20,20 83:1,2
 83:13 87:9 88:15 90:7

- 90:9,20 93:3 94:11,17
94:20 97:22 102:20
110:13,15 113:13
163:17 167:18 197:7
database 60:16 124:6
databases 51:1
date 23:11 204:17
dates 211:21
dating 92:18
datum 21:1 23:3 45:20
Dave 11:3,12 17:11
19:12,20 20:3 22:6,18
23:17 24:21 27:14
29:13,18,21 53:3,3
56:5 61:19 63:20
70:20 71:12 171:3
185:10 186:2
David 1:19 213:2
day 3:2 4:5,7,16 5:8
6:19,20,20 7:8 8:4,19
13:1,9 14:15,17 21:12
63:8 108:4 112:8,13
112:14 113:3,8,9,19
114:4 117:16 123:7
123:20 133:3 138:5
144:7,19 147:6 153:5
154:8 172:11
days 46:2 65:11 93:19
106:12,18 107:22
108:1,5,5 114:6,12
116:9 156:22 206:11
206:11 214:5
deal 123:22 139:13
dealing 33:22 103:20
117:12 186:13 190:17
dealt 139:15
death 109:18 188:3
decade 50:13 93:11
December 209:1
decide 44:3
decision 136:14
deck 35:17 39:17
dedicate 198:22 205:10
dedicated 205:18
207:15
deep 60:10 61:5 67:11
69:15 93:6 155:9
deep-dive 201:6 202:7
defer 142:14
deficiencies 75:22
deficiency 214:4
define 33:4,5
defined 80:2 160:3
161:4
definite 70:12
definitely 44:1,15,21
62:12 71:2 118:12
146:7 174:5 204:15
definition 51:14 52:7
124:5
Delaware 40:16
delay 107:17 108:1
192:16
delay-driven 106:1
delays 107:14
delineation 62:22
deliver 89:8
delivery 96:1
delta 193:22
deluged 36:7
demand 52:5
demonstrate 54:22
70:1
demonstrated 64:15
143:11
demonstrating 153:4
Denis 95:16 96:13
Dennis 65:15
density 52:16
Dentler 2:12 4:13 10:2
212:21
Denver 84:22
Department 1:1 66:14
70:21 71:4 93:22
departments 71:7 96:3
depend 5:11
depending 123:16
130:17 144:12 193:17
deploy 29:2 171:9
depth 168:21 176:1
depths 123:2
deputy 81:19
derived 88:12,19
describing 21:5 196:1
deserve 71:2
design 178:4
Designated 2:8
designation 62:21
designed 200:14
desire 41:20
desired 61:7 165:17
detail 32:6 99:22
100:17 213:15
detailed 80:9
details 69:2 71:10
129:15
detectors 105:12
determine 25:17 26:15
54:18 71:2 182:22
develop 34:11 50:9
61:2 124:9
developed 34:9 78:11
87:20 96:6 124:9
developers 97:7
developing 31:4 89:5
97:10 98:12 139:7
development 5:19
31:11 43:5 45:2 46:4
78:5 86:6 97:4 150:6
169:3 190:6
deviate 111:14
device 153:10
dial 202:14
dialogue 74:7
Diego 131:16,22 132:8
132:15 133:1,6
difference 57:6 108:1
different 31:14 32:1
33:6,12,13 40:2,7
42:1 43:9 50:15 53:21
54:15 55:14,15 71:7,7
72:17 73:3 99:17
108:19 119:7 134:12
135:20 137:3 151:21
155:18 159:13 161:1
181:17,21 194:2
195:8 198:8 204:2,3
213:10
difficult 37:13 39:21,22
77:12 98:5 111:6
135:1
digest 12:2
digital 43:6
dimensions 108:20
directed 12:6
direction 40:8 76:17
184:6
directions 134:12
directive 60:2
directly 206:7
Director 2:3,4,9
Directors 191:10 213:5
213:9
disadvantage 208:8
discovered 79:4
discretionary 162:16
discuss 46:3 147:7
199:18 211:3
discussed 15:22
156:19 199:17
discussion 3:3,14 7:21
15:1,3,6 16:5,12 17:8
18:2 30:10 33:3,19
34:17 39:4 44:13
69:19 73:10 74:3
84:18 103:11 125:14
139:11,13 158:17
173:3 179:4,15
180:11,18,22 191:19
192:5 198:14 201:5
203:21 209:17
discussions 14:18
135:7 177:17 181:11
193:11
disheartened 66:8
disparate 10:9
display 153:19
disruptions 108:20
dissemination 66:3
distancing 157:5,5
distribution 96:1
107:21 129:6
District 89:22
Division 2:12
DMEs 119:6
doable 65:21 66:7
143:3
document 15:2 42:18
59:6,9 62:17 68:18
147:21 161:20 163:10
169:10,22 170:14
173:13 176:19 190:12
documented 67:15
documents 80:9 92:18
92:21
doers 174:5
doing 12:16 17:7 21:21
30:6 31:13,14 37:2
44:16,19 57:22 76:9
103:4 112:3 131:21
133:3,18 140:6
163:17 167:9 171:6,7
172:12 189:14 196:13
197:17 202:10 205:13
205:14,15,21 214:9
dollar 57:10 101:17,18
111:7 123:20 128:1
146:5,16 151:11
dollars 50:8 54:17 87:3
93:18 117:15 124:22
138:5 146:11 150:14
159:3
dollars' 142:10
domain 56:18
dominant 107:13
Don 180:8
donate 55:6
door 12:15
door's 18:14
double 54:4 74:9
Double-punching
176:14
doubt 113:17
Douglas 96:22 98:15
downtown 120:11
Doyle 81:19,22 82:4,8
dozen 74:18 185:14
dozens 171:9
Dr 1:15,17,19 6:6 7:13
7:17 16:3,4 28:15
39:5 68:9 70:8 91:20
92:2,8 116:11,14

117:11 120:22 125:1
126:1 128:16,20
129:21 137:13 138:2
139:8 177:16 188:21
189:11 191:10,11
194:8 200:18 201:13
202:1
draft 29:22 59:5 61:7
94:5 192:2 194:5
drafting 59:4
drag 35:16
dredging 111:20
124:13
drifted 206:6
drill 153:11
driven 38:1
driver 176:7
driving 120:1
drones 146:10,11,22
147:1
dropdown 142:13
dropping 213:18
dry 150:13
dual 123:14
due 76:19 85:13,14
104:3
Duffy 1:16 7:4,6 24:20
59:20 165:2 179:19
182:18 183:10,15,20
185:6,10 186:1 187:5
187:22 188:20 189:15
190:1 191:8,13,20
192:10,21 193:5
194:13 203:11 204:5
209:19
duplicate 63:12
duplication 195:10
dwell 166:12
dying 52:14
dynamic 153:22 154:4
174:14

E

earlier 79:14 99:12
102:10 156:19 190:10
early 17:21 80:1,14
208:17 209:3 211:9
211:12
earthquakes 90:16
easier 85:11 116:15
120:10
easily 69:12
east 40:12
easy 108:6 124:10
158:21 159:1 202:12
202:14 214:2
eat 10:13 63:5
echo 78:3 134:6 186:4

echoing 14:22
echosounder 21:2
echosounding 21:2,18
ecological 181:6
economic 103:17 104:4
106:20 109:7 115:22
121:12 125:11 130:9
142:12 181:4
economical 117:14
138:1,8
economics 38:1
economist 79:9
economy 9:12 66:22
67:1 116:8 124:21
181:4 184:8
Ed 1:12,20 4:3 8:16
9:22 10:5 11:21,21
12:19 13:12 22:12
24:12 27:8,16 37:15
40:15 42:10 46:18
47:12 49:7,13,13,15
49:19 53:1 58:15 59:3
62:4 64:11,13 66:10
73:21 74:4 75:15,16
126:19 141:16,18,19
141:21,22 142:3
144:5 145:8 147:12
148:13 157:9,13
163:11 168:10 172:1
175:15 183:21 185:6
187:6 198:17 199:3
202:5 203:9,11
206:15 207:4,6
208:14,17,21 211:11
211:13,20 213:11
Ed's 14:8 142:5
edge 78:11
edit 59:8
editing 182:13
Eds 75:15 79:1,2,3
209:11
EDT 1:12
educational 57:5,22
EDWARD 1:14,18
Edwing 2:4 15:8,9
28:17,19 29:4 70:15
70:16 102:10 178:22
191:14,16 192:4
EEZ 33:11 67:12 68:14
68:15 69:15 93:13
94:2 171:16
effective 77:19
effectively 178:7
effects 15:21
Efficiency 66:15
efficient 77:10,18 98:13
184:4
efficiently 97:22 178:7

effort 12:7 14:6 17:4
22:21 23:7 40:22 50:9
77:7 84:5 88:1,7
150:15,22 156:1,3,17
157:4 179:3 187:11
193:10
efforts 36:1 42:6 43:5
60:1 204:21
eight 45:21 76:6
eight-hour 206:11
eighth 207:7
either 48:22 67:16
69:19 70:6 179:1
180:13 203:2
electricity 176:3
electronic 186:13
electronics 187:1
elements 17:17 66:18
elephant 10:14 44:4
63:6 139:22
elevates 29:8
Elevation 53:10,17 54:8
elevations 210:5
Elko 1:17 7:13,14 20:9
21:14 25:2 26:8,21
60:7 165:8,10 188:21
188:22 199:22 201:16
email 62:15 201:9
emailed 10:6
emails 200:11
embarrassed 67:21
embracing 18:12 57:7
emphasis 5:9 9:14
16:13 80:18 192:8
emphasize 5:17 68:21
80:10,13 190:5
emphasizing 43:1
empty 111:4 130:9
enable 120:15
enabling 97:13
encounter 86:17
encourage 18:2 51:13
175:7 189:13
encouraged 76:6 95:8
encouraging 51:8
189:7
end-all 15:20
endless 49:20
endorse 11:8
energy 66:14,15,19
107:4 130:7 144:9
176:3 214:8
energy-wise 203:1
engage 21:10 86:20
96:11 165:12 195:15
engaged 13:14 78:16
101:3 189:12
engagement 160:12

204:12
engaging 73:4
Engineer 91:5
Engineers 43:21 89:18
89:21 166:20 205:20
English 133:12
enhance 196:17
Enhanced 53:10
enjoy 16:5 163:5
enjoyed 7:16 15:10
enormity 66:8 151:14
enrich 59:5
ensure 9:3 150:18
154:20
ensuring 152:8
enterprise 102:20
entire 107:18 113:20
144:4
entirely 161:1
entities 86:19,19 88:16
107:13,13 136:21
entity 63:14
entrance 133:5
environment 80:17
149:21 181:5 202:13
Environmental 109:3
envision 43:15 99:12
equation 109:21
equipment 134:21
equipped 124:3 146:20
186:20 187:9
Eric 98:20 99:2,7,8,10
erratic 149:8
Eskimo 152:15
especially 15:1 103:6
103:14 108:2 116:22
137:22 183:8 191:3
Esri 46:4 95:5
essence 112:19 161:17
essential 33:15 88:2
establish 36:18 170:20
established 47:21
195:6
establishing 48:18
establishment 64:21
estimate 105:8
estimation 111:15
et 151:14 154:17 155:13
156:14,15 184:22,22
198:4,4 204:4
Europe 121:3
evaluate 87:9 91:1
evaluating 25:16,19
106:18 154:14
evaluation 26:5 94:20
evening 214:12
event 7:9 104:18
eventual 33:1

eventually 66:22 156:9
everybody 8:17 11:15
 11:19 32:1,3 46:8
 51:18 58:19 59:5
 61:19 68:6 79:18
 126:3,22 127:2 134:2
 146:8 161:22 163:9
 171:20 182:11,14
 192:3 194:6 197:20
 199:8 202:14 207:2
 208:12 213:3 214:6
everybody's 8:3 11:16
 17:17 133:2 171:22
 194:9 195:15 197:19
 201:1 202:22
everyone's 156:9
evolved 16:9 42:14
 88:20
exactly 21:21 25:4
 26:22 48:16 77:5
 130:11 195:21 197:15
 209:6
example 42:12 43:19
 44:16 45:18 46:12
 50:14 51:6 57:19 66:3
 69:17 70:5 94:15
 115:17 118:6 119:20
 120:22 123:15,17
 146:2 149:17 205:11
 206:17
examples 32:7 49:21
 72:9
excellent 13:18 14:15
 100:15,20 214:1
exception 214:2
Exchange 12:13
excited 6:14 8:20 102:1
exciting 9:20 12:8,17
excuse 153:18 198:22
execute 175:6
executed 77:20
executes 55:22
execution 13:7 174:15
executive 81:20 169:13
executives 174:8
exercise 25:21
exist 75:22
existing 46:22 60:16
 62:8 162:6 169:11,12
 190:11 196:16,18
exists 48:10,15 49:5
 125:9
exorbitant 114:8
expand 113:7 114:3
 140:22 205:2
expands 106:10
expect 119:22 149:11
 149:13 195:12

expecting 107:16
expense 146:13 162:15
expensive 113:6
experience 41:22 42:11
 45:12 85:20 87:21
 90:16 95:4 118:20
 131:16 139:3 165:11
 207:19
experiences 106:12
 178:12
experiencing 91:2
expertise 11:17
explain 102:1 107:14
explains 130:1
explicitly 81:9
exploration 33:1 41:13
 160:22 167:8
explore 116:8 125:11
 133:18 172:4 178:6
 178:13
explored 192:7
exploring 58:2 150:10
 152:21 154:12
exponential 138:6
export 130:5,12
exporting 130:7
expressed 163:2
extended 94:1
extensions 140:20
extent 185:5
external 93:2 167:17
extrapolate 126:9
extreme 90:17
extremely 207:16
eyes 88:11 120:17,18

