

U.S. DEPARTMENT OF COMMERCE

+ + + + +

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

+ + + + +

PUBLIC MEETING

+ + + + +

WEDNESDAY
MARCH 6, 2024

+ + + + +

The Hydrographic Services Review Panel met via webinar, at 8:30 a.m. PST, Sean M. Duffy, Sr., Chair, presiding.

HSRP MEMBERS PRESENT

SEAN M. DUFFY, SR., Chair
NATHAN WARDWELL, Vice Chair
DR. QASSIM ABDULLAH
MARY PAIGE ABBOTT
CAPTAIN ANUJ CHOPRA
DR. NICOLE ELKO
SLOAN FREEMAN
KIMBERLY HOLTZ
DEANNE HARGRAVE
CAPTAIN CAROLYN KURTZ
ERIC PEACE
REBECCA QUINTAL
JULIE THOMAS

NON-VOTING HSRP MEMBERS

CAPTAIN (NOAA, ret.) ANDY ARMSTRONG, Co-Director, NOAA-University of New Hampshire Joint Hydrographic Center
BRAD KEARSE, Deputy Director, National Geodetic Survey (NGS), National Ocean

Service (NOS)

DR. LARRY MAYER, Co-Director, NOAA-University of New Hampshire Joint Hydrographic Center
DR. MARIAN WESTLEY, Director, Center for Operational Oceanographic Products and Services (CO-OPS), NOS

NOAA LEADERSHIP PRESENT

NICOLE LEBOEUF, Assistant Administrator for Ocean Services and Coastal Zone Management, National Ocean Service

RACHAEL DEMPSEY, Deputy Assistant Administrator, Navigation, Observation, and Positioning, NOS

RDML BENJAMIN EVANS, Director, Office of Coast Survey (OCS), NOS, and HSRP Designated Federal Officer

NOAA STAFF PRESENT

AMBER BUTLER, Office of Coast Survey

ASHLEY CHAPPELL, National Ocean Service

ROBIN CZERWINSKI, National Ocean Service

VIRGINIA DENTLER, Center for Operational Oceanographic Products and Services

DR. RACHEL FONTANA, National Marine Fisheries Service

NATHAN LITTLEJOHN, National Geodetic Survey

AMANDA PHELPS, Office of Coast Survey

MEGAN SCHWINDEN, Office of Coast Survey

GALEN SCOTT, National Geodetic Survey

MODERATORS

ERIC PEACE, HSRP Member
NATHAN WARDWELL, HSRP Vice Chair

SPEAKERS

ROSEMARIE FUSCO, Marine Affairs Department,
University of Rhode Island
JUSTIN LUEDY, Senior Environmental Specialist,
Port of Long Beach

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

Recap and discussion of Day 1 and round robin with all members 5

Adaptive and Resilient Ports: Managing climate change impacts to port infrastructure and operations - Moderator: Nathan Wardwell.28

Introduction by Nicole LeBoeuf67

Justin Luedy84

"Climate Change Adaptation and Resiliency Planning at the Port of Long Beach" Rosemarie Fusco. 100

Discussion 118

Public comment period. 143

HSRP Planning and Engagement working group (P&E WG) discussion, Eric Peace and Mary Paige Abbott. 150

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

2 (8:31 a.m.)

3 RDML EVANS: Well, good morning,
4 everyone. Or good afternoon, depending on your
5 location. Welcome back for day two of the spring
6 2024 Hydrographic Surveys Review Panel. Excuse
7 me, Hydrographic Services Review Panel.

8 As mentioned yesterday, my name is Ben
9 Evans. I'm the Director of NOAA's Office Coast
10 Survey and I am the Designated Federal Official.

11 I'll be joined here momentarily by the
12 HSRP Chair, Mr. Sean Duffy. But before we start
13 this morning, I just wanted to offer just a
14 couple of technical updates and then I'm going to
15 turn it over to Ms. Amber Butler for some
16 administrative reminders before we get into our
17 round robin this morning.

18 So again, thank you to everyone for
19 making the pivot to the virtual environment. One
20 thing we noted yesterday was that it was
21 challenging to balance having multiple people
22 onscreen and engaging in dialog while at the same

1 time ensuring that there was adequate band width
2 for the ASL interpreters, for the Court Reporters
3 to do their work and provide the access to the
4 full range of participants.

5 So in discussions prior to starting
6 this morning, what we thought we would try is for
7 the purpose of the round robin and the round
8 robin only, we'd like to have all the HSRP Panel
9 Members come on camera if you're able.

10 And just to provide that, a little bit
11 more of a face-to-face as we go around the room,
12 to make that more as if it were -- as if we were
13 all in the room together as we wish we could be.

14 And if that doesn't work for the ASL
15 interpreters or the Court Reporter, we'll revert
16 back to just one person on camera at a time. So
17 we'll be very mindful of that, of course.

18 But we're trying, again, trying to
19 balance the providing access to all attendees and
20 participants with ensuring or facilitating as
21 robust a discussion as we can.

22 So as I said, we'll try for the round

1 robin with cameras on. If that doesn't work,
2 we'll revert back to single cameras or just a
3 couple of cameras on. So hopefully that works
4 for everybody.

5 And then before we turn it over to
6 Sean to kick off the round robin for this
7 morning, I'd like to turn it over to Amber to
8 give us a quick -- a few quick administrative
9 reminders.

10 MS. BUTLER: Thank you, Rear Admiral.
11 This is our privacy statement for the meeting
12 today. This meeting is recorded today. You can
13 refrain from using the question box if you do not
14 want your likeness recorded or you can close out
15 of the meeting.

16 For our meeting logistics, we have an
17 agenda attached as a resource for you. You can
18 use the questions box in the menu on the right
19 side of your screen to submit any public comments
20 or questions.

21 You can contact myself or Virginia
22 Dentler for any troubleshooting. You can also

1 contact us at hydroservices.panel@noaa.gov for
2 any public comments now or later.

3 We will be addressing all comments and
4 questions during our public comment period later
5 in the agenda today. And here is some alternate
6 connection info if you would like to join by
7 phone.

8 And now I'm going to turn it back to
9 Mr. Sean Duffy. Thank you very much.

10 CHAIR DUFFY: So good morning,
11 everyone. Welcome to Day 2 of HSRP. Yesterday
12 was a very interesting day. Lots of moving
13 pieces; appreciate everybody's attendance.