F

FAA 146:9
FAC 168:12
FACA 161:9 162:12,14
 166:2,6
FACAs 165:14 166:9
face 115:21 177:19
 187:8
faced 138:11
faces 75:17
facilitate 66:2 82:10
facilitating 184:3 189:8
fact 17:16 47:4 72:8
 80:13 195:14 202:9
 206:8
factor 184:20
factors 143:1,18 184:3
 184:15 185:3
fail 119:10
fair 132:9
fairly 9:18
faithful 18:11

Falkor 93:17
fall 77:5
falls 204:9
false 191:5
familiar 75:17 182:12
families 103:4
far 9:21 13:6 38:12
 61:10 64:15 65:16
 80:12 99:3 108:12
 111:22 120:20 122:4
 128:7 148:3 149:4
 150:21 152:6,21
 155:17 156:17 158:8
 163:6 180:6
farms 176:4,4
farther 81:7
fast 132:5
faster 89:4
fault 10:4
favor 197:20
fed 39:21 49:10
federal 2:9 5:12 17:2
 40:22 41:16 50:6
 53:11 55:11,15 61:2
 72:9,15,17,19 96:3
 159:14,15,16 160:4
 160:14,17,17 162:6
 165:13 173:1 175:1
 208:5,6 209:16,19
federally 36:2 70:2
 208:1
feedback 13:18 73:22
 101:5 192:19 212:5
feel 6:10 22:7 46:11
 83:21 92:3,8 104:16
 116:2 136:6 145:13
feeling 61:8
feet 157:6
felt 46:8 132:2
Ferrini 35:1
field 5:21 18:9 85:5
fields 207:16
figure 30:21 73:3 128:5
 145:22 154:15 159:15
 160:8 209:16 214:4
filing 35:15
fill 83:18
final 13:7 23:11 29:22
 89:8 114:13 179:12
 182:14
finalize 173:13
finalized 22:8 26:4
finally 107:21 110:6
financial 105:9 184:7
financially 108:10
find 17:4 50:12 64:3,6
 65:18 83:11 92:20
 98:4 102:3 132:14

135:8 174:13 185:19
finding 16:22 83:18
 195:10
findings 104:7
fine 17:7 24:16,18
 28:15 30:6 58:18 59:2
 153:14 199:5
finish 56:12,13 138:22
 158:10 176:19
finished 55:8
firmly 18:14
first 4:16 5:5 10:16
 35:13 53:4 59:4 62:20
 63:15 75:9 76:16 82:4
 92:17 95:12,16,18
 97:15 104:16 106:22
 109:19 110:20 125:22
 163:13 210:22
firsthand 75:21
Fischer 98:20 99:11
 100:15
Fisheries' 198:2
fisherman 146:2
fishing 132:17 186:22
 194:1
fit 80:3
fits 80:8
five 62:17 63:1 86:10
 92:13 107:22 108:1,5
 120:1 138:16 163:15
 212:1
five-day 107:17
fixing 80:11
flag 163:18
flagged 163:2
flagging 95:10
fleet 35:3 82:10 83:3,12
 113:20 171:8
fleet's 82:15
fleet-wide 83:4
flexibility 162:5
flexible 77:16 160:13
flight 118:14 119:1
flights 138:7
flipping 46:20
floats 209:20
floor 4:11 42:10 66:17
 87:19 100:22
Florida 9:20
flow 60:20
flows 103:22 180:20
fluctuation 111:13
fluctuations 110:18
fly 119:13 146:14
focus 6:12 8:12 9:2
 17:19 19:17 33:12
 108:12 141:5 143:21
 177:18 186:5 211:6

- focused** 89:10 97:17
focuses 204:20
focusing 76:14
fog 3:12 15:12 102:7,13
 103:13,20 104:3
 105:4,11,11,18,20
 107:11 108:3,20
 111:22 113:19 115:3
 116:4,6,9,22 117:12
 118:19 119:15,18
 122:3 131:16,19,20
 132:9,11 136:1,18
 137:5,7,15,19,20
 142:19 145:9 147:3
 158:22 186:14 191:19
 193:7,16
fog's 193:13
fog-borne 133:13
fog-related 105:6
 107:13
foggy 118:19
folk 33:17 36:22 37:22
folks 64:8 74:20 91:10
 95:15 99:15 204:16
follow 88:16 142:18
 159:7 165:4
follow-up 68:1 165:19
 200:21 202:1
followed 54:8 63:5
following 49:19 93:8
follows 147:20
Folly 7:15
force 43:15 45:8 46:16
 58:5,9 60:20 64:16
 72:12,14 102:19
 166:2 169:11,12,18
 169:19 170:18 172:16
forced 37:19
Ford 97:5
fording 86:8
forecasts 15:19
foreign 163:2
forget 214:3
form 45:8 72:17 174:14
 174:16
formal 160:7 202:18
format 182:11
formats 204:3
forming 33:15
formulate 9:16
formulation 48:8 78:17
forth 48:3 78:13
forum 121:12 172:17
 195:19,22
forward 6:13,16 7:21
 12:22 13:8,20 14:17
 15:3,6,11,22 38:9
 58:7,9 60:3 90:11
 116:12 125:15 142:7
 161:13 168:5,6
 179:12 193:10 203:22
 208:11 211:18
foster 89:3
fostering 85:22
found 64:5 116:5
 207:15
foundation 32:22 85:3
 87:2 123:10
founder 84:10,20 96:22
founders 97:2
four 93:20 117:15
 123:20 130:17 137:11
 206:8
fragile 149:21
framework 83:4 97:11
 97:16 177:2,7
Francisco 127:11
 132:14
frankly 132:17
free 50:20 83:21 93:20
 145:13
freeway 120:2
freewheeling 197:10
frequency 123:15
frequent 124:15
frequently 122:12
front 7:2 40:6 52:12
 88:8 108:7 114:16
 115:16
Fugro 42:10 44:17
 75:10 78:9
Fugro's 21:16 75:19
 76:4
full 9:4 56:18 74:17
 102:19 106:12 112:14
 140:5 195:19 209:16
 209:19
fully 78:14 88:4 206:13
function 100:11
functioning 48:11
funded 35:9 36:1,2
 47:21 70:2 167:10
 208:1
fundes 37:11
funding 36:20 39:12
 55:21 79:20 80:4,15
 82:15 87:3 92:14
 93:10,12,18 94:2 98:6
 98:14 162:16 175:3,4
 188:13 209:16,19
funds 40:1,5 55:1,2,5
 56:4 64:2 71:18 95:22
further 22:12 25:11
 28:11,12 29:13,14
 49:17 59:16 61:16
 62:6 63:20 71:14 75:9
 82:19 102:21 155:5
 169:2 183:18
future 12:9 51:17
 149:20 151:22 189:14
 205:8 206:14 210:1
-
- G**
- gained** 86:12
Galen 213:1
Galveston 102:7
 103:16 107:5 109:8
 109:14 111:18 135:14
 135:18 136:12
game 196:22
gap 202:21
gaps 61:1
Garmin 124:17 146:13
 146:15,21
Gary 1:21 14:1,11 27:22
 28:1 67:4 172:21
 182:5,6,15 183:10
 186:4 207:4 209:21
gatekeepers 86:21
gather 49:3 97:22
gathering 196:9
GDA 94:16
GDP 107:1
Gee 1:17 8:1,2 27:6
 30:11 32:13 61:17
 69:10 138:19 139:5
 165:21 166:22 170:13
 170:17 188:2
general 37:10 106:3
 141:1 188:15
generally 135:2
generate 63:5
generated 60:1 147:21
generating 41:18
generation 105:12
gentlemen 111:8
 114:14 115:9
Geodetic 2:3
geographically 18:19
 164:9
Geopotential 23:3
geoservices 85:8
geospatial 70:22 75:21
 94:11,17,20
getting 13:16 24:21
 32:5 35:14 37:7,7
 52:12,20 55:21 64:17
 90:11 136:18 146:12
 156:18 158:5 159:19
 163:18 168:7 177:18
 194:7 208:5
giant 51:1
GIS 122:5,10 124:6
give 32:11 49:15 55:16
 74:20 100:16 101:8
 120:15 122:20 160:15
given 98:1 132:2 133:3
gives 149:16
giving 175:12 192:8
 199:16
glad 12:9,17 18:1 42:21
 68:9 84:2 137:11
glass 211:15
global 85:4 90:17 119:3
 121:12
globally 105:16
GNSS 210:2
goal 46:11 156:8
goals 47:17 62:17 63:1
God 115:6
Goodrich 84:9,12,15
goods 107:19
google 108:6 121:22,22
 124:17
gotten 39:11 153:12
 157:10 179:5 198:5
governance 100:3
governing 143:14
government 16:20 35:4
 39:1,11 43:9,20 50:6
 50:15 52:21 65:12
 82:14 85:7,10 86:8,19
 87:16 89:3,9 98:2,5
 100:3 160:10,13
 170:19 174:22 197:12
 208:6
government's 52:15
 85:15
governments 81:5
 85:13 87:5
GPS 119:3 131:7 173:5
GPS/GNSS 123:6
grander 196:20
grant 85:4 87:3
grants 71:5
grateful 104:10,16
gratified 207:12
Greetings 14:21
grossly 48:14
ground 86:2 97:17
group 3:9 43:19 101:9
 103:10 141:3 142:15
 164:4 169:18 170:1
 170:20 171:2 172:5
 174:21 183:3 195:18
 213:14
groups 3:15 15:5 39:20
 135:5 145:2 165:12
growing 175:15
growth 106:2,20
Guam 90:10
Guard 64:21 66:5

110:13,15 112:5
143:13 153:21 154:12
Guard's 66:1
guess 32:14 125:22
127:11 156:4 162:19
166:4 168:1,7 202:16
guessing 52:19 117:3
guidance 165:4
guide 119:1
guideline 190:15,16
191:6
guidelines 9:8
Gulf 106:19 107:4,6

H

Hains 95:17
half 32:3 169:10
half-days 212:4
halls 57:3
Hamburg 105:15
133:12
hampered 177:1
Hampshire 10:22
hand 19:2 74:10 101:11
136:19 144:19
hand-off 74:9
handle 45:5 157:5
hands 39:16
happen 46:12 109:3,4
109:21 114:11 123:5
152:3 168:3 177:21
178:4
happened 57:7 167:19
178:1 191:22
happening 57:8 148:7
184:1
happenings 167:21
happens 121:9 129:3
happy 6:20 61:7 69:3
100:16 161:6 165:16
harbor 127:17 167:12
hard 11:16 18:11,15
45:11,15 124:2 126:8
209:1
harnessed 125:10
hate 187:7
havoc 110:8
Hawaii 7:20 9:20 91:14
92:3 207:21 211:20
Hawaiian 7:19 93:16,19
head 208:2
healthy 214:7
hear 4:14 8:18 20:3,5
31:6 39:22 53:5 73:22
81:22 82:5 84:12
86:13 99:3 101:14,22
102:2 119:14 126:13
127:7 134:2 137:9

158:12,13 165:8
166:18 182:17,21
heard 14:15 34:22
144:17 158:1 161:18
162:2,3 180:16
hearing 9:1 208:4
heart 139:2
heartburn 199:16
heavily 120:3
heavy 91:3 106:20
132:10 149:2
held 57:3
Helen 172:10
Hello 4:3 14:13 84:12
89:19 91:21
help 15:14 48:6 52:22
61:7 83:12 88:18 91:1
117:20 119:1 140:13
141:7 150:18 174:15
178:14 182:22 183:7
helped 15:17
helpful 31:3 32:8 58:13
61:13 98:11 177:9,11
helping 9:7 15:18 83:18
182:10
helps 80:21 82:9
herd 45:11
hesitant 23:5
hey 64:1 99:11 134:1
135:10 140:12 141:16
141:18 142:4 185:8
Hi 6:4 8:2 11:4,14 12:21
15:9 75:13 94:10
99:10 101:13 175:21
185:11
high 86:1 87:12 112:8
112:12 113:5 114:2
124:5 180:5 181:13
high-level 160:7
higher 108:15 113:5
highest 54:20
highlight 20:8,14 70:6
95:2
highlighted 20:1
111:22
highlights 150:16
highly 77:15
hinted 190:4
Historically 206:5
hit 58:15 180:4,9 182:6
187:20
hitting 7:8 125:20
hold 212:1
hole 10:22 177:4
home 7:2 132:15
Honolulu 89:22 90:1
166:19
hope 8:12 13:19 40:8

64:6 83:11 90:1 103:3
185:15 208:1,3,9
211:13
hopefully 38:10 59:12
155:16 194:7
hoping 41:21 42:9
58:12 104:18
horizontal 122:8,22
hosting 90:1 195:18
hot 60:4
hotel 130:7,8,10
hour 144:11 157:16
205:10
hours 86:8 206:8
House 12:7
Houston 2:16 98:16
104:6 106:7,11 107:4
114:22 115:16 126:7
130:3,7 184:14
Houston- 102:6 103:15
111:17
Houston-Galveston
101:20 104:22 106:9
Houstonian 115:14
hows 38:13
HSRP 1:13,14,15 2:1,8
2:13 3:3,9,14,14,18
4:4,8 5:17 21:20,20
41:22 51:5 76:9 79:2
92:10,12 94:13,22
101:5 103:9 125:13
126:19 140:11 144:22
147:20 160:19,20
166:7 168:20 174:12
174:15,20 179:5
182:20 188:5 192:8
204:1 206:3 207:15
209:4
HSRP's 77:22
HUBZone 85:7
huge 6:10 8:9 40:12
57:6 65:20 110:18
171:21 175:16 188:4
human 214:4
hundred 213:2
hundreds 50:7
hung 163:18
hunters 194:1
hunting 152:6
Hydroball 20:22 21:6
hydrographic 1:4,11
2:2,6,11 76:22 87:4,5
97:12,20 98:6 190:8
197:8 198:1
hydrography 97:17

I

ice 147:16 149:9,10,12

149:14
ID 146:10
idea 10:7 58:3 59:7 65:9
72:12 115:15 127:2
149:18 185:17 204:13
206:13
ideas 31:2,7 58:21
59:10 74:7 158:6,18
158:19 162:1 169:1
200:12,17 201:14
202:2
identified 192:14
identify 53:14 178:14
IDIQ 85:8
idle 88:7
idleness 107:22
IFSAR 55:12,17
II 85:2
III 169:9
illustrate 110:2
illustrative 196:6
image 114:19
imagery 88:5,13
imagine 39:9 40:11
109:4 197:19
immediate 80:19
impact 51:17 102:9
104:2,4 105:3 108:20
109:13,15 113:19
115:21,22 117:13,14
132:16 149:21 155:12
184:8 193:17,18
impacted 114:6 115:18
115:19
impacting 56:18
impacts 103:18 184:7,8
184:11,14
impediment 149:12
implement 124:2
145:20 177:19
implementation 3:3
31:4 33:5 54:19 62:1
76:10 78:6,18 83:9
88:22 91:6 169:2
implemented 106:6
120:7 146:9 185:16
implementing 5:10
importance 9:11 13:3
43:1 55:12 80:11
150:16
important 10:12 14:5,9
35:18 37:3,9 39:19
43:20 45:3 46:15
52:13,18 58:6 66:13
66:21 70:6 73:18 84:5
95:11 96:5 135:4
136:8,22 157:10
importantly 35:7 36:16

- impossible** 40:1
impractical 185:18
impressed 13:13 171:6
impressive 113:9,15
improve 67:1
in-house 87:10
inaction 89:11
incidents 111:21
inclement 116:21
include 69:18 100:5
 106:1 192:19
included 20:1 60:1
 187:15
including 47:2 48:16
 86:18 99:15 113:1
 180:13
inclusion 29:22 48:17
inclusive 30:19 196:4
incorporate 47:16
 81:17
incorporated 192:2
increase 150:2 156:1
 195:12
increased 82:22 90:19
 151:20
increases 52:7
increasing 149:18
incredibly 214:10
incubators 57:16,17
indecision 89:11
independent 58:5,9
indication 151:20
indigenous 76:2 96:14
 152:6
individual 168:18
individually 22:11
industries 50:15
industry 17:20 34:4
 45:16,22 47:16,17
 48:7,18 49:10 50:7,20
 51:4,13 52:22 53:12
 57:4 64:22 65:4,13,18
 81:4 85:22 87:13
 97:12 105:4 107:12
 107:15 110:7 111:6
 130:3 143:22 146:5,5
 172:9 181:20
industry's 52:15
inefficient 76:19
Inertial 119:5 123:18
inexpensive 29:6
 131:13
inform 96:18 159:9
information 14:18 49:3
 65:7,15,19 90:12 95:3
 102:17 112:5,11
 132:20 149:14 150:18
 154:10 181:8 185:1
- infrastructure** 79:21
 94:21 121:10,17
 122:11 124:6,8
inherent 94:12
initial 135:7
initially 76:13
initiation 175:17
initiative 83:7,9
initiatives 6:15 82:19
 82:21
inland 54:10,11
inner 36:22
innovation 6:12 57:14
 85:3
innovations 78:14
innovative 86:3
innovators 85:4
inorganic 57:13,15
input 14:16 15:4 17:17
 34:8 44:5 52:20 58:20
 69:9 160:1 173:5
 179:6
inputs 69:18
inroads 86:11
inside 93:12 94:2
 142:20 190:14
insights 4:9
install 123:14
instance 51:8 95:2
 195:17
Institute 93:14 162:8
institutes 44:22 49:9
institution 5:13
institutions 57:5,22
 98:10
instrument 52:11
 118:12 120:16
instrumentation 82:15
instruments 118:15
insurance 115:7
integrated 77:15 97:16
integration 78:4 95:1
integrations 83:7
intelligence 97:1 99:18
intended 77:14
intense 132:11
inter-government
 100:2
interaction 81:9 101:6
interagency 9:4 16:18
 16:20 39:20 43:18
 56:20 60:19 92:14
 100:3 165:12 172:5
 180:18 189:2,8
 203:15,17 204:10,21
 205:1,19
interest 128:10,13
 176:8 179:14 206:21
- interested** 127:22 128:7
 129:19 135:13,15
 166:11,16 171:4
 199:20
interesting 17:4 72:22
 82:5 102:4 111:1
 112:2 134:5 163:5
 165:21 166:13,18
 167:1
interests 48:1
interfere 184:10
interference 4:12 92:5
 107:6
interfering 152:5
interim 202:18
Interior 71:4
Interior's 70:22
internal 159:7
international 85:12
 87:5 143:12 151:17
 156:1,3
internet 93:1
interrupt 73:7
interruption 103:21
interruptions 103:11
intersect 76:3
interviews 145:19
intricate 105:17
intrigued 178:8
intro 72:8
introduce 101:7 104:5
introduction 116:14
intuitively 36:17
inundation 90:19
 181:14
inventory 94:16
invested 82:14 86:5
investment 54:20,22
invitation 177:3
invite 44:8 116:11
 125:12 133:22 135:9
 206:20
invited 46:1 74:19
 104:17
inviting 65:17
involved 9:3 13:5 34:6
 34:7 41:11 43:4 47:12
 52:12 78:17 83:11
 92:10 120:3 142:22
 143:18 154:18 155:22
 195:18 202:15 208:12
involvement 17:21 41:8
 41:9 48:2 57:1
involves 6:8
involving 135:5
IOCM 92:10,22 195:4
 195:17 196:8
IOOS 47:7,15 48:3,4,16
- 48:20 50:1 62:5,8
 63:3 64:14 162:7
 166:11,14 168:13,15
 168:18 169:4 178:9
IP 98:11
iPhone 153:19,19
iron's 60:4
Irv 79:8,9,11
island 90:16 92:3
Islands 93:16,19
isolation 56:19
issuance 76:7
issue 43:1 80:5 102:7,8
 103:21 109:18 116:7
 132:16 133:8 135:5
 136:12 142:19 145:1
 149:12 152:10 158:22
 184:17 187:2 190:18
 193:13,21 199:19
issues 11:16 28:6 35:10
 81:5 94:19 131:18
 133:15 137:10 141:5
 147:17 152:3,21
 172:7,17 177:18
 186:19 214:10
it'd 164:6
it'll 143:11 151:18 155:4
 177:11
item 17:8 36:4 128:10
items 17:14 51:10
 109:17,18 204:19
IWG 43:19
IWG-OCM 170:7 195:17
-
- J**
-
- J** 1:14,18
Jacob 189:11
Jacob's 202:1
Jacobs 7:17 194:8
 200:18
JALBTCX 20:10 43:21
 205:20
jamming 12:4
Jeff 96:21,22 98:15,15
jeopardy 107:9
Jersey 9:19 129:1
Jessica 89:17,18,20
 91:8,12 166:18
jetliner 118:7,7 119:5
Jill 99:6 212:21
job 10:12,13 39:10 50:2
 52:1 58:22 74:6
 124:12 179:22 187:20
 193:2 205:13 212:15
jobs 107:2,9
John 98:16
joining 74:16 89:15
joint 49:9 99:13 162:8

jotting 60:8
Joyce 91:15,15,16,18
 91:22 92:6 94:7 167:5
 167:14
Julia 59:21
Juliana 2:3 14:19 15:7
 24:7 29:13 45:20
 46:10 70:19 72:6
 123:9 178:18 179:5
Julie 1:15 13:10 14:1
 17:10 19:3 22:14
 28:13 29:15,17 30:13
 32:9 42:21 46:17
 47:12 49:19 56:16
 59:3 62:7 67:9 74:6
 127:5 144:20 145:5
 145:16 173:15 178:20
 179:1,20 183:11
 194:18 200:8 205:3
 210:11
jump 4:6 141:13 208:16
Juneau 12:12 75:18

K

kayak 153:4,7,14
keen 34:6
keep 14:6 18:2 19:6
 30:7 39:17 41:4 116:6
 152:9 157:6 159:12
 159:19 174:5 175:14
 189:16 195:1 214:8
keeping 209:6
keeps 164:4
Kelly 1:18 8:16,17 27:9
 27:10 46:18,19 62:4,7
 141:19,21 142:1,4
 168:10,11 187:6,7
 203:9 207:4,6,6
 208:19 209:8,13
 211:11,13,17 212:7
 212:11
Kelly's 49:19 64:13
key 17:16 34:3 37:9
 59:10 140:11 142:16
 148:2 178:5
keys 177:22
Khadijnova 75:10,12
 75:14
kick 32:9 38:19
kinds 42:5 51:20
 132:21 172:8
kinematic 123:6
Kinner 1:18 10:1,3
 27:12,13 62:14
 127:15 130:22 131:2
 133:11 169:6,8 186:2
 186:3
KITTI 55:6

knew 139:11
knowing 131:19,20
knowledge 96:8
known 64:19
knows 136:7
kumbaya 156:3
Kyle 84:9,11 89:14

L

LA-Long 64:20 132:10
lack 86:18
ladies 111:8 114:14
 115:9
lady 190:9 191:3
laid 135:11
Lamont 10:22
land-based 173:3
landing 149:5
lanes 154:17,19
large 144:3
largely 85:14
larger 29:2 87:18 96:15
 149:1 159:9 195:7
 196:3,19
largest 98:2 121:2
Larry 2:5 16:3 17:6
 28:14 33:20 34:17
 38:16 39:2 42:16 68:8
 177:15 205:14
Larry's 205:13
lastly 55:7
late 22:18 211:9
latest 37:6 205:17
laughing 211:11
Laughter 79:6 90:5
 194:16 203:4
launched 46:15
law 160:3,14 161:4
lawn 171:12
laws 31:8
lawyers 72:13 159:22
layers 108:19
lead 9:2,6 10:8,19 13:3
 14:8 16:14 19:6 56:21
 74:11 95:22 101:12
 125:15 142:17 143:3
 154:17 155:7 162:3
 162:10 181:2
leadership 2:7 39:10
 43:16 59:4 99:14
 207:13
leading 47:18 105:15
 105:16 169:16 181:1
 189:1
leads 151:3 189:6
learn 81:11 133:16
learned 53:8
learning 81:3 97:14

leave 135:11 158:3
 194:4 203:18 204:17
 211:14
led 53:17
leeway 23:10
left 48:8 112:6 153:4
 157:16
legacy 87:10
legal 34:1 71:18
legislation 145:21
 166:3
Leica 44:11
less-than-pragmatic
 85:15
lessons 53:8
let's 19:10 22:9 24:9
 25:9 28:9 30:3,9,9
 49:12 53:4 58:14
 59:14,15 61:14 67:8
 70:15 71:22 74:2 97:1
 107:15 126:21 135:12
 147:11 151:15 158:7
 163:12 164:4,7,12,13
 164:17 171:3 173:13
 176:10 178:18 186:8
 189:13 200:7 201:6
 214:8
letter 3:15 30:1 179:18
 182:10
letters 92:13
level 25:16 32:6 72:20
 86:1,2 90:17 91:1
 120:1,5 164:11
 190:21 206:21 213:22
levels 20:10 29:5 53:16
 86:13
leverage 35:11 65:5
 70:11 98:5 188:12
leveraged 66:4 70:4
leveraging 64:16 78:14
 94:12
Leveson 79:8,10,13
license 143:17 187:16
lidar 53:18,22 90:20,21
 122:7,19
life 109:18 116:15 142:8
lift 91:3 149:2
light 115:13
lightering 149:1
liked 201:22
limit 79:4
limited 174:11 193:19
limits 52:6 111:20
 113:21
Lindsay 1:17 8:1,15
 17:11 27:5 30:10
 32:11 49:14 61:15
 69:6,8 103:7 138:19

139:3 141:10 165:20
 173:12 187:22 188:20
Lindsay's 173:1 177:20
line 68:10 74:14 75:11
 81:3 138:10 210:14
lines 12:15 78:1
list 63:5,10,18 75:10
 170:6,7,7 182:4
 189:16 191:17,18
 194:15 202:6 205:1
 210:15 211:6
listed 137:13
listen 4:18 9:16 82:5
 191:1
listening 4:19 84:17
listing 170:15
lists 213:16
literally 50:7
little 17:13 19:13 23:5,9
 26:2 30:14 31:22
 67:20 70:14 79:20
 83:16 100:17 132:17
 134:6 135:21 136:17
 140:1 141:6 153:9
 157:22 158:17 160:15
 186:16,21 187:3
 196:11 199:11 200:15
live 187:9
living 95:5
LLC 84:10
LNG 151:7,8,17
local 154:6
locals 96:17
Lockdown 109:20
logic 180:20
logistics 91:4 105:10
 105:21 107:18 108:15
logs 65:16
long 36:12 41:5 63:8
 79:18 80:16 94:19
 128:6 135:16 181:9
 191:17 197:20 206:8
long- 80:18
longer 36:11
longish 39:4
look 15:3 31:20 41:3
 51:4 67:17 71:9
 115:21 116:12 117:17
 118:7 120:18 121:3
 122:21 125:2 126:6
 139:17 161:13 168:6
 179:12 183:3 188:10
 193:10 198:21 214:7
look-look 151:15
looking 103:17
looking 6:16 7:20 12:22
 13:8 14:17 15:5,11,22
 48:6,17 49:2 50:20