14 I am serving as the Chair of the HSRP
15 and then based in New Orleans, Mississippi River
16 Navigation, Big River Coalition. We're going to
17 start off this morning with a round robin to hear
18 from our members, notes from yesterday, thoughts
19 that stayed with you and we're going to do it
20 alphabetically.

21 I see a new show, Mary Paige, are you
22 -- there are two As there, Mary Paige, I think

1 you're up first.

2 MEMBER ABBOTT: I had to put my
3 glasses on Sean just so that I would look similar
4 to you.

5 CHAIR DUFFY: That's not a good goal.
6 Like that should not be a goal at all.

7 MEMBER ABBOTT: I got to cut my bangs.
8 Anyways, from the rainy East Coast of the Gulf of
9 Mexico -- my today, that is. Yesterday was
10 gorgeous.

11 First, the sessions were fabulous
12 yesterday. And I want to thank everyone, and
13 kudos to all the moderators and the presenters.
14 It was as I'm learning these meetings can be a
15 tad overwhelming as to the amount of information
16 that's being presented.

17 Yet, what I heard most yesterday was
18 a focus on safe and efficient as well as create
19 best practices. And that seemed to ride across
20 the presenters as well as our Directors.

21 And then a couple of concerns that I
22 had is that information we may have may be

1 underutilized, so underutilization of data,
2 websites, everything that we're doing, may
3 unintentionally be underutilized.

4 Or I'm also concerned that some of our
5 non-NOAA sources -- Jeff Ferguson brought about,
6 made a comment about we must make sure we
7 validate non-NOAA sources.

8 So that's a concern as to whatever is
9 the dynamics that are put in place to do that as
10 well as the continuity, a concern of continuity.
11 Another was that PPU's that the pilots are using.

12 It seemed that one coast had one
13 system or one port was using a system that suited
14 that pilot association and then I believe I heard
15 another one using yet a different.

16 I don't know if there's rationale for
17 having continuity between things, but that was
18 just something that caught my eye. And that's it
19 for me at this moment.

20 CHAIR DUFFY: Thank you, Mary Paige.
21 Next we'll go to Qassim. I don't see him on the
22 screen. No, there you are.

1 MEMBER ABDULLAH: Thank you, Sean.

2 Good morning, --

3 CHAIR DUFFY: Good morning.

4 MEMBER ABDULLAH: -- everyone. I
5 think it was a great day. I agree with Mary
6 Paige definitely as was fabulous day. All the
7 Panel well organized, nice mix of a speaker.

8 And really the nice thing, the one I
9 noted about, the timeline the importance of NOAA
10 services and data to the industry, to this
11 community of mariners.

12 But also a timeline to the importance
13 or I will say as climate, the more people rely on
14 NOAA data, you got to expect -- more expectation
15 for high resolution data, higher accuracy and
16 more frequency. That's what I noticed
17 definitely.

18 I mean, we -- that is a highlight on
19 the precision navigation with all these great
20 presentations, how much a foot of draft could
21 save us in 30 - 50,000 barrel of oil, for
22 example.

1 So the precision navigation, that is
2 a pressure on us to really to support that. And
3 the only way to support it is to have high
4 resolution, more availability of the data with
5 more frequency, so that's a great opportunity for
6 NOAA. Thank you all. That's all I have sharing.

7 CHAIR DUFFY: Thank you, Qassim. Next
8 up Anuj Chopra. Anuj, I saw you earlier. There
9 you are.

10 MEMBER CHOPRA: Hi, good morning,
11 everyone. This is Anuj Chopra. My apologies. I
12 couldn't attend yesterday. I did catch up on the
13 proceedings, but things got ahead of me so I'm
14 looking forward to today.

15 I would like to reiterate what Dr.
16 Qassim said. That precision navigation is very
17 critical for our competitiveness for the ports.
18 So for economic security, for operational
19 security, and second that we utilize every data
20 source there, like other commercial ports, and
21 make our ports more competitive as to what they
22 already have.

1 Whatever information they have, what
2 they have, that's value. Second point to what
3 Mary Paige added about pilot PPU's, maybe there's
4 opportunity for the National Pilot's Association
5 or other organizations to review that to
6 standardize as a bare minimum.

7 Maybe that's for another time to delve
8 into it, but that's good point raised by Mary
9 Paige on that. Looking forward to today and
10 thank you, again.

11 CHAIR DUFFY: Thank you, Anuj. I am
12 looking -- I see Captain Cruz would be next. I'm
13 not sure if he's there. And not seeing, I'll
14 just, I'll go down the list. Nicole Elko, are
15 you here?

16 MEMBER ELKO: Yes, good morning.

17 CHAIR DUFFY: Hey, good morning,
18 Nicole.

19 MEMBER ELKO: All right, I would love
20 to amplify all of the thanks and applause for
21 yesterday. It was marvelous. Great job making a
22 virtual meeting happen so quickly. That was

1 amazing.

2 Truly the Panels were really
3 interesting and informative. And, you know, when
4 I saw the agenda, I seen like a lot of the ports
5 focus and I wasn't, you know, not as surprised.
6 Of course, we would do that here.

7 I wondered what the coastal community
8 connection might be and it's very obvious. I
9 think very relatable. The challenges that the
10 ports are having, their data needs, you know,
11 it's very relatable to coastal communities which
12 is the, you know, my lens, my kind of
13 perspective.

14 But I bring to this as I mentioned
15 yesterday in my question related to, you know,
16 reusing sediment for resilience, lots of other
17 challenges are bubbling with this surface that I
18 think are, you know, not just port specific.
19 Right?

20 They are, they are things that NOAA
21 can help with, and by helping the ports, they're
22 going to be helping the neighboring and adjacent

1 communities.

2 So some of the specific things that I
3 was hearing yesterday and I was glad to hear
4 because I came to the meeting wanting to talk
5 about them was, you know, as Qassim just
6 mentioned, the height of spatial resolution in
7 the data.

8 We all know that taper local water
9 level is something that I'm passionate about and
10 that our communities are asking for even louder
11 than they were six months ago to help with their
12 sunny day flooding, their challenges with
13 planning for sea level rise.

14 The second one is communities have
15 some data conversion anxiety so I was glad to
16 hear Mary Anne's update yesterday as well as
17 updates on the NSRS.