54:10,11 57:15 71:2
 90:11 103:15 142:7
 175:3 181:19 183:7
 187:3 193:20 196:17
 203:15 204:8 211:17
looks 25:6 27:7 32:7
 70:17 160:8
loose 50:11
lose 114:18 188:19
losing 138:7,7
loss 113:2 114:10 130:5
 130:9,13 138:1,1,6,8
losses 105:9 109:8
 111:7 114:21
lost 108:13 117:2
 119:12,14 123:20
 138:4
lot 7:12 8:15 11:18 12:2
 12:5,8 14:5 18:8,9,12
 35:5 38:9 41:7 42:18
 47:13 49:9,14,19 54:3
 55:22 60:4,11 61:20
 65:3,10,19 68:14 70:4
 70:11 71:10 72:5 74:5
 74:6 81:8 86:11 96:17
 100:6 101:5 109:16
 115:6 118:14 127:12
 131:6,8 133:4 134:15
 134:18 137:13 138:14
 142:12 151:7 156:18
 157:11,17 158:6,17
 159:6,8 163:16 164:5
 164:9 173:3 179:5,22
 180:9,10,21,22
 181:16,21 190:20
 191:22 192:6 194:1,1
 194:1 195:6,13 198:5
 202:15 206:6 210:4
 210:20 213:10,15
lots 8:7 41:8 62:2 131:6
 149:6 180:18 197:11
loud 7:3 82:2 84:14
 91:22
love 45:13 128:4 158:6
 197:2
low 15:15 25:2,3,9 26:3
 146:13 182:22
low-cost 183:4
lower 20:16 28:21,22
 29:11 193:22
lunch 206:10
Lyft 97:5
Lynne 2:13 24:4 29:22
 92:21 94:6 125:19
 126:14 199:3 201:17
 208:15,16 212:7,13
 213:17

M

M 1:16
ma'am 192:21
MAC 82:21 170:10
machine 97:13
magic 132:2
magnitude 88:21 126:5
 126:8
main 56:2 119:4 131:5
 164:12
major 80:4 93:21
 103:19 109:5 115:18
 171:16
majority 67:11 182:1
making 35:18 70:12
 82:16 108:1 110:8
 136:14 152:13 180:13
 184:2
man 121:4
manage 83:4
managed 77:7 83:3
 97:3
management 45:3
 55:10 82:20 138:11
 180:1
manager 62:22 63:2,14
 121:3
mandates 94:16
maneuvering 133:5
manner 171:12
MANUE 171:4
manufacturer 44:2,5,9
 44:10 205:12,16
manufacturers 52:11
map 36:11,11,12 87:18
 88:10,15 93:18 124:6
 124:11 188:15,16
mapped 76:14
mapping 2:6 3:4 11:7
 13:15 15:2 19:12,16
 21:17 32:22 43:6 55:8
 55:9,13,16,18 66:16
 67:11 68:15 69:15
 72:10,18 76:5,10,13
 77:3,6,8 78:9 82:17
 83:15 88:6 92:20,22
 93:6,12 94:1 122:16
 155:22 156:2,6,18
 163:7 171:15 176:1
 178:2 180:12,17
 185:13 190:7 195:3
 195:19 197:3,6
 200:19
maps 121:22 124:7
March 211:9
marching 46:13
Maria 2:15 101:22
 104:5,9,12 115:11
 128:18 130:1
marine 3:10 12:13
 84:10,21 85:1 103:11
 150:12 153:22 167:4
 167:7,11 172:4 184:4
 188:17
mariners 6:18 142:22
 185:2
maritime 6:19,20,20 7:8
 56:18 64:22 65:4,13
 65:16,18 97:10
 102:20 105:4 106:22
 143:12 147:17 150:16
 150:19 151:3,20,21
 181:4
mark 16:14
marked 210:13
market 137:14 151:9
markets 151:17
mass 81:6 129:14
materials 107:19
Mates 142:14
math 112:4
mathematics 113:16
 114:8
matrix 158:7 198:21
 199:2,13 200:9
matter 29:7 30:12
 113:18 136:13,13
 137:16 144:14 214:14
Maune 1:19 11:3,4
 19:13 20:5,7 23:13,19
 24:1,5 25:12,15 26:6
 26:9,14 27:3,14 29:10
 53:3,5,7 63:20,21
 171:3 185:10,11
 212:13
maximum 37:7 114:10
Mayer 2:5 16:3,4 28:15
 39:5 68:9 70:8 177:16
 191:10,11
McCammon 20:21
 21:14
McIntyre 1:19 11:13,14
 27:15 28:4,5,8 64:9
 127:13 133:22 134:1
 134:4 143:15 171:18
 171:19 185:7,8
mean 8:10 35:13 44:16
 45:9,19 52:4 117:1
 118:7,11,12,19
 119:13 120:5 121:15
 123:7,21 127:14
 146:3,7,10 166:11
 174:2,19 175:1,8
 176:18 193:14 206:1
 206:6 211:22
meaningful 74:7 214:11

means 32:1 96:6 208:5
measurement 29:4
measuring 210:5
mechanism 16:17,22
 33:22 39:17 40:21
 41:14 42:14 43:3 55:4
 55:4,20 56:3 62:12
 64:1 80:15 161:1
 174:4 178:11,14
 186:10
mechanisms 16:19
 34:19 38:18 42:2
 49:11 81:8,10 95:6
 162:6 172:15 178:6
media 104:17 108:9
median 112:15 113:2
medical 109:19
meet 89:4 198:1
meeting 1:6 3:17 4:6
 14:5 103:10 156:20
 157:12 159:22 182:21
 199:3 205:8,9 206:16
 207:8 211:3,4,7,8
 213:14,20,22
meetings 189:11
 200:14 201:4 202:19
 206:8 210:1
mega 109:11
megaships 110:20
 111:9
members 1:13 2:1 3:18
 4:8 43:18 47:9 56:11
 92:19 103:8 126:11
 126:15,19 165:4
 166:16 191:9 193:11
 199:15 204:13 205:19
 207:15
memorandum 76:8
 95:20
memory 92:4,9
mention 20:21 43:7
 71:6 105:3 109:16
 110:19 182:7 184:2
 185:4 191:21
mentioned 16:16 20:15
 33:20 34:2 35:1,8,15
 37:4,17 46:10 50:1
 56:20 58:4 81:10 82:7
 121:1 133:17 155:21
 166:7 173:10 190:10
merely 118:11
Mersfelder-Lewis 2:13
 91:16 92:6,21 98:19
 101:15 104:12 138:15
 138:19 141:16,18
 199:7,14 208:15,22
 209:5 211:10,19
 212:8,19 213:6,13

messaging 85:21
met 1:12 75:18 84:19
methods 18:16 76:19
 177:1
metrics 62:18
mic 84:15 102:21
mics 101:11
Mid-Atlantic 47:11
middle 118:21
miles 106:10,11 156:12
 193:15
military 99:17
Miller 91:15,20 92:2,8
million 54:17 87:3
 107:2 113:3,8,21
 114:4 117:15 128:1
 130:17 138:4 142:10
 213:2
millions 50:8 93:18
 107:8
mind 116:10 141:13
 163:19 178:11
mine 7:18
minimal 117:22
minimized 105:22
minimum 44:14
minor 20:18 22:15,19
minute 19:9 34:16
 58:15 64:8 74:13
 153:1
minutes 72:2 74:21
 138:16 144:11,22
 147:13 158:4,4 200:8
 205:10 212:1
mirrors 76:22
missed 202:9
mission- 54:14
mission-critical 53:13
Mississippi 137:18
 193:14,22
mistake 144:2 209:8
mitigate 184:10
mobilize 96:11
mode 4:18
model 98:2 118:6
 196:13
modeling 57:19 122:6
models 102:14 140:19
 197:14
moderating 74:11
moderator 212:22
modernization 22:21
 23:7,11 192:17
Molly 20:20 21:14
moment 6:17 80:20
 99:4 144:20 198:8
money 38:5 50:12,21
 53:19 56:6 64:5,17

71:17 72:9 114:18
 162:4 175:5,11,12
 188:9 195:14 196:21
monopolized 156:21
month 111:12,13,14
 112:2
months 18:8 79:20
 86:17 98:8 103:14
 148:19 200:14
moon 121:4
morning 4:21 5:6 6:5
 10:6 11:14 77:21
 202:3 206:9
Mother 184:9
motorized 187:16
move 13:20 19:1,1 30:3
 38:8 60:2 80:3 105:13
 108:8,18 109:22
 110:11 111:10 112:18
 114:5,13 147:11
 155:5 171:3 188:7
moved 151:13
moving 83:16 121:7
 124:7 137:16 151:18
 184:5
mowing 171:12
MTSA 57:2
multibeam 35:21
 171:13
multimodal 129:7
multiple 123:16 178:16
multiplier 64:16
multiply 113:11 114:5
multisector 42:15
Murica 197:11
murky 122:18
mute 7:4 27:16 28:1,18
 53:4 60:6 64:9
mute/unmute 125:20
 125:21
muted 4:15 7:5 10:2
 11:21 20:4 91:17,19
 92:7 169:6,6,6,7
 172:2 203:3,8,12
 211:11
muttering 203:3
Mythos-AI 97:1,2,10
 98:16
Mythos-AI's 97:7

N

naked 120:17
name 155:10 166:19
names 169:11 174:10
NASA 41:3,4,5,6,8,13
nascent 86:9
nation 54:8,10 58:7
 100:14 126:9

national 1:3 2:3 5:21
 14:10 40:4 42:12,13
 43:4 48:16 53:10 77:6
 79:21 83:1 85:2 87:2
 87:22 88:6 100:13
 102:15 149:13 159:9
 167:4,6,11 190:7,21
nationwide 53:18
nature 89:7 184:9
nautical 88:9 93:3
Navarin 150:8
Navies 100:6
navigate 15:15 117:21
 123:1 136:1,18
navigating 109:10
 120:9,10
navigation 3:10 103:22
 118:12,18,22 119:2,4
 121:7 134:17 137:1
 184:1,12 188:18
Navy 86:13 99:16 208:4
 208:6
NCEI 35:6 95:1
near 148:19 150:8
near-shore 54:12
near-term 84:5
nearly 87:3
nearshore 181:13
 200:1
nearshore/deep 181:11
necessarily 85:13 86:1
 174:20
necessary 17:3 140:15
 192:17
NEEA 54:7
need 8:22 9:15 13:6
 29:2 30:19,21,22
 31:12,13,18,18 32:18
 33:12,13 39:13,16
 40:9 42:12,13 44:1,2
 44:11,14 52:16 53:22
 58:8 61:3 64:3 65:6
 66:5 68:19,21 72:14
 73:10 86:14 87:18
 90:7,14 95:1,2,11
 105:10 106:6 122:11
 122:20,22 123:1,1,11
 123:13 124:14,16,18
 124:18 144:8 145:16
 157:18 158:20 159:7
 159:13,14 160:2,8
 161:19 164:18 167:21
 167:21 168:12 174:4
 174:5,6,9 175:10,20
 177:7 192:7 196:19
 197:5,6 210:10,16
needed 50:18 205:2
needing 21:18

Needless 116:4
needs 52:17,17 58:4
 62:9 63:17 80:1 99:18
 100:13 116:2 154:19
 170:2 171:15 183:3
 200:21
neighborhood 151:10
neighboring 98:12
nest 196:3
Netherlands 121:10
 176:5
network 47:1,7 48:5,16
 105:10 107:18 108:15
 108:17 169:4
never 130:10 142:13
nevertheless 153:13
new 9:19 10:22 31:19
 31:19 43:6 45:20 51:9
 51:15,16 57:21 60:17
 105:10,12,20 120:5
 128:22 135:18 169:20
 174:21 187:15 200:17
news 59:22 92:16 108:7
 114:16
newsletter 65:16
newspapers 108:9
next-generation 97:11
NGA 86:12
NGS 23:2 45:18 46:7
 123:8
nice 60:18 71:21 164:6
 189:3 193:2 205:16
 208:21,21
Nicole 1:17 7:13,22
 20:9,15 21:14 25:1
 27:5 60:6 61:15 165:6
 178:11 199:22 201:13
night 19:21 42:19 118:9
 130:8,8 132:15
nimble 89:7
NOAA 1:3 2:7,10 5:12
 6:8 9:2,6,10 10:19
 13:3 14:8 16:14,21
 18:7 19:18 39:9,15
 40:13 43:16,17 45:12
 45:17,17 46:22 48:4
 48:14 50:5,8,22 51:12
 51:21 52:21 54:18
 55:2,3 56:3,21 64:1,6
 64:8 65:17 66:2 71:16
 72:18 86:12 88:9,18
 90:10 91:5 92:22
 102:5 123:8 124:12
 140:9,14 141:7
 149:13 150:17 152:10
 154:18 155:12,19
 162:2,17 169:13,15
 171:6 174:14 175:5,8

178:14 180:22 183:2
184:11 185:12 189:1
189:6,12 190:22
205:21 206:2 207:13
207:20
NOAA's 45:14 51:6
54:8 66:4 76:22 79:18
88:13,21 102:19
104:17
NOAA-NOS 95:21
noise 7:1 152:14
Noll 94:9,10
NOMEC 3:3,7 4:20 6:7
8:9,21 10:10 11:10
13:15 15:1 16:12
17:14 30:9 39:13
47:19 49:15 56:17
62:17 63:1,22 74:3
84:4 94:6,13 95:20
96:2 100:1 125:4
157:18 158:1,11
159:5 163:11 164:21
169:10 172:7 177:19
188:12,15 195:1
NOMEC's 180:11
181:10 188:3
non- 25:17 35:3 38:22
non-academic 95:7
non-control 136:20
non-controversial
20:11
non-Government 34:5
37:22
non-issue 163:19
NON-VOTING 2:1
nongovernment 170:20
171:1
nonissue 21:22
nonmanned 38:6
nonprofessional
142:22
nonstaffed 38:6
NOPP 40:3 42:4,4
normal 5:3 179:22
188:4
normally 199:9
North 14:4 23:2 142:9
151:8,16 171:7
northwest 93:16 149:4
northwestern 93:19
NOS 2:3,5,9
note 188:9
noted 106:13 213:21
notes 60:8 98:17
158:19 213:11
Notings 151:13
notify 154:1
November 76:8

nowadays 118:14
119:4
NSF 35:9
NSRS 22:21 192:16
number 4:5 18:7 32:17
35:8 38:15 67:11 69:7
69:13,14 106:13
112:12,15,15,20
113:5,9,22 114:1,7,8
142:8 168:16 176:21
193:19 202:5
numbers 111:16 115:13
116:1 130:4,5,17
138:2 142:7
numeral 169:9

O

Oahu 92:3
observation 114:15
observations 15:18
102:12
observing 33:7
obstacles 86:17
obstruction 208:10
obtain 98:5
Obvious 12:3
obviously 13:6 16:19
33:17 74:6 151:4
160:10 172:11 196:11
occasionally 79:3
occur 134:16
occurs 116:4
ocean 2:5 3:4 12:5 37:1
50:14 66:16 67:1
72:18 93:14 155:22
156:7 160:21 167:8
181:11 188:16 195:3
195:19
ocean-going 112:6
OCEANIC 1:3
oceanographic 2:4,13
33:9 40:4
OCMIA 195:4
OCS 76:22
odd 67:10 150:11
OEAB 166:7
off-shore 54:12 150:9
150:21
offers 40:6
office 2:9,12 15:17
21:16 55:10 66:15
71:5 82:9 153:6 197:8
198:1
officers 196:4
Official 2:9
officially 95:21
offshore 21:4 111:5,5
150:6

oil 150:11 151:2
old 7:2 10:13 203:10
210:18
OMB 55:14
onboard 65:6
once 94:4 144:3 154:18
155:19 168:13 200:14
one-half 157:16
one-page 191:6
ones 25:19 38:20 43:20
80:20 131:9 173:9
ongoing 51:2 54:8
ONR 100:7
onward 111:12
open 18:14 74:14
132:15 134:10 200:15
operate 187:13,16
operated 171:10
operating 38:4 100:11
143:6 144:3 152:17
operation 137:8
operational 2:4,12 88:4
89:6 100:7 106:1
operations 18:17 38:5
87:7 88:13 91:10
105:22 111:21 149:1
150:3,17,19
operator 131:14
opinion 162:13
opinions 164:10
opportunities 12:9 71:3
opportunity 6:10 13:21
36:9 47:14 57:17
71:11 73:19 75:3
77:21 78:20 84:16
89:20 91:5,7 102:22
133:18 162:18 189:22
196:6,17
opposed 195:10
Optech 44:10
optional 123:19
options 129:7
order 5:3,4 80:3 89:2
182:4
orders 88:20
organic 57:13,13
organization 48:20
68:5 82:9 143:13
178:10
organizations 34:5
41:11,18 47:2 67:13
71:17 87:6 93:14
99:14
organize 40:20
organized 201:5
original 76:12
OSV 111:4
ought 65:22

outcome 65:8
outcomes 96:1
outdated 154:22 177:2
210:20
outer 57:9
outlined 32:18 148:3
outpacing 143:20
outputs 96:2
outreach 36:20 37:10
outs 209:3
outside 11:17 13:16
71:17 73:5 93:13
138:5 206:2
outside- 181:21
overall 15:13,21 187:19
overcome 86:18 119:17
overhead 162:15
overlap 155:19
overnight 21:15 124:9
oversee 174:21
overtime 198:18
overview 32:12
owe 157:19
owes 207:21
owners 108:13,15
ownership 34:10 46:9
owning 115:1

P

P-R-O-C-E-E-D-I-N-G-S
4:1
P&E 199:1 211:3
p.m. 1:12 4:2 144:15,16
214:15
pace 89:4
Pacific 93:11
page 1:20 11:21,22
12:2 20:13,19 21:9,9
22:20 23:13,15,17
25:9,13 27:17,18
28:20 47:12 64:11,13
75:16 108:7 114:16
147:12,15 148:14
157:14 169:9 172:2,3
183:21,22 209:11
pages 21:21 158:19
190:13,14
Pago 167:12,12
paid 48:11 55:19,19
Panama 156:14
pandemic 18:5,21
panel 1:4,11 4:8 7:10
13:5,14 19:15 22:10
24:10 47:8 61:14
75:15 92:19 94:16
103:1 125:18 137:10
165:4 180:6 191:9
Panel's 4:20 90:7

panelists 101:21
paper 8:14 11:8 21:20
 21:20 22:2,7 24:20
 29:18 32:12 34:15
 49:15 56:9 61:18,20
 63:22 68:4 94:5
 147:20 165:17 199:19
papers 3:14 145:1
 169:1
Paradise 193:21
paragraph 21:5 189:4
parallel 41:16
parameters 33:6,9
part 12:10,18 18:1
 25:21,21 33:16 35:12
 36:22 65:22 69:20
 94:17 104:19 132:19
 133:7,14 136:15
 140:4,5,8 160:13,18
 172:17 203:16 206:12
 207:22
participate 83:14
participating 84:8
participation 168:22
particular 21:3 23:1,6
 38:20 51:21 69:9
 110:12 184:9 198:18
particularly 108:2
particularly 4:20 8:5
 10:7 18:18 45:16
 68:13 76:1 78:5,6
 93:6,15 96:14 132:8
 133:4 134:12 173:9
parties 65:4 115:5
 152:16
partly 140:17
partner 98:9
partnered 167:7
partnering 66:2 85:21
partners 5:12 6:8 50:5
 135:10
partnership 5:18 6:11
 20:10,11 31:21,22
 32:4 40:4 43:2 50:19
 51:2,3,5,15 65:10
 66:3 69:20 95:4 162:7
 180:19,19 203:14
 204:18
partnerships 14:9
 30:20 31:16,20 32:3
 33:21 49:22 50:17
 62:13 64:20 85:22
 204:2
parts 50:15 116:5 197:5
party 135:13
pass 102:21 126:11,14
 201:17 210:22
Passage 149:4

paths 41:16
pathway 88:15
pay 45:9 53:20 54:1,2
paying 18:10 208:6,6
pea 132:1
pedal 12:4
peers 197:3
Pelican 153:15
penetration 176:2
people 18:10 19:1
 36:19 37:20 38:3
 45:13,15 50:11,20
 53:9 54:6,15 55:1,19
 55:21 56:1,4 64:2
 65:5 107:15 109:9,12
 109:12,14 110:3
 119:22 138:7,12
 143:12 152:13 166:5
 167:21 168:4 169:15
 170:17,19 171:1
 174:7 177:4 178:2
 187:8,12 190:17
 198:2 199:19 200:16
 201:12
percent 54:2,2 55:19,20
 107:1,3 118:2,3 156:5
 156:6
percentage 69:16
perfectly 10:19
performing 75:20
period 3:6 17:8 74:12
 74:18 93:5 130:13
permit 197:5
person 19:22 136:14
 137:14 181:20
personal 48:12 128:13
 131:15
personally 17:22 51:5
 131:10 202:1
persons 168:17
perspective 39:12
 42:13 77:9 166:17
 210:12
perspectives 87:11
pertain 110:13
pertains 109:17 110:15
 110:21
petroleum 130:2
Ph.D 2:15
Phase 85:2
phases 80:2,14
Phelps 212:20
phenomenal 39:10
philanthropic 41:10,17
philosophy 119:16
photograph 21:3
pick 198:16 203:5
picked 127:19

picking 58:19
picture 133:20
pictured 88:14
pictures 110:1 148:18
piece 29:1 95:11
pieces 15:20 184:19
 195:13
pile 85:19
pilot 111:3 117:21
 119:14 120:16 122:2
 134:7 135:5 136:6
 154:5,5
pilot's 143:16
pilots 118:8 119:12
 122:21
ping 161:22 163:8
pipeline 151:10
PIs 35:14
place 31:12,18 33:21
 39:3 96:8 137:8
 168:20 169:19 195:3
 197:16
places 18:18 32:16
 143:14
plan 31:4 46:13 78:18
 78:19 80:8,8,9 83:14
 97:21 204:11 211:22
planning 13:7 204:12
plans 3:3 115:7 150:2,7
 151:1
platform 168:19
platforms 18:16 78:13
 150:9 163:17
platooning 120:2
play 184:16 185:3
 189:13
playback 18:4
player 41:6
plays 130:14 150:17
please 5:5 7:13 8:1 10:1
 11:13 20:13 93:5
 105:14 108:9 110:1
 111:19 116:18 117:1
 117:8 118:5,17
 119:19 120:13,21
 121:19 122:13 123:3
 128:19 145:12 164:20
 190:22 205:5 212:10
pleased 8:20 11:6
pleasure 104:5 207:17
 208:13
plenty 144:6
plugged 84:3
plug 109:19 130:4
PNT 173:2
Podoski 89:17,19,21
 90:4,6 91:13 166:21
 166:22

point 23:6 24:22 29:3
 37:16 52:10,13 59:22
 63:19 68:10,18,20
 70:21 78:4 79:17
 80:10 81:2 82:11,13
 86:20 94:15 96:15
 111:6 119:1 128:10
 131:11 136:6 151:15
 163:21 168:2 191:21
 192:10 211:4
pointed 82:18 83:8
points 9:14 32:17 38:12
 38:15 56:2 67:5 75:8
 79:13 180:5 187:20
 189:17
Polar 149:15
policy 36:19 93:3 95:11
 147:20 160:13
policymakers 37:11
polite 193:8
pollute 144:4
pollution 109:3
poorly 154:22
pop 101:10
populate 60:16
port 101:19 102:6 104:3
 106:10 109:14 111:17
 111:20 113:21 114:22
 115:17,18 117:13
 120:9 121:5,7,9,10
 122:11,17 123:2
 124:5,11 125:1 126:7
 127:12 128:6,22
 129:3 130:11 132:8
 133:1 134:14 135:19
 136:10,15 137:4,4
 138:5,12 146:1
 154:13 155:18 183:8
 208:7
portable 152:22 153:9
porting 135:17 142:9
ports 66:2 103:12,14,19
 105:6,14,15,16 110:5
 115:20 119:18 121:2
 123:11,12 124:7
 125:2 133:11 134:15
 140:20,20 142:20
 145:20 155:13 181:7
 203:16 207:22 208:5
 209:17
poses 135:19
posit 46:21
position 117:18 168:14
 173:6 182:22 183:8
positional 122:7
positioned 10:20
Positioning 119:3
positive 143:9,19

188:11
possible 18:3,17 38:18
possibly 155:8 210:8
post 136:1 192:2
potential 51:16 86:22
 171:14 178:6 181:12
 210:3
power 153:10,11
powered 153:10
practical 5:20 80:20
 185:15
Practically 134:22
practice 142:17 143:4
 143:20
practices 133:17
 190:19
precedent 195:6
precise 137:1
precision 3:10 103:22
 184:1,12
predict 77:12
predictions 77:2
 102:13
prefer 146:3
prepared 137:4 149:19
 162:22 163:3
preparing 167:9
presence 154:2
present 1:13 2:7,10,14
 6:18 8:11 36:18 37:5
 181:18
presentation 104:11
 105:8 126:2 127:9
 139:8,17 210:8
presentations 125:14
 125:17 202:11,17
preserve 67:1
president 84:10,20
presidential 60:2 76:8
 95:19
presiding 1:12
press-released 156:16
pressing 82:13
pressure 25:18
prestigious 45:13
pretty 12:17 33:2,13
 69:12 72:20 74:22
 106:15 110:17 112:17
 132:11 143:15 184:13
 194:7 210:18,19
prevailing 112:1
prevent 89:11
preview 77:22 102:3
previous 110:17 112:21
 148:1
pride 114:18
primarily 179:2
primary 110:13 119:4

prior 142:8
priorities 3:14 55:13
 145:1 196:10 198:21
 199:2,12 210:14
 211:6
priority 55:16 85:18
 146:1 158:7 200:9
priority's 205:1
private 5:13,18 9:5
 10:21 34:4 37:22 41:7
 41:17 43:2,10 45:16
 47:2,17 48:1,7,17
 49:4 52:8 53:12 65:10
 78:4 93:13 172:8
 174:22
private/public 62:13
privilege 104:4 130:2
proactive 13:16
proactively 105:19
probability 102:14
probably 13:4 22:18
 36:3 59:8 60:6,18
 69:13 94:3 120:9
 124:2 145:16 168:16
 183:5 192:6 197:14
 202:15 206:7 207:8
problem 91:9 101:18,19
 102:20 103:18 104:20
 106:7,8 107:11
 116:16,17,20,21
 117:10,12,20 119:17
 126:4,5,8 132:19
 133:8 135:21 136:4
 137:19 138:11 140:14
 153:1 159:1
problems 108:11,21
procedures 9:8
proceed 185:2
process 12:18 17:21
 21:11 25:20 53:20
 60:9,18,21 61:6 98:7
 155:2 182:13 193:4
processed 192:1
processing 45:2,4
 78:13
produce 66:19 140:18
 176:3
producer 44:14
producing 151:2,7
product 85:18 89:8
 182:14
products 2:4,13 9:12
 70:22 85:17 86:14
 102:16
professionals 107:12
Professor 104:5
profound 51:17
profusely 157:1

program 35:16 40:4
 53:18 55:22 70:5 76:5
 76:11,13 77:19 80:2
 96:2 175:8 195:4,11
 195:16
programs 35:9 70:2
 77:8,20 97:3 196:18
progress 76:7 184:2
progressed 89:1
progressive 121:16
project 13:3 53:21 54:1
 60:14 62:22 63:2,14
 66:21 75:20 78:11
 151:6,11 163:1 167:6
 171:21 176:8 190:20
projects 13:5 66:14
 112:22
promoting 181:4
prompted 176:20
properly 38:4 50:10
proposing 123:5
proprietary 128:2
prosperity 181:4
protected 153:22
protecting 181:5
protocol 175:4 190:19
protocols 71:8 195:19
proud 79:2
prove 25:22 116:15
proven 18:20 25:4,17
 26:6,7,15,18,20 78:7
 83:4 87:20
provide 15:17,19 36:13
 36:16 40:21 46:5
 54:19 63:11 88:15,17
 97:22 101:2 117:20
 129:17 173:5 184:12
 197:7
provided 35:5 38:7
 93:17 98:16 185:13
providers 87:13 89:1
provides 36:8
providing 34:8 65:2
 123:8 150:18
proving 25:20
proximity 142:20
public 1:6 3:6 5:18
 14:16 17:9,20 19:11
 36:20 37:10,11 43:2
 47:2 56:13 61:12
 73:19 74:11,17 76:2
 81:17 96:19 100:19
 100:21 101:2 114:19
 155:4 160:1,12,12
 161:19 195:20 200:16
 202:18,18 206:20
 207:8,9
public- 9:4 65:9

public-private 6:11
 14:9 30:20 49:21 57:1
 64:19 95:4 180:19
published 88:10
pull 10:20 48:2,6 60:15
 71:11
pulled 93:4
pulling 10:8,11 14:6
 63:3,3
pulse 127:2
purchasing 129:11
purpose 40:6
pursue 87:4
pursuits 48:22
push 18:15 52:6 86:3
 190:6 206:10 209:1
pushback 198:6
pushed 12:14
put 23:5 33:20 38:5,15
 39:2,16 43:10 46:6
 48:3 56:8 60:14,22
 62:21 81:14 83:5
 98:22 115:16 116:15
 123:21 125:3 147:1
 153:14,15,21 169:19
 170:1 182:5,10
 184:19 186:8 189:3
 189:10 197:15 198:3
 200:9
puts 208:7
putting 9:15 95:12
 147:9 212:14
puzzle 95:11
Python 113:14