18 You know, that's all coming together
19 and I look forward to helping communicate all
20 that you all are doing to the coastal communities
21 as they move through that process.

22 And then the third one that is of

1 concern to communities right now is the
2 implementation of this unprecedented amount of
3 coastal resilience funding with BIL and IRA.

4 You know, getting the funding though
5 automated and then sort of what is involved in
6 implementation. All the permitting that NOAA is
7 going to be overseeing to get it through, funding
8 the foundational data collection that you need to
9 support those projects.

10 And expanding the workforce. Right?
11 Having enough people at NOAA and everywhere else
12 to do all of this work. And that goes along with
13 training the next generation, which is one of our
14 other goals.

15 And I heard all of that stuff
16 yesterday. So, Admiral Evans, thank you for your
17 excellent presentation, the collaboration across
18 NOAA, not just within NOS, is impressive.

19 I loved that Weather Service is kind
20 of included in almost everything you all are
21 doing. And the stakeholder engagement, you had
22 so many pictures of humans on your slides. I was

1 just cheering you on.

2 QR codes, it is really cool. So great
3 to see all of that happening and, yes, the
4 training the next generation really warms my
5 heart. Finally, I had some questions yesterday
6 regarding the data conversion or the datum
7 conversion.

8 And just wanted to thank Marian and
9 CO-OPS, you know, the way that you all are
10 looking forward, thinking about incorporating AI
11 into the next conversion and already starting to
12 get ahead of that is a very good contract so
13 thank you for the time.

14 CHAIR DUFFY: Thank you, Nicole.
15 Excellent insight. So good morning Deanne
16 Hargrave. You're up next.

17 MEMBER HARGRAVE: Hi. Good morning,
18 everyone. Nice to see you. Echo amazing
19 presentations yesterday, the content, the
20 expertise. The sharing of information is, you
21 know, it's symbolic of the great work that this,
22 that this group does.

1 So no surprises there. Interesting,
2 Qassim, that you went before me because I think
3 you are in my head and read my notes. I had
4 resolution, accuracy and frequency and so you've
5 already prefaced that.

6 And I'll then move it into data
7 standards for a globalization of these data sets
8 to really leverage, you know, the full
9 capability. The more standardization we have,
10 the easier that becomes.

11 And that the models are there, you
12 know, the models are only as good as the
13 information and as we build more real time and
14 more complex models, they need more data to be --
15 not only to build the model, but to keep it
16 updated.

17 And to keep, and you know, once you've
18 -- I think you've all experienced, you know, you
19 -- maybe with your iPhone, you get a new phone
20 and all of a sudden it's fantastic and all these
21 new things.

22 But then they stop maintaining the

1 tools that you've gotten used to using on a daily
2 basis. And so that maintenance of the things
3 that we build is equally as important as building
4 on them first place, so.

5 Yes, also I was tickled by Larry's
6 presentation looking into the, you know, how do
7 we best utilize these tools. Tools, of course,
8 are very interesting and we love to just say, oh,
9 here's a new thing, let's go use it.

10 So it's really interesting to see how
11 effective they can be and when are the optimum
12 times to leverage tools like that, uncrewed
13 tools, that's all. So, thanks for that. Looking
14 forward to another great session today. Thank
15 you.

16 CHAIR DUFFY: Thank you, Deanne. I
17 know that Tuba has an excused absence so I will
18 move to Eric Peace. And Eric, I did catch your
19 comment about beignets yesterday.

20 Just made a move forward, I'm sure the
21 interpreters brushed up on their beignets. With
22 that, good morning, good to see you, Eric.

1 MEMBER PEACE: Good morning. So as we
2 get ready to start our season here on the Great
3 Lakes which is going to be earlier this year than
4 ever before, I start to think about the
5 operational aspects.

6 The couple of things I heard
7 yesterday, they kind of stemmed through a lot of
8 it. So you talk about, you know, and one of our
9 members mentioned the economic impact in making
10 sure that our ports are resilient and can
11 function. Their issue is safety.

12 Navigation safety is critical, so here
13 on the lakes, we have some places that we just
14 discovered that haven't been surveyed since 1948.
15 And that shoal has encroached now onto our
16 traffic separation scheme which is going to cause
17 a hazard to navigation.

18 So things like that are critical to
19 make sure that we continue to have that vital
20 precision data to be able to operate our vessels
21 safely.

22 And again, we're talking thousand foot

1 vessels here on the Great Lakes as well so heavy,
2 big ships. In addition to that, the other big
3 piece which I'm sure everybody knows I foot stomp
4 this all the time, the NOAA PORTS system is
5 crucial.

6 That PORTS system is absolutely safety
7 of navigation. And again, I'll say it one more
8 time. I believe it should be funded completely
9 within NOAA. I don't think it should be a cost
10 share agreement.

11 Just like I don't pay for my stop
12 sign, we all pay for it. It's a safety in
13 navigation issue, but the presentations were
14 fabulous.

15 I really enjoyed the fact that I get
16 exposure to the West Coast as well. So thank
17 you.

18 CHAIR DUFFY: Thank you, Eric. And
19 Julie Thomas is up next. I haven't seen her on
20 the screen. Julie, are you with us? Okay well -

21 -

22 MEMBER THOMAS: Hey, I'm here.

1 CHAIR DUFFY: Okay. All right.

2 Sorry, Julie.

3 MEMBER THOMAS: Thank you, Sean. Yes,
4 while I try to make these virtual meetings,
5 really interactive is difficult. One thing that
6 -- I did drive down from Long Beach last night to
7 San Diego so I'm home now.

8 And I thought, you know, particularly
9 for the four new Members that we have, I was
10 feeling kind of bad for you because when we're in
11 person, we're really much nicer.

12 And we're much more interactive and
13 not -- I don't really mean nicer, but there's a
14 lot of discussions, you would be welcomed very
15 warmly, et cetera. So it's very difficult in
16 this virtual environment.

17 But I do appreciate the four new
18 Members sitting through this meeting because it
19 is difficult in your first meetings. I have to
20 say that I really always enjoy the Directors'
21 reports.

22 And you've heard me say this many

1 times. I like to have them right up front of
2 this meeting because I feel that the work that
3 goes on within these three divisions is so
4 incredible.