Q

Qassim 1:15 6:2,6
 17:10 24:15 42:11,17
 42:19 46:19 49:14
 58:4 59:1 69:6 103:7
 116:11 125:7 133:17
 137:13 140:19 145:9
 145:12 147:4 164:16
 164:16,17 173:12
 175:19 190:1 191:8
 197:2 199:18 202:5
 206:13
Qassim's 10:6 11:9
 13:2 52:10 139:16
 201:9
Qilak 152:2
quality 20:9 52:20
 53:16 82:20,22 122:9
 134:19,20,20
quantitative 36:14
quantity 83:1
quarter 190:13
question 39:14 43:14

60:10 126:3 128:2
142:16 143:10 166:4
170:6,21
questions 83:22 192:6
quick 72:4 89:8 147:19
147:19 203:13
quickly 80:4 99:21
194:8 200:10
quiet 30:17
quite 78:1 195:5 209:13
quote 109:1

R

R2R 82:21 170:10
rabbit 177:4
racing 52:8
Rada 75:10,11 78:22
radar 124:1,3,4 131:9
131:12 132:3 136:2
radio 119:5
rain 119:15
Rainier 12:12
rainy 14:4
raise 176:18
raised 38:17,17 95:13
192:6
raising 96:13 152:14
Raleigh 14:4
ramble 39:7 42:8
RAs 48:3,5
Rassello 1:20 12:20,21
27:20 66:12 135:16
138:18,21 175:21
183:17
Rassello's 209:7
rate 92:12
raw 107:18
RDML 4:15 29:17 30:13
30:16 72:3 73:8,11,15
73:17 74:15 75:13
78:21 79:7,11 81:13
82:2 84:1,14 89:14
90:3 91:8,14,18,22
94:7 95:9 99:2,5,10
99:20 100:16 158:12
158:15 170:5,12
179:10 194:20 203:2
203:6 209:15
reach 46:11 49:3 83:22
114:3 124:19 131:14
reach-out 57:4
reached 103:19
reaches 47:1
reacts 185:12
read 75:5 84:16 94:5
95:15 173:10 177:4
190:14
reading 213:10

ready 22:3,7 24:13
141:8 175:18 204:6
real 34:10 37:18 123:6
148:7 193:21 203:13
207:16 208:13
reality 115:9 134:17
142:19
realization 18:6
realize 54:16 150:4
realized 184:15
realm 78:12
Rear 2:8 4:10,13
reason 11:4 116:1
185:18
reasons 90:14 140:6
200:20
Recap 3:2,17
received 11:7 182:2
receiver 123:14,15
recognize 75:7
recognized 65:11
recognizing 68:20
180:8
recommend 169:3
189:6
recommendation 5:16
8:13 21:10 30:1 158:5
164:12 180:13 182:10
192:13 202:16
recommendations 9:2
9:17 11:9 16:10 36:5
62:1 77:22 161:14
179:17 185:14,16,20
recommended 20:8
21:4 22:1 59:5 155:9
recommending 72:16
record 75:6 79:15 81:17
96:20 144:15 200:6
207:10,10,20 209:9
214:15
records 92:20
recovered 130:10
recreational 76:2
139:19 153:1
redundancy 119:10
reef 167:15
Reference 119:5
123:18
referenced 110:14
referred 21:17
referring 21:19 201:17
refineries 107:19
refining 76:9
reflect 8:3
reflecting 34:4
reflectometry 210:2
regard 205:4
regarding 11:9 13:2

region 106:2,9,19 108:3
114:10 115:22
regional 33:12 38:21
47:7,9,15 60:20 107:1
166:17 168:15 178:10
196:9
regionally 196:10
regions 48:22 49:1
regular 205:9
regulate 146:19
regulating 146:2
regulation 145:21
146:6,19 174:12,18
regulations 88:17
regulatory 177:2
reinvent 93:5
relate 132:12
related 17:14 34:21
51:9 166:10 167:5
181:3 192:16 206:7
relationships 86:7 89:3
relative 17:19 206:21
relatively 29:6
release 23:4
relegating 85:17
relevant 148:2,6 160:18
160:18 210:21
relook 116:7
rely 118:11 119:11
143:22
relying 143:17
remainder 4:21
remark 145:9 176:20
remarks 145:4
remember 25:4 26:22
remembering 195:1
reminder 144:21
reminding 198:11
remote 18:13,17 37:16
77:13,16 85:1 96:10
146:10 178:3,3
repeated 17:18
replacing 23:21
Report 121:13
repositories 83:2
Repository 35:18
representatives 100:5
represented 46:16
100:9
represents 182:14
request 49:20 65:15
104:14
requested 22:20 46:21
requests 53:2
require 187:16
required 15:14 87:21
102:12 210:10
requirement 91:11

94:14
requirements 54:9
181:12
requires 197:16
research 5:13 35:3
37:20 44:22 82:10
85:4,18 93:10 98:9
112:21 115:13 183:7
210:6,8
researchers 89:9
researches 112:21
reservations 129:5
resilience 181:15
resolution 52:18 87:13
181:13
resolutions 204:3
resources 10:10 58:8
63:11,17 64:16 66:6
78:15 181:6 195:12
respect 12:4
respects 81:7
respond 135:20 145:17
174:3
responded 181:21
response 34:12 42:9
49:20 145:10
responsibilities 80:11
188:5
responsibility 63:3
174:16
rest 19:17 58:20 125:13
126:9,18 164:9 191:7
restricted 3:11 103:12
105:1 116:21 139:10
186:14
result 105:22
results 13:8 36:19
resumed 144:15
ret 1:20
retailers 129:13
retiring 208:17
return 54:20,22
reverse 5:4
Review 1:4,11
revised 163:10
revolutionize 97:12
reword 70:10,14
rewording 67:18
Rich 2:4 15:7 16:2
28:17 70:15 102:10
178:21 179:9
RICK 2:11
RIEGL 44:11
rightly 81:2
rigs 150:9
rippling 184:7
rise 90:17 91:1
risk 117:22 118:1 143:1

143:16,18
risks 111:20
river 137:20 193:14,22
road 18:3 120:1,12
 201:2
robin 3:2,17 4:8
robust 97:9 103:10
role 95:22 96:14 106:18
 118:6 140:12 150:17
 160:20 179:2
roll 23:11 174:7
rolling 35:17 51:11
 200:17
roman 169:9
room 126:18 130:8,9
root 113:17
Rotterdam 105:14
 120:22 121:5,15
 133:12 137:2
rough 150:4
round 3:2,17 4:8 5:2 8:8
 17:9
rounding 193:3
roundtable 55:9 145:3
route 149:10 154:13
 155:19
routes 154:15 155:8,9,9
routing 155:10
row 108:5,5
rule 14:7
rules 197:12
rumor 39:22
run 152:19 162:9
 195:11 207:11
run-off 181:14
run-up 181:14
running 58:20 155:15
 193:3 200:12
rush 45:15 175:16
Russian 148:16

S

Saade 1:12,14 4:3,4 5:1
 6:2,22 7:12,22 8:15
 9:22 11:2,12,20 12:1
 12:19 13:10 14:1,11
 14:19 15:7 16:2 17:6
 19:5 22:12 24:12,13
 30:6 40:15 49:13,13
 49:18 58:15,18 72:1
 74:5 75:16 100:22
 101:1 126:21 141:12
 141:17,21 142:2
 144:5,17 163:11,12
 164:3 199:5 200:7
 201:13,19 203:5,9,19
 206:4,19 208:14,21
 209:3,9 210:9 211:8

212:18 213:12,19
sacrificed 153:5,7
sacrificing 133:19
safe 143:12 150:16,18
 214:7
safely 15:15 149:20
safer 137:8
safety 108:21 119:10
 133:20
sailboat 186:22
Saildrone 171:7 180:17
Saildrones 171:10
Sal 12:20 13:10 27:19
 66:11 135:13 139:2
 175:20 183:16 209:7
SALVATORE 1:20
Samoa 90:8,13 167:4
 177:21
San 127:11 131:16,22
 132:8,13,15 133:1,5
Sanctuaries 167:7,11
satellite 76:15,18 87:13
 87:15 88:9,12,19
satellite-based 85:16
satellite-derived 85:1,5
satellites 87:18 88:4
save 38:4 124:21
 156:11
savings 125:4
saw 117:13
saying 46:20 139:21
 151:15 152:16 164:10
 167:20 197:22 202:6
 207:10
says 23:2 67:11 121:3
 169:8
scale 87:22 97:9 195:7
scenario 39:9 54:19
 99:14
scenes 71:10 213:1
schedule 17:7 30:4
 206:12,17
scheduled 23:3
Schmidt 93:14,17
schools 45:1
Science 85:3 87:2
scientific 37:8
scope 103:18
scopes 61:2
screen 120:18 122:3
 124:18 170:9,11
 176:22
Scripps 49:10 162:9
scroll 26:2
scrutiny 71:19
se 210:19
sea 87:19 90:17 91:1
 148:21 150:10

seabed 10:10 50:13,16
 188:16
seafloor 92:22 176:1
seamless 214:1
Sean 1:16 7:4,4,13
 24:19 59:19 137:18
 158:4 165:1 179:16
 183:17 187:19 188:2
 189:19 190:3 191:11
 191:16 193:2 194:11
 198:15 203:2,6,20
 208:2
second 13:1 58:3 73:7
 78:3,3 80:10 96:4,21
 129:4 136:2 142:14
 147:12 162:14 197:1
 207:22
Secondly 92:17
seconds 118:13
secretary 81:20 169:14
section 145:10
sector 41:7,17 52:8
 78:4 97:10,14
sectors 42:1 73:5
 178:16 196:5
security 100:8,13
seeing 18:7 37:17 65:6
 86:2 87:17 142:7
 148:17,17 171:5
seen 42:11 80:20 85:4
 108:12 110:9 127:11
 130:4 143:4 155:8
 212:22
sees 21:1
segue 193:6
self-driving 97:4,8
self-muted 104:13
semiprocessed 107:19
Senators 55:14
send 24:4 29:21 94:6
 137:6 173:11 211:1
sending 59:11 94:4
 154:20 163:10
senior 47:9 189:12
sense 34:1 38:2,9 68:11
 69:7 127:14
sensing 77:13,17,17
 85:1
sensor 29:1 119:11
 181:7 204:2
sensors 20:16,17 25:18
 26:4 28:21 29:6 76:20
 105:11,20 121:18
 204:4
sent 22:17 62:15 69:7
 92:17,20 93:2 104:14
 183:13
sentence 27:1 176:22

177:5
separate 36:4 68:17
 69:1,22 77:8 162:12
separately 34:22 77:19
separation 155:8
September 1:9 4:5
 128:22 155:3
serious 103:21
seriousness 116:16
serve 4:4 20:22 45:6,17
 173:2
server 40:18
Service 102:16 149:13
services 1:4,11 2:5,13
 9:11 65:3 70:22 98:7
 155:13
session 15:11,12 56:14
 139:10 145:3 147:7
 198:19 199:1 205:18
 206:9,10
sessions 7:16
set 5:14 9:7 137:8
 159:20 194:5 197:16
 199:2
setup 100:4 167:13
seven 45:21 107:1
shake 208:10
shaking 208:2
shallow 21:18 76:20
 77:17 90:22 188:8,14
share 46:7 98:10 104:6
 130:19
sharing 53:9 95:2,7
shelf 57:9
Shell 150:3,20
Shep 2:8 29:16 32:11
 32:14 71:22 72:2 73:6
 74:10,12 98:19 101:1
 157:19 158:9 161:16
 170:10 174:3 179:5,9
 188:6 202:20
Shep's 49:20 168:2
 194:12
ship 69:13 93:20
 108:10,12,13,14,21
 112:20 113:8 117:15
 120:9 122:1 123:15
 134:19 135:17 137:4
 138:4 163:19 193:15
 194:3
ship- 114:22
shipping 105:21
ships 35:19 109:8,11
 111:3,4 112:7,10,13
 114:1 117:21 124:3
 136:1 137:22 142:10
 149:3 150:10 151:17
 152:18 153:2 162:22

163:2,6,14 186:20
shirt 7:19
shore 150:22
short 61:21 74:20
 110:12
short- 163:13
shot 150:4
shout-out 75:15
show 36:19 122:4 199:8
 199:12
showcase 205:11
showed 125:1
showing 28:21 140:19
shows 20:8 21:3 153:19
shut 150:14,15
side 43:17 49:4 57:12
 83:13,16 100:7,8,12
 108:12 112:8 116:11
 148:16 201:20,21
sides 202:11
sight 188:19
sighted 163:14
significant 82:14 83:10
 102:9 133:14 149:7
 187:11
significantly 82:22 88:6
 148:15 156:11
similar 47:18 81:5
 133:15
similarly 196:4,8
simple 112:4 113:16,16
 114:8 121:21 124:20
simplifying 37:12
simply 37:12 110:19
Simultaneous 26:13
 208:20 209:12
single 21:1 63:13
 111:12,16 112:7,13
 112:20 114:4,6
 171:13
sir 5:1 127:4 182:18
 194:15
sit 44:12,20 45:1 46:1
 102:22 132:13
sits 72:19
sitting 40:17 88:8
situation 38:7 40:11
 47:19 102:6 112:19
 120:11 177:22
situations 38:3
six 18:8 75:2 79:20
 92:13
size 123:16 184:21
skilled 207:16
sleeves 174:7
slide 105:13 106:4
 108:8,18 109:22
 110:11 111:10 114:14

116:18 117:1 118:5
 118:17 119:19 120:13
 120:21 121:19 122:13
 123:3 145:2 148:11
 150:1 151:5 152:1,12
 152:20 154:11 155:6
 155:14,20 157:2
slides 117:3 148:8
 155:15
slight 38:14
Slope 151:8,16 171:7
slow 87:17
slow-moving 177:2
small 40:18 84:21 85:3
 85:6,21 86:10 89:3,5
 89:6 123:18 124:1
 127:16,17 131:4,14
 133:1 137:6 142:22
 146:2,14,20,22 149:5
 182:21 183:8 184:14
 184:16 186:5 187:17
 193:20
smaller 112:10 131:9
 149:2 187:12
smart 124:8,8
Smith 2:8 4:10,13,15
 19:11 29:17 30:13,16
 58:13 61:5 72:3 73:8
 73:11,15,17 74:15
 75:13 78:21 79:7,11
 81:13 82:2 84:1,14
 89:14 90:3 91:8,14,18
 91:22 94:7 95:9 99:2
 99:5,10,20 100:16
 158:12,15 170:5,12
 179:10 194:20 203:2
 203:6 209:15
social 109:15 157:4,5
soda 211:15
software 45:2 46:3
 124:16
sold 80:16
soliciting 54:5
solid 14:17
solution 65:19 104:19
 118:3 123:5 124:15
 133:19 135:9 137:9
 140:4,4,5,5,8 143:10
 172:18
solutions 89:10 97:9
solve 97:19 140:13
solved 41:5 137:18
 159:2
somebody 10:18 42:11
 63:9,17 161:7 162:21
 164:6 175:12 177:6
 200:4 208:1
somebody's 10:8

169:19
something's 169:21
SOMP 83:14 84:4
sonar 44:19
soon 144:13 197:22
 211:21
sophisticated 44:18
 122:5 153:12
sorry 4:15 11:3 28:6
 39:2 87:1 89:22
 125:19 128:17 138:15
 157:7 176:15 190:2
 208:22 212:9 213:6
sort 11:10 14:7 29:4
 31:16 32:9 37:12
 60:14,15,17 67:10
 83:9 100:7 131:8
 161:11 175:16 186:11
 197:2 200:18
sorts 140:22
sound 114:19 198:3
sounded 60:13
sounding 122:17,17
sounds 26:8 27:13 28:9
 91:9 159:13 166:12
 172:18 185:17
soup 132:1
source 93:3 119:4
 140:18 167:18
sources 10:21
South 7:15
space 41:12 56:17,22
 57:14,16,18 88:3 98:7
 98:13 130:15
span 98:8
spanning 148:15
spatially 77:11
speak 24:12 75:5 94:11
 98:21 127:15 138:20
 165:5 200:3,4
speakers 195:20
 213:16
speaking 26:13 208:20
 209:12
specializing 84:22
specialty 48:22
specific 62:22 82:20
 90:7
specifically 66:15
 90:21 103:13 104:3
 159:11 188:17 212:20
specification 190:20
specifications 88:17
specifics 103:16
speech 209:10
speed 198:3
spend 4:19
spending 50:21

spent 150:5 213:9
spoken 29:21 62:5
sponsored 196:9
sport 180:1
Sportsman's 193:21
spot 182:6
SR 1:16
staff 2:10 99:13 189:12
 207:13 212:14
stages 107:20
stake 57:10 106:17
stakeholder 66:13
 135:5
stakeholders 21:10
 46:16 57:5,10 65:3
 66:21 135:10 165:13
 176:8
stall 196:2
stance 107:10
standard 5:22 149:10
 190:7,11,12,16,22
 191:3,4,6 195:19
 197:7,15,20
standardization 84:6
 181:10 190:5
standards 5:19 9:7 11:9
 14:10 33:17 48:19
 60:22 92:20,22 93:8
 181:11 197:3 198:1
 199:20
standby 129:8
standing 94:19 102:18
 138:5
stands 32:12 102:5
start 4:7,10 10:15,15
 17:15 30:9 39:3,8
 60:19 62:19,21 63:7,9
 63:13 72:13,15 73:13
 84:5 151:2 163:12
 171:11 182:4 197:22
started 12:16 30:14
 41:5,15 45:21 125:18
 139:9 141:2 170:2
starting 92:11 191:10
startup 98:4
startups 98:12
state 53:11 54:1 64:21
 75:22 77:1 78:10
 93:22 97:7
stated 52:2 85:22
 117:11
statement 70:12 93:10
 94:1 117:10 190:9
statements 95:16
states 23:2 53:12,19
 115:18 134:13 187:11
 187:14
station 123:9

stay 36:4 141:6 214:7,7
staying 150:21 153:5
steer 45:11
step 5:20 56:17 63:15
 76:16 169:17
stepping 12:3
steps 63:5
Stoddard 99:4,8 212:21
stop 51:19 179:15
 198:12
stopped 110:5 186:20
storm 181:13
story 177:20 184:13
Strait 154:14
stranded 109:14 110:4
 113:21
strange 68:11
strategic 96:11
strategies 3:4 5:9,10
 6:7 57:21
strategy 6:14 8:5,9,21
 11:7 15:2 21:17,19
 30:18 56:17 62:1 77:4
 77:6 78:6 96:6 100:1
 125:4 159:9 164:21
 168:7,8 170:14
 174:15 180:11,12
 185:13 188:12
strength 79:18
stress 95:1
stressed 95:20
stressing 9:10
strike 60:3 67:14
string 49:21
strong 17:18
structure 27:1 48:4,10
 49:3 58:6,8 62:8 73:4
 100:3 159:15 160:8
 161:4 166:13 195:2
 195:11 196:3
structured 47:1 134:14
 160:2,3
structures 31:12,17,19
 196:16,18
structuring 189:5
struggle 34:3 85:9
stuck 110:8 113:20
 159:19 174:10
studies 162:11 181:15
studio 113:14
study 16:8 54:7,9,10
 128:21 154:13
stuff 72:5 137:13 144:5
 193:3 196:4 210:17
sub-bottom 33:8
subcontractor 85:8
subject 161:9
submission 94:18

submitted 79:14 167:17
subsequently 153:13
subsidence 90:15
subsistence 152:4,7
success 5:10 9:12 18:6
 32:7 43:13 45:19
 87:14 101:4
successful 49:21 51:2
 65:8
successfully 103:20
Suez 156:14
suffer 105:18
suggest 19:18 44:8
 67:17 80:6 161:8
 162:14
suggestion 46:17 73:1
 175:2 177:8 206:3,5
suggestions 59:10
 60:12 61:10
summarize 98:22
 157:22 161:18
summarized 74:19
summarizing 16:12
summary 38:11 74:20
sunny 7:15 9:18 153:5
super 82:4 135:4
supplier 88:12
suppliers 86:7
supplies 109:19
supply 107:21 108:16
 109:17 113:7 114:3
 116:6 128:7 129:2
support 11:6 39:11
 82:16 87:15 111:5
 140:10,15 141:8
 172:7,11 175:8 179:2
 188:18 192:13 194:9
 204:14 206:13
supported 70:3
supporting 32:21 66:13
 66:22
supposed 155:4
surface 51:10 97:3
 171:5
surfboard 7:19
surfboards 7:17
surge 181:14
survey 2:3,9,12 12:14
 40:12 97:18 124:14
 159:8 167:18 190:8
surveyed 154:22 155:1
 167:13
surveying 12:5,16 88:1
 124:13 154:19 156:2
surveyor 46:6
surveys 2:12 21:19
 44:16 76:22
suspect 68:13

sweet 110:13
switch 20:13 30:9
symposium 33:18
synchronicity 111:12
synchronization
 195:20
synergies 83:12 195:10
system 15:14,21 29:2,8
 52:3,4 119:2,3 123:18
 123:21 131:7 134:10
 134:10 140:20,20
 146:15 172:5 181:18
 198:3 203:16
systematic 171:12
systems 28:22 29:11
 36:13 37:6,14,17
 51:20 107:22 119:1,5
 129:5 131:13 155:10

T

table 5:2,14 44:1,12,20
 50:5 51:14 52:12 83:6
 168:17 190:14 191:7
 201:4,7
tackle 5:14 44:4
tackling 214:10
taken 92:15
takes 51:12 63:2 124:19
 204:19
talent 48:15
talk 14:7 17:13 19:13
 21:18 36:6 63:8 68:19
 72:12 104:21 107:11
 108:10 114:17,20
 116:20 117:14 122:6
 123:20 144:22 148:7
 151:9 157:18 158:5
 163:22 172:13 179:16
 186:21 195:1 199:22
 203:13 204:2
talked 33:17 66:1 123:9
 152:22 159:21 172:10
 199:17 204:20
talking 15:13 20:16
 21:11 34:19 62:16
 101:17 105:11 108:21
 113:8,20 122:15
 130:14 136:22 137:12
 139:10 146:11 170:13
 197:13 199:20
talks 22:20 115:8 154:5
tanker 144:3 146:3
 148:22 149:2,2
tankers 123:17 148:17
 148:18
target 88:11
task 10:16,16,17 43:15
 45:8 46:15 58:5,9

60:19 65:20 66:8
 72:12,14 120:10
 166:2 169:11,12,18
 169:19 170:18 172:16
 175:12 188:17
taskforce 159:12 161:3
tasks 48:21
TCarta 84:10,20,21
 86:5,20 87:2 88:5,11
TCarta's 85:20
team 14:5 24:4 45:14
 45:20 58:13,21 153:8
 153:8 174:4,14,17
 180:1,3
teams 60:20 103:4
teamwork 180:20
tech 28:6 31:10,11 98:4
 98:12 204:15
technical 3:9 82:16
 86:12 101:9 174:9
 200:22 201:6 202:10
 202:17 213:22 214:3
technically 59:21
technological 143:10
technologically 134:8
technologies 76:15
 77:13,18 78:12 81:11
 85:17 86:3,9 87:4,6
 87:10,11 88:7 98:1,6
 98:12 120:6
technology 2:15 6:13
 44:3,7 50:3 51:9,15
 57:12,16 78:8 81:1
 86:6,22 87:14,17
 88:18,19,22 89:5 93:7
 97:8,18,21 103:9
 104:1 116:11 117:20
 119:7,11 120:14
 123:4 124:17 125:9
 133:7 135:9,22 136:7
 136:8,13,19,22
 137:10,12 139:12,17
 140:3,15 141:3,6,8
 142:16 143:2,3,8,17
 143:20 144:1 145:17
 146:7,12,16 153:7
 154:10 163:1 171:15
 173:6 182:21 183:4,4
 205:11,12,17 206:22
technology's 133:16
 140:7,13
telephone 154:7
tell 53:2 161:7 191:20
 214:6
telling 26:14 106:5
 122:22 190:15
tells 160:1
temporally 77:12

ten 137:21 158:4
163:15,22
tend 162:13
tentacles 172:7
term 80:16,19
terminal 130:5
terminals 106:11
terminology 25:5
terms 39:12 81:1 91:3
106:19 178:12
terrible 50:2
territories 90:10
Territory 90:8
test 138:11 153:7
testing 21:7
tests 167:13
tethered 21:4
Texas 103:14 106:19
107:5 113:1,4
text 38:14 191:6
thanks 6:22 7:12,12,14
7:21 8:15 9:21,22
11:12,20 13:12 14:1
14:11,18,19 15:7 17:6
19:6 25:7 27:4,14,19
42:16 49:7,18,18 53:1
56:5 58:11 61:15
66:10 67:3,9,22 71:12
74:5 83:21 89:15,19
91:7 101:1,1 123:8
129:20 130:20 139:5
141:9,14 144:6,13
145:5,7 147:8 157:13
161:15 168:8 171:20
175:19 176:13 177:14
179:8 188:2,19 193:4
194:20 208:12,14
213:3
the-box 181:22
theme 34:14
things 7:3 10:9 13:20
18:13,13 25:15 30:19
32:1,21 33:13 34:10
34:20 35:13 40:3,19
41:1,9 46:12 49:1
50:4,10 51:18 52:9
64:17,18 66:5 83:16
118:9 120:12,19
121:8 122:4 129:13
129:14 136:16 140:22
148:3,3 155:12,18
159:6,8 161:5 167:2
168:3 186:12 188:22
191:2 195:6 197:17
199:15,21 200:2
202:2 204:19 208:8
210:14 214:9
third 93:9