5 Trying to ingest everything that the
6 three, Brad and Marian and Ben, went through
7 yesterday in their very quick allotted time slot
8 was quite challenging I thought.

9 It's almost I need to go back and
10 really check out some of those programs that you
11 mentioned. And I always learn so much and then I
12 actually think they kind of set the stage for the
13 meeting because really what we are here to
14 discuss, and advise, is to support these three
15 divisions.

16 And so the more we know about their
17 work, I feel it's really crucial and pivotal to
18 this group. There were a bunch of certain
19 particular comments that I wanted to follow up
20 on.

21 This modernization of the NSRS, I
22 definitely have already been talking with Dana,

1 Brad, we're going to -- Captain Jacobsen asked if
2 I would arrange a meeting.

3 And Kim, you, Kim Holtz would be
4 involved with this too, but Captain Jacobsen
5 would like to learn a little bit more about this
6 modernization and particularly how it's going to
7 affect this under keel clearance project, et
8 cetera.

9 And so I will be following up with
10 Dana on that and Kim and Captain Jacobsen and I
11 don't know, Admiral, if you want to be included
12 in that conversation.

13 But it is kind of important as we're
14 bringing in these deep draft ships, you know, if
15 there's going to be an impact there with this
16 change. The other thing was Admiral Evans'
17 comment about STOFs.

18 I do want to follow up on that. Jim
19 Haussener's presentation was really interesting.
20 He managed to cram a lot of facts and figures and
21 points into that talk.

22 And, you know, one thing he said was,

1 NOAA, please do something to protect our wetlands
2 and our underserved communities. And I was
3 sitting, you know, I am like at home I started
4 thinking about that and I thought, what?

5 What can NOAA do to protect some of
6 these very vulnerable places? We have a lot in
7 California and, you know, we have water level
8 measurements. There's inundation models now.

9 But I thought that was really
10 interesting to try to quantify a little bit
11 about, you know, what are the components of NOAA
12 that's really going to support these areas?

13 Okay, I've got two more comments. I
14 could go on and on, but really Qassim, I'm a
15 little bit sorry we didn't have more discussion
16 time. Karsten from Rotterdam is -- I had dinner
17 with him the night before.

18 And he's such a wealth of information
19 about projects that are going on that really do
20 overlap with this digital twin concept in AI. I
21 mean, one thing that was interesting and we were
22 talking about AI in this context, the more data,

1 like the motion sensor now that they're
2 developing to put on the ship.

3 Right now there's a very cumbersome
4 motion sensor that they have. And the pilots
5 really, you know, if the weather is rough or
6 anything, they can't really deal with setting up
7 the sensor.

8 And they have, as of today, they have
9 150 measurements, the vessels with the motion
10 sensor on, but now they're developing this three-
11 inch cube that they'll be able to take on and
12 like a black box, set on the deck.

13 They're trying to, the manufacturer is
14 trying to get it so they don't even have to take
15 it out of the box. It will just have this little
16 antenna, pick up the motion sensor.

17 They'll put one on the stern, one on
18 the bow and, you know, he really would like
19 thousands of measurements because to really, as
20 you heard, the -- it's not only the length and
21 the width and the depth, it's the how it's loaded
22 and what type of product they're carrying.

1 There's so many variables in this
2 motion sensor. So thinking about deep draft and
3 under keel clearance, the discussions to me could
4 just go on and on.

5 And I was sorry that, you know, we
6 didn't have more time to really get into that.
7 And Nicole, this comment about sediment transport
8 is so crucial.

9 In L.A. there isn't, as was mentioned
10 yesterday, a lot of sediment transport. But
11 during large storms, those edges can fall off.
12 There's deep canyons there, and we do see it.

13 And as you heard, one foot of change,
14 they now have reduced the draft of the channel
15 from 76 to 75 and they suspect that there will be
16 more reduction edges as we go on after the large
17 storms.

18 So there is -- was just a multitude of
19 things that go on. I'll stop there. Thank you.

20 CHAIR DUFFY: Thank you, Julie. Some
21 really excellent points and again, I'd like to
22 thank you for your leadership as our past

1 chairman.

2 MEMBER THOMAS: Thank you.

3 CHAIR DUFFY: Big shoes to fill. I
4 won't say bigger jersey, because I would need a
5 fat boy size and you would need a small lady
6 size. So with that, and as we do this, we'll get
7 a little better.

8 I've noticed, of course, that Nathan
9 is online and I can see the names. I had to wake
10 up and think about that. Our Vice Chairman
11 Nathan Wardwell. Good morning, sir.

12 VICE CHAIR WARDWELL: Good morning.
13 All right, well let's see, I don't know if it's
14 better going first or going last. And those are
15 always my options, you know?

16 I mean going in the middle might be a
17 nice choice at some point, but I -- yes, so, I
18 took a number of -- a ton of notes from the
19 meeting yesterday.

20 And, you know, I'll echo what a lot of
21 people have said, but just a ton of kudos to the
22 NOAA team for pulling this meeting off. With

1 being Vice Chair, I'm starting to see all the
2 effort behind the scenes that it takes to pull
3 off this meeting and there is a lot that goes
4 into it.

5 And let alone switching -- pivoting so
6 fast from in-person to virtual so definitely
7 appreciate all that effort. One of the main
8 takeaways or something that I heard quite a bit
9 was about just the increased vessel size.

10 And how that's bringing challenges for
11 ports and waterways and crowding the oceans and
12 spatial awareness. Right? And so, you know,
13 just kind of for me that further highlighted
14 comments that other Panel Members just brought
15 up, but the importance of increased measurements
16 and improved positioning. Right?

17 Like these waterways aren't getting
18 bigger so we need to provide more information to
19 be able to navigate them safely. I mentioned, or
20 I heard about the value of PORTS, the Physical
21 Oceanographic Real Time System, a number of
22 times, and that's no surprise.

1 It's a very valuable system especially
2 with the Panels that we're hearing yesterday. I
3 did hear specifically call outs to wave data and
4 wind data for those ports from a few Panelists.

5 I really enjoyed Larry's presentation,
6 and I was digesting it and trying to figure out
7 the right way to explain my thoughts, and Deanne
8 hit it right on the head for me and it was how to
9 best utilize tools. Right?

10 And so I think about that all the time
11 in just the water level world. There's a lot of
12 different types of sensors to use, but not one
13 works in every situation.

14 And so I look forward to hearing more
15 about that and learning. I was really excited
16 about the OceanMaps release that will be coming
17 out in March for better access to operational
18 forecast models that Marian brought up.

19 And then Julie's comments about
20 Jacobsen's interest in getting an update on the
21 NSRS modernization, I think that's awesome. I
22 mean, that is really great.

1 If that's something that comes out of
2 this meeting then that is great. I hear, you
3 know, just kind of my general sense is there's a
4 lot -- groups understand that this modernization
5 is happening.

6 But I don't think many people
7 understand what it's going to do to their
8 operations and how it will affect the operations.
9 And so getting a better grasp of that is going to
10 be a big task.

11 And then just one last comment. I'm
12 -- I think I'm really surprised, Qassim, that I
13 didn't hear digital twin come up yesterday so
14 well maybe it will come up today. And that's it
15 for me.

16 CHAIR DUFFY: Thank you, Nathan.
17 Again, excellent comments and as I adapt a little
18 better, I do see that Tuba was online. I think I
19 messed up and think she's going to miss tomorrow.

20 Tuba, I apologize. Are you there? I
21 did not mean to skip you. And --

22 MEMBER OZKAN-HALLER: There we go.

1 Can you hear me now?

2 CHAIR DUFFY: Yes. Yes, and I
3 apologize again. I'm at out of adaption here.

4 MEMBER OZKAN-HALLER: No, Sean, you
5 didn't skip me. I was, unfortunately, only able
6 to join a little bit late. So I came online just
7 as Julie was talking about her impressions.

8 Yes, but so thank you and again,
9 apologies that I was late this morning. So
10 yesterday, as usual, packed meeting, but one
11 thing that I reflected on after the meeting, you
12 all remember I did miss the fall meeting which
13 means the last time I really engaged, you know,
14 with all of this work was a year ago when we met
15 in Puerto Rico.

16 I was impressed when I was hearing all
17 of the updates from the NOAA folks just how much
18 work gets done in a year. I actually was really
19 impressed by just all of the progress along all
20 of the dimensions that we talked about at our
21 last meeting.

22 So that's just phenomenal to see so,

1 you know, congrats to all of you all who are
2 doing this important work. And then, as far as
3 the other sessions are concerned, I really,
4 really enjoyed the session on the PORTS.

5 I really enjoyed seeing just how all
6 of the bits and pieces fit together in order to,
7 you know, enables safer passage and safer
8 navigation. This is exactly how it should work.

9 And, you know, I asked the questions
10 about funding because I feel the local context
11 matters, but again, NOAA's willingness to
12 prioritize a particular area because this engaged
13 work is going on there and maybe we can replicate
14 that kind of collaboration coordination for some
15 of these other important ports too.

16 And then finally, again, I was just
17 really happy and I feel fortunate that I would
18 hear about the progress that Marian and Ben and
19 Brad reported on. And again, I too, really
20 enjoyed Larry's presentation.

21 Even though it was all the way at the
22 end, you know, it was definitely one worth

1 waiting for. So great first day. Look forward
2 to another day and a half here. Thank you.

3 CHAIR DUFFY: Great. Thank you very
4 much and I'll let you know your late, tardiness
5 is excused. So I really want to welcome the new
6 Members. If it doesn't show, I was an athlete
7 coach for a long time.

8 I really do believe in a team concept
9 and it's great to have some new Members here.
10 I'm going to ask -- it's not in my notes, but I
11 would ask that you give us a -- add a little
12 about your background, and where you are, what
13 your expertise is and we will go in order as you
14 see on this screen. And it's hard for me to
15 introduce you because I really don't think I've
16 ever met -- I've seen some of your names before.

17 But I'm happy to be educated and we'll
18 start off with Sloan Freeman. Good morning.
19 Welcome.

20 MEMBER FREEMAN: Good morning. It's
21 a pleasure to be here. And it's an honor to
22 serve on the HSRP. I guess a little background

1 on myself, I co-founded a hydrographic survey
2 company in the Mid-Atlantic region about 20 years
3 ago.

4 We've been a contractor for the Corps
5 of Engineers and for NOAA and updating nautical
6 charts as well as some state port authorities
7 over this decade.

8 And so it's in my primary impression
9 from yesterday's meeting is certainly how
10 critical the data that we've collected over
11 decades is to the -- to the safety and to the
12 commerce sector as a whole.

13 And my primary impression, honestly,
14 I can't help but see it through the lens of how
15 much work goes into collecting high resolution
16 data.

17 Especially when it's needed
18 repetitively in areas of concern and across the
19 wider physical ocean where data might be, you
20 know, 60, 70 years old is how much workforce is
21 going to be required in order to keep that type
22 of data updated and serving the public interest.

1 Whether that data is collected on
2 traditional vessel platforms or through
3 autonomous vehicles, there's a tremendous amount
4 of expertise that comes into acquiring good data
5 and processing good data and then delivering good
6 data so that it can be used in the public sphere.
7 And that will be challenging in a flat budget
8 environment to say the least.

9 So I look forward to serving on the
10 Panel and helping however I can. And I really
11 look forward to the continued discussion today
12 and tomorrow. Thank you.

13 CHAIR DUFFY: Thank you. And welcome
14 aboard. Next we'll move on, Kimberly Holtz. I
15 guess you're at home where we were going to be,
16 but all of you --

17 MEMBER HOLTZ: Yes.

18 CHAIR DUFFY: All right, well welcome,
19 again and look forward to learning more about
20 each and every one of you.

21 MEMBER HOLTZ: So yes, so I'm the
22 Director of Surveys for the Port of Long Beach,

1 but most of my career -- probably I have 30 years
2 of land surveying experience.

3 And most of it has been geodetic
4 surveying, coordinate systems, datum changes. I
5 also am a licensed geologist and work as a
6 petroleum geologist for the city for four years.
7 So I kind of switch back and forth.

8 But I remember when we switched from
9 data or NAD 27 to NAD 83 which was the datum
10 shift. So we're getting ready to do that again
11 and I remember, you know, when it was actually
12 put out, the new coordinate system, new
13 elevations, and when agencies switched to it.

14 It was about a ten-year period
15 because, you know, smaller agencies didn't switch
16 to it so I'll be curious to see as the new
17 national spatial reference system rolls out, you
18 know, how quickly like do ports switch to it?

19 You know, there's obviously lots of
20 other agencies that are port related. And I was
21 really interested too when they were talking
22 about like the new tidal datum coming out.

1 Which I assume the tidal datum coming
2 out is going to be tied to the vertical datum of
3 88 which we're currently on, but I'm, you know,
4 I'm assuming that as soon as the new system comes
5 out, they'll have like dual -- we'll be able to
6 update our tidal datum to the I think they're
7 calling it 24, NSR 24.

8 So I'm just curious to see how that's
9 going to work out and then how actually, how long
10 does it actually take before ports start using
11 this system.

12 Because historically, I mean, there's
13 only been -- this will be the third datum shift
14 in the history of the United States. So it's a
15 big deal.

16 I mean, I was, that's how I got
17 involved in geodetic surveying was when the data
18 shift happened in, you know, '88, but most of the
19 agencies didn't switch to like 1995. So I'm real
20 curious about that.

21 In the last five years, I've gotten
22 very involved with the bathymetry survey at the

1 port because I oversee our hydrographic crew and
2 then we've been working closely with NOAA to get
3 all of -- to be doing our surveys in the same
4 manner that NOAA does theirs.

5 And probably half the port has been
6 zoned as Category Zone of Confidence A1. The
7 other is we're just waiting for it to where we
8 expected the whole port will be all Category Zone
9 of Confidence A1 which is a big deal.

10 And we plan on updating the port
11 bathymetry surveys every two years, so we will
12 never have data older than two years old anywhere
13 in any of the channels in the Port of Long Beach.

14 And that's because we get the largest
15 ships in the world. And we have very -- you
16 know, our main channel is very tight. I mean
17 we're getting ready to do a big deep draft
18 project where we're going to lower the -- I think
19 we're going to 80 feet depth.

20 But it's still a very narrow channel.
21 We are going to try widening it at points,
22 widening it as to some of the turning basins.

1 It's a tight fit. I mean, Jacobsen Pilots is
2 very aware of what a tight fit it is and we work
3 with them.

4 Pretty much if they have a concern for
5 any specific berth, like we'll bring in -- we
6 probably have brought in a largest ships. And,
7 you know, the first port to get with this large
8 ship.

9 We'll go out and do a hydrographic
10 survey right like the day or two before they come
11 in just to, you know, double checking, ensure
12 that we can take that large ship.

13 So the last five years I've learned a
14 lot about bathymetry surveying. And I'm really
15 excited to be on this Committee. The talks
16 yesterday were just amazing. A lot of
17 information.

18 CHAIR DUFFY: Thank you for that
19 update and good to get to know a little bit more
20 about you and with -- very much appreciate. I
21 can't help it when people say what I call the D
22 word, datum.

1 I have to like make sure I'm paying
2 attention. It's over my level. I've been told
3 by many that the Mississippi River is the most
4 complicated place in the world for datums.

5 And maybe that's why it's above my
6 head, but it's good to have smart friends on that
7 list to call to ask and with that, I'm going to
8 move on to Captain Carolyn Kurtz, Tampa Bay
9 Pilots.

10 Good morning and I think it's well,
11 it's actually afternoon in Tampa so assuming
12 you're home. Good morning and welcome aboard.

13 MEMBER KURTZ: Hi, there. Hi,
14 everyone. So first of all I just want to well
15 going close to the end there's not a whole lot to
16 add. Yesterday was amazing and I have lots of
17 notes.

18 I have a whole page of acronyms so if
19 anyone needs those, I'd be happy to share. A
20 little bit about me, I am a life-long mariner. I
21 graduated from Merchant Marine Academy in 1986
22 and was deep sea for nine years.

1 And then I became a Tampa Bay Pilot,
2 so the last 28 years as a Tampa Bay Pilot.
3 During that time, I chaired the Pilot Commission
4 for many, many years.

5 And also, chaired NAVSAC which is a
6 Coast Guard FACA, so Navigation Safety Advisory
7 Committee, and I still do that. And I'm also a
8 pilot instructor.

9 So I coach pilots in man model and
10 ship handling and other deck officers that go
11 through the school and simulator instruction and
12 all that.

13 It's all about ship handling and
14 piloting. So those are just some of the things
15 I'm doing now even though I'm not working as a
16 pilot, climbing up ships in the middle of the
17 night anymore, which is really nice.

18 But it was a fantastic profession. I
19 would like to address something that Mary Paige
20 brought up about the lack of standardizations in
21 PPUs. And there are a few reasons for that.

22 Every pilotage area is different, and

1 pilots are very protective and proprietary about
2 their pilotage areas and fight tooth and nail to
3 avoid standardization in training, in policies,
4 in the economic structure of their associations.

5 And of course, in the equipment that
6 they carry aboard ships. So there are even
7 groups that still are not using PPU's because they
8 don't feel it's appropriate.

9 Although the standard of care in the
10 piloting profession is to carry a PPU. One of
11 the most important parts of the PPU is to carry
12 an independent GPS so that you're not getting
13 that through the AIS plug.

14 And I don't want to go too far into
15 the weeds. I could probably talk all day about
16 all of that stuff. But pilot groups feel that
17 they have chosen the best equipment for their
18 port, for their use.

19 One of the other really important
20 factors that determine the selection of this
21 equipment is cost. Even though it's something
22 that is -- has become very important and critical

1 in making some of these decisions with huge ships
2 and with very little under keel clearance, some
3 ports are fully funded for this equipment through
4 their tariff.

5 And through grants and things and then
6 other ports are paying for this stuff out of
7 their own pocket. So, you know, there's a
8 spectrum of equipment that's available and that's
9 another thing.

10 There are only about 1,200 pilots in
11 the United States and so vendors are competing
12 with this kind of fixed market for who is going
13 to use them. So it seems to trend.

14 A lot of people are using SEAIq, which
15 is what they're using in Long Beach. And
16 actually, that's what we were using in Tampa.
17 It's great software, highly customizable and
18 easily integrated with other things.

19 But anyway, it's kind of a long
20 answer, but that's the reason why this stuff is
21 not standardized. There is no standardization of
22 the equipment and the quality of the data that

1 goes into what you're seeing on your screen.

2 So that's the underlying reason. I
3 also just wanted to touch on this, you know, the
4 precision navigation thing is amazing and it's so
5 impressive.

6 All of that I think has to be taken
7 with a grain of salt that, you know, pilots were
8 not supposed to really be subject to economic
9 pressure. It's really all about safety.

10 And so increasing the draft of the
11 ship that can come in even if you have in
12 dredged, you know, that's your smaller
13 tolerances, your chipping away at your safety
14 margins.

15 So that the precise navigation
16 information is critical if those are the
17 decisions that you're trying to make. And we
18 went through that in Tampa.

19 We increased the draft by a foot even
20 though nothing else had changed physically in the
21 channel. So it really was about the pressure to
22 bring in larger vessels and to accommodate a

1 customer.

2 And so, but you end up running slower
3 in the channel because if you go too fast then
4 you squat and then you have just done away with
5 the extra water and -- anyway, I'm not going to
6 go too far into that.

7 But I would just remind people that it
8 is the pilot's job to make an informed and
9 supported no decision. That's a very important
10 reason to have this, all of this data.

11 It's not just the go decision, but the
12 no is the hardest thing that we have to do is to
13 say no to a customer because of particular
14 conditions. And with that, I will say thank you
15 and I look forward to the next day and a half.

16 CHAIR DUFFY: Well good to have you on
17 the team. Some excellent comments. I had very
18 similar thoughts being closely associated with
19 the pilots on the Mississippi River.

20 And our last of the four new ladies to
21 join the team, Rebecca Quintal. Can you give us
22 a little update about yourself and comments

1 please. The floor is yours. Good morning.

2 MEMBER QUINTAL: Good morning,
3 afternoon, yes. We've switched. Well I'm happy
4 to be on the Panel. Yesterday was very
5 informative and well managed. We stayed on track
6 for a lot of content.

7 My background, I am a degree in
8 geology and oceanography. And a long history of
9 ocean floor mapping. A large majority of that
10 had to do with the safety of navigation surveys,
11 but other types of surveys as well.

12 Both for domestic and international
13 safety of navigation. So I -- that's where my
14 background lies and where I think I can
15 contribute the most to this.

16 I want to echo Tuba's comments on the
17 -- just how informative the conversations were on
18 the Port of Long Beach and Los Angeles yesterday.
19 I really enjoyed those.

20 I had not seen the Port in action so
21 I hope to get back there, maybe at a future
22 meeting we'll be able to attend. There was a lot

1 covered already.

2 A couple of topics of interest that I
3 am interested in pulling the thread on is, you
4 know, I'm not surprised at all that the pilots
5 are utilizing the S-102 standard to add a level
6 of granularity to their EMCs displays.

7 And I know that the format is not
8 finalized and there's limited coverage that we
9 have available now, but I'm interested in
10 understanding what other community groups are
11 taking advantage of that ability to customize.

12 And hope that we're getting the word
13 out on that ability. And then another area that
14 I'm interested in learning more on, the talk on
15 the wave heights and that of the magnitude of the
16 wave heights has been increasing.

17 And I'm interested in how well our
18 predictive models are performing at predicting
19 those extreme events because particularly in a
20 place of like Long Beach that can be very
21 impactful.

22 And a lot of thoughts have been

1 covered so I'm happy to be part and I'm looking
2 forward to the next two days.

3 CHAIR DUFFY: Well it's good to have
4 you on board. We have given out some new jerseys
5 and with that, we'll move over to our Government,
6 non-voting members. I'm not sure if Nicole is
7 available. I didn't see her on the list.

8 MS. BUTLER: We're going to go to the
9 Directors.

10 CHAIR DUFFY: Okay. Okay, I'm --

11 MS. BUTLER: Thank you.

12 CHAIR DUFFY: I must be -- okay, must
13 have the -- I'm sorry, must have the wrong list.
14 Got something crossed.

15 MS. CHAPPELL: I think Andy is up
16 next.

17 CHAIR DUFFY: I'm sorry. Well, good
18 morning, Andy. Or afternoon, Andy. Sorry.

19 CAPT ARMSTRONG: Yes, good afternoon,
20 all. So, you know, folks spoke about going last.
21 We're really last here in this list so there's
22 not much left to say.

1 I do just want to add how impressed I
2 was with the Panels yesterday and how they're --
3 folks are working together and using NOAA's data.
4 I think it's important for us and NOAA to pay
5 attention as to how folks use our data so that
6 was very informative.

7 But I think the main thing I would
8 like to say is how impressed I am with the HSRP
9 Panel Members who have been so closely paying
10 attention and absorbing material from this
11 meeting.

12 I just think the comments that we've
13 just heard are impressive and I'm really pleased
14 to be a part of a Panel that pays so much
15 attention and takes so much care in what they're
16 doing. Thanks.

17 CHAIR DUFFY: Thank you, Andy. So I
18 see Dr. Marian Westley in front of me. If you
19 are ready to go, good morning, or good afternoon.
20 I guess I'm going to catch myself sooner or
21 later.

22 It's all the different -- with

1 everybody across different places in the country.

2 DR. WESTLEY: Great. Can everyone
3 hear me okay?

4 Great. So thank you again. I just
5 find these meetings extremely energizing. It's
6 always terrific fun to brag about the great
7 things your people do, but it's even more, it's
8 more exciting that you're really listening.

9 And you're giving that real feedback
10 and kind of real input. So I just really
11 appreciate the time here. Very sorry we're not
12 in L.A./Long Beach. I've been very interested in
13 getting, seeing that port up close.

14 As you know, we have a great PORTS
15 partnership in L.A./Long Beach with three
16 partners. Very exciting to see how you're using
17 all the PORTS data that we have and the interest
18 and possibly additional data would be great.

19 So just again, exciting to be here.
20 It's a real shot in the arm to kind of keep doing
21 the great work that we're doing, and so thank you
22 all much.

1 CHAIR DUFFY: Thank you. Moving on to
2 Brad Kearse as the next Director.

3 MR. KEARSE: Yes, great to be here.
4 I'm not usually involved in these. Juliana is,
5 but it's really -- it was really enlightening to
6 listen to just the feedback that you were giving.

7 And, you know, where we go as an
8 organization in helping us out as the parts of
9 this nav, obs, and positioning. I always love it
10 when I hear about the National Spatial Reference
11 System. We've got a lot of work to do.

12 You know, to make sure that the word
13 is getting out there, where it might impact folks
14 so I hope that conversation continues. You know,
15 we've got some folks on the Panel that do really
16 understand that.

17 And we need you as advocates to keep
18 quizzing us and get the right folks connected up.
19 Julie, I'm glad to hear that Dana is going to get
20 connected with the Port.

21 I know he's very active in the state
22 of California and those things are really nice to

1 hear, and where we have our other advisors that
2 are out there across the country to get them
3 engaged with everything from the ports to all
4 pieces of transportation and how they connect.

5 So great to hear the discussion,
6 really appreciate your feedback. I took copious
7 notes from each one of you all as you were giving
8 the feedback. I look forward to, you know,
9 catching up in person.

10 You know, those sidebars and all those
11 are so important, but really appreciate everybody
12 that pulled this together in the virtual
13 environment. Thanks.

14 CHAIR DUFFY: Thank you. I really
15 appreciate the comments about pulling this
16 together and I don't have everybody's title in
17 front of me so I'm doing the best I can and we'll
18 wing through.

19 I appreciate you putting up with not
20 maybe a proper introduction. But I can go to
21 Larry Mayer and just say it's Larry Mayer. Good
22 morning or good afternoon, Larry.

1 DR. MAYER: Thank you, Sean. It's
2 wonderful to be last again. It's not my place I
3 guess. So as Andy said, you come at the end and
4 notice everything that's been said already.

5 I do have to reiterate the compliments
6 that have been given by others to the great
7 sessions yesterday. They really were great
8 Panels.

9 And to the staff because this switch
10 suddenly to a virtual meeting is a non-trivial
11 thing and I think they pulled that off amazingly.
12 I think what I can do is take a step back and
13 offer a very long-term view.

14 I think with the exception of Andy,
15 I've probably been at more HSRP meetings over the
16 years than anybody else attending here. I think
17 that's true.

18 And I have to say that, well, the
19 quality of the Panel, but the sophistication of
20 the Panelists this time was tremendous. And what
21 I heard from them, and it's actually -- I think
22 I've seen an evolution over the years is really

1 sincere praise for what NOAA has to offer.

2 Sometimes we'd hear at panels kind of
3 lip service and things like that and a lot of
4 whining and a lot of complaints, but I think
5 there was no question -- I've seen this again in
6 the last few years -- there's real convergence of
7 coming away from a meeting like yesterday and
8 feeling that NOAA really, really is providing a
9 tremendous service to this amazing part of our
10 economy. I mean, the numbers and the size of
11 these ships are just tremendous.

12 And I really came away feeling very
13 good about that. I think you're really on the
14 mark here in terms of providing what they need,
15 particularly with the precision navigation. And
16 it's wonderful to see both NOAA models and NOAA
17 data streams being used in models that really are
18 providing very, very helpful real-time
19 information. I think that's great.

20 Now, as always, people want more and
21 they want better. That's natural and we heard
22 some of that, but what I didn't hear which I've

1 heard over the years and I remember the days of
2 Sal, the Carnival, you know, Chief Captain.

3 You know, there was a lot of what he
4 wanted was different. And, you know, NOAA just
5 wasn't doing things right. But I think, you
6 know, I think we really are seeing a real
7 convergent here.

8 And I, it just made me feel real good
9 so it was nice to hear all that. I'll stop
10 there.

11 CHAIR DUFFY: Very good. I really
12 appreciate your comments too and I will say that
13 it's very good for navigation to be able to reach
14 out to you and Andy.

15 Some of the work at UNH is being
16 embraced and desired by pilots on the Mississippi
17 River as we talk about advancing things like air
18 gaps.

19 So with that, again, thank you
20 everybody. Directors, hopefully I didn't blow
21 anything too bad. It's easier for me to
22 introduce Rear Admiral Ben Evans to see if he had

1 any comments he would like to make.

2 RDML EVANS: Thank you, Sean. And
3 just before I begin, I want to note for everybody
4 that Rachael Dempsey, our Deputy Assistant
5 Administrator for nav, obs and positioning is on
6 the line.

7 Our understanding is that she may be
8 in a position where she can't speak up. So
9 Rachael if you're listening and you would like to
10 say anything, feel free to just speak away and
11 I'll pause my comments.

12 But our understanding is that, excuse
13 me, that she's not currently in a place where she
14 can easily speak. So just, you know, I want to
15 acknowledge this as really I am going last year.

16 So everything I'm going to say does
17 sound a bit, has already been tread, but I want
18 to add to the comments of everyone and frankly
19 it's very gratifying to hear, you know, the
20 comments about the products and services that
21 the, that our offices are providing that are
22 making a difference.

1 I think for me of the discussion of
2 the local requirements yesterday in the Southern
3 California region and in particular the under
4 keel clearance project, that that's something
5 that's been in the works.

6 We've been working that problem for
7 seven, six, seven, maybe eight years now dating
8 back to when I was in at the Pacific Hydrographic
9 Branch in Seattle when this really first kicked
10 off in the mid-2010s.

11 So it's really great to see that
12 coming to fruition in the S-102 format and being
13 utilized. But of course, now the challenge is
14 how do we, how do we, how do we export that?

15 How do we, how do we expand that
16 effort to other ports, other waterways where that
17 same value could be realized? Yes, I think it
18 was Nathan that noted that, you know, the ships
19 are getting bigger and the waterways aren't.

20 And that's very true. And we're
21 spending as a country we're spending billions on
22 physical infrastructure to support our marine

1 transportation system, to support our ports and
2 that is absolutely justified spending.

3 The challenge we have is, you know,
4 commensurate, proportionate, but commensurate
5 level of investment in the geospatial
6 infrastructure because in many respects, that is,
7 you know, I think of that as virtually dredging
8 in some respects.

9 It allows us to make smarter risk
10 assessments to utilize all the water that's there
11 at a fraction of the cost of building out the
12 physical infrastructure further so. It's very
13 gratifying, again, to hear that the public
14 private partnership the Port of Long Beach is
15 showing so much value.

16 To a couple of the comments made by
17 some of the other Panelists, I just want to note,
18 Julie, to your comment about the datum changes
19 and Captain Jacobsen's interest, I think OCS
20 would absolutely like to be a part of that
21 conversation as well.

22 I think NGS and CO-OPS probably have

1 a more central role, but as that comes together,
2 please keep