Thompson 1:21 14:2,3
28:1,2 67:5 172:22
182:5,15,16,19 186:4
207:4 209:22
thought 14:14 16:7
20:21 31:5 32:2 38:20
39:2 42:8 56:16 68:11
69:21 81:16 127:21
133:21 143:6 158:16
160:16 213:22
thoughtful 81:15
158:16 159:6 161:13
thoughts 4:20 32:8
42:2 66:11 67:4 72:11
104:6 192:18 194:21
thousand 146:11,16
thousands 109:9 110:4
138:12 156:12,12
three 21:20 23:16 43:11
72:2 108:5 119:22
120:5 127:10 137:11
142:5 148:19 190:13
206:11
throw 42:9 65:7 168:13
201:3
thrown 145:20
thrust 68:4 141:2
THURSDAY 1:8
tides 198:3
tilt 198:10
times 4:17 12:17 17:18
18:7 60:4 85:10,11
90:17 103:5 128:6
180:17
timesheet 212:10
timing 19:10 59:14
titled 92:22
today 6:18 7:10,18 8:13
9:16 11:5 13:9,20
14:14 15:4 16:11 57:8
74:16 75:1 80:12 84:7
84:18 102:10 122:16
180:2,14 191:19,22
192:5
today's 7:21 15:12
74:11
told 34:9
tomorrow 163:20
tool 132:20 211:5
tools 31:11 184:11
top 99:15 110:20 112:5
148:20
topic 192:8 204:6
206:21
topics 164:5 185:21
199:2 200:12 210:1
210:10,18,19,21
211:4

topographic 53:15
topography 54:11
totally 10:4 37:15
145:18 146:1 191:5
touch 91:11 158:6
touchdown 118:14
touched 99:12 136:6
tough 18:18,20 72:21
107:14
tour 174:8
tourism 109:20
town 41:6 57:3
track 68:7 140:8
tracked 153:14
tracklines 83:17
tracks 69:13 155:9
traditional 96:8
traffic 103:11 106:20
111:17 112:6 132:10
134:11 136:11,20
137:5 148:15 149:9
149:17,20 154:15,17
154:19 155:7 156:11
traffic's 149:7
transcriptionist 212:2
transfer 50:2 96:7
149:1
transformed 105:21
transiting 194:2
transition 45:20
transmitter 127:18
transponder 146:21
transport 146:21
transportation 107:2
129:7 138:9 172:5
184:4
travel 212:11
treat 130:6
tremendous 86:14
207:19
tremendously 207:11
tricky 193:13
tried 198:5
trigger 37:18 38:7
Trimble 46:4
trip 207:21
trucking 110:7
trucks 110:7 120:2
129:6
true 16:6 67:13 68:12
68:12 86:21 97:14
177:10 180:2
truly 40:5
trust 8:18 167:8
try 17:4 30:16 34:12
60:9,9 72:4 81:10
159:20 173:13 198:8
208:21,21 211:1

trying 17:19 28:20
32:15 33:4 36:18 73:2
86:2 110:2 141:5
149:10 152:4 154:15
161:3 177:19 178:14
209:15 211:11
tug 149:6
Tuktoyaktuk 149:3
turbid 122:19
turn 50:11 59:12 74:3
100:21 101:11 177:22
179:16 212:10
turned 212:9
turns 67:19 100:6
twitchy 31:22
two 25:18 43:22 44:8,11
44:14,15,18,22,22
45:1 46:2 75:15 77:7
77:19 92:18 95:14,17
101:10,11 107:1
110:12 122:20 125:17
142:5 147:22 188:22
190:14 203:17 212:3
two-thirds 77:1
two-way 155:8
twofold 75:19
type 48:9 76:21 99:13
127:18 134:16 148:17
163:17 168:17 181:11
184:20 195:22
typed 79:15
types 31:19 33:6 50:4
134:11 144:22 151:21
161:5 204:18
Typically 108:4

U

U-turn 110:8
U.K 176:5
U.S 1:1 18:21 40:13
50:15 67:12 68:13
82:10,13 85:7,10,14
86:8,13 87:9,16 89:21
90:8,10 93:12 94:2
96:2,10 106:19 107:3
107:4,6 110:13,15
112:4 143:13 162:22
163:6
Uber 97:5
UHF 136:3
ultimately 50:6
umbrella 204:9
uncertain 23:10
uncrewed 18:15,16
51:9,10 52:4
underline 105:10
underlines 9:14
underlying 71:19 72:7

underneath 110:14
underpin 9:10
understand 103:18
 104:2,8 106:17
 128:14 135:14 161:2
understanding 161:9
undertaken 112:22
 148:5
underutilized 48:14
underway 151:6
unfeasible 76:19
unfortunately 139:14
UNH 51:4 93:22 155:22
UNH-Joint 2:2,6
unique 49:1
Unit 162:11
United 53:12,18 115:18
 134:13 187:11
units 152:22
universities 51:4
University 2:16 40:16
 104:6 113:1
unlock 86:22
unmute 22:13 104:13
 164:18 214:3
unmuted 78:21 127:8
 134:2 165:3,7 169:9
UNOLS 35:1,2 81:20
 82:8 170:10
unsurveyed 154:21
up's 183:11
update 3:9 22:7 29:21
 101:9 122:12 140:18
 147:13,19 157:10
updated 30:7 121:17
 148:1 177:1
updates 15:5 213:2
upgrade 187:11
urgent 109:17
USB 153:10
USCG 1:20
use 21:7 25:22 26:17,17
 48:12 49:8 81:10 87:6
 93:2 97:21 123:7
 129:3 136:7,8 188:11
 209:10 210:4
useful 59:14 61:22
 205:8
users 76:3
uses 53:15
USGS 43:22 53:8,9,19
 54:3,7 55:3,4,18,20
 55:22 56:1 64:5
USGS' 53:17
utilization 85:16 86:15
utilize 71:3 118:22
utilized 62:9 183:5
Utqiagvik 148:19

utter 85:9

V

vacations 109:11
valid 164:11
valuable 179:6
value 94:12 99:16 111:7
 130:18 198:11
value-added 107:20
values 113:5 114:2
variability 134:19
variables 184:15
various 17:14 48:21
 53:14,16 87:9 102:16
 116:4 166:6 168:15
vast 88:1 108:16 109:13
vehicle 54:21 97:3
vehicles 51:7,10 85:14
 119:21 173:4
vented 25:18
version 89:16 93:3
 148:2 179:12
versus 146:1 156:13
vertical 122:8
vertically 97:16
vessel 40:18 113:3
 128:1
vessel's 184:20
vessels 15:15 35:2
 40:17 83:5,20 111:5
 112:6 131:5 142:22
 152:9 153:17,19,20
 154:1,2 162:17,22
 171:5
Vice 47:11
Vicki 34:22 35:8 82:18
videocam 11:5
view 79:19 89:2 125:8
 125:11
Virginia 2:12 26:2 148:9
 212:14,21
virtual 1:6 4:5 206:17
visibility 3:12 15:12,15
 15:19 102:14 103:13
 105:1,12 116:21
 139:11 186:14
visibly 120:17
vision 46:7
visualization 36:14
vital 87:14
voice 201:14
Volkswagon 97:6
voluntarily 47:22
voluntary 45:9
volunteer 45:10
VORs 119:6
vote 22:3
vouchers 212:12

VTS 64:20 112:5 136:9
VTSA 110:15
vulnerability 91:2

W

wait 109:18 147:12
waiting 87:8 109:2
 129:12 132:14
wall 199:6
wand 132:2
wanted 25:5 49:12 56:2
 71:15 72:11 80:13
 82:11 90:4,6 94:15
 115:15 139:16 145:11
 157:22 189:20 192:18
 203:21
wanting 188:15
wants 61:6 98:21
 160:20 199:18 201:3
War 136:2
warehousing 107:22
 129:5
warning 152:9
warnings 137:6
Washington 55:9
wasn't 24:13 32:4 99:11
 136:15 176:18 178:3
 191:5 209:17
Watch 25:16
water 21:18 25:16 29:5
 66:17 67:11 69:15
 76:20,20 77:11,17
 90:22 93:6 122:18
 152:17 155:9 176:3
 188:8 210:5 211:15
water-level 102:17
waters 90:22 154:22,22
 155:1 156:6
waterways 96:18 180:1
wave 176:4
waves 66:18
way 5:9,15 6:16 16:8
 17:4 35:17 40:21
 43:15 46:15 51:17
 55:2 62:21 64:5,6
 66:18 69:19 70:7 80:7
 88:14 94:22 99:7
 116:5 119:14,21
 122:3 137:17 140:3
 143:6 153:2 154:9
 160:2,3 166:1 175:8
 186:8,15 196:14
 197:17,21 208:3
way/her 122:3
ways 18:12,13 49:2
 50:12 56:7 57:13 64:4
 71:9 135:20 160:11
 172:15 181:21 184:18

weather 102:15 115:6
 116:22 118:15 149:13
web 214:8
webcam 104:14
webinar 1:12 181:20
website 213:3
weeds 61:10 69:2
week 12:12 21:15
weeks 59:13 62:15
 171:11 195:21
weigh 146:4 212:3
weighs 149:15 152:10
weight 102:19
welcome 4:4 75:13
 79:11 144:18 192:19
 212:4
went 68:15 150:13
 153:6 156:5 190:13
 191:19 199:8 214:15
west 127:12 149:4
whalers 154:6
whales 152:7 157:7
whaling 152:15 154:1
whatever-you-want-t...
 186:13
wheels 93:6
white 11:8 12:7
whittle 194:6
wholesalers 129:13
wide 18:14
willing 55:5 65:7 143:22
 186:6 204:14
win-win 47:20
wind 176:4 184:21
windmill 198:10
window 17:13
wins 51:18
winter 103:13
wirelessly 153:18
wish 6:17,19 114:11
 213:15
wishes 6:21
witness 121:11
woman-owned 85:6
wonder 121:15
wonderful 212:15
wondering 19:7 39:17
Woods 10:22
Woolpert 44:17
word 23:21 26:10,11,16
 31:22 57:1 65:14
wordsmithing 68:5
work 5:12 8:6 11:16,18
 12:22 13:1,20 18:8
 24:21 25:22 35:2 48:9
 48:18 49:9,14 58:1
 61:1,2,20 62:2 65:18
 68:5 69:16 70:4,11

75:20 76:9,22 77:13
 79:22 80:14 82:8
 83:11 87:10,21 89:4
 89:10 90:21 96:18
 113:13 116:6 122:19
 140:21,21 157:17
 161:13 167:10,14,16
 168:6 171:21 182:12
 206:13 207:12,17
worked 43:11 47:22
 74:22 166:15 181:9
workflow 97:20
working 3:9,15 6:9 7:10
 11:5 13:22 15:5,18
 18:11,11 39:20 43:19
 85:10,12 101:9
 102:12 116:6,9 130:2
 131:8 134:7 135:3
 145:1 158:20 165:11
 169:18 170:1,20
 171:2 174:21 196:12
 196:15 213:14
workload 87:20
works 47:1 81:12 134:9
 134:22 166:14 178:9
workshop 45:22 103:9
 140:7
workshops 196:9
world 6:19,19,20 105:7
 116:5 121:2,11,12
 136:2 142:9 187:8
 197:4,6,15
worried 163:14,20
worry 16:21 36:10 39:5
 39:7
worth 34:21 57:15
 93:18 142:10 159:2
 197:18
would've 143:5 158:21
 159:2
wouldn't 16:6 131:10
 131:11 159:17
wrap 3:18 73:13
wrap-up 145:3
writing 61:11 95:19
written 74:18 79:14
 81:16 89:16 95:21
wrong 114:9 161:7
 162:1
WRV 7:17

X

X 61:3

Y

Y 61:3
year 23:6,18 90:2
 106:13 111:13,13,16

114:7,12 115:2,3
 133:14 167:3 207:7
 208:18 209:6,10
years 41:22 43:11
 45:21 75:18 76:6
 86:10,18 92:13 93:8
 93:20 106:16 110:17
 112:17 119:22 121:14
 130:4 134:8 135:18
 137:11,21 143:5
 147:22 150:11 151:12
 151:19 152:17 163:15
 163:16,22 195:2
 207:14
yellow 20:7,14 110:19
 111:22
yesterday 4:9,17 5:8
 6:12 8:3,19 12:3,13
 12:22 14:4,6,14 15:1
 16:17 23:7 33:4 35:1
 35:15 37:18 38:17
 43:7 46:10 59:22
 74:17,18 82:19 84:18
 122:16 188:6 200:19
yesterday's 7:16 15:10
 16:5
yield 4:21
York 135:18 187:15
York-New 128:22
Young 180:8

Z

zone 144:12

0

1

1,000 54:14
1:00 1:12
10 123:21 146:4 151:11
10,000 109:12 146:5
100 118:2
101 3:12
11 128:22
12 20:19 142:8
12:59 4:2
13 21:9,9
135 112:7 113:21
145 3:15
15 144:11 151:12 158:3
 200:8
15-person 84:21
163 3:17
18 135:18
18.5 114:12

2

2 4:5

2.0 92:22
20 106:14 143:5 150:11
 156:6 195:2
20-something 55:15
20,000 123:21
200 106:11 117:16
2002 92:10
2008 87:1
2011 92:11,18
2012 53:9 88:10,21
 92:18
2015 111:11
2016 121:13
2017 121:13
2018 87:1 94:11
2019 110:16
2020 1:9 4:5
2022 23:3 46:11
2024 23:4,8,9,18
2030 10:10 50:13,17
 156:8
212 112:9
22 55:10 106:12,14,18
 112:16 114:6,12
23 106:14 134:8
24 1:9
25 106:11
25- 130:3
26-foot 186:21
260 193:14

3

3 22:20 23:17,18 69:7
 114:9
3:32 144:15
3:45 144:11
3:46 144:16
30-\$40,000 120:7
30-foot 186:22
31 3:4
31st 209:2
3D 53:17 54:8,9 122:6
 122:10 124:6 181:14

4

4 3:2 67:11 93:4 113:8
4:58 214:15
45 144:21 205:10
46 55:19

5

5 176:21
50 54:1,2 151:11 169:11
 197:14
500 112:12
52 106:10
52-mile 109:5
54 55:19

6

6 157:6
6.7 156:5
60 151:11
60,000 132:22
602 53:13

7

7,000 109:12
70 93:19
700 112:13
70s 75:20
73 3:7

8

848 114:4
85 150:7

9

9 20:13 25:13
90 107:3
98th 118:3
99 118:3

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: 09-24-20

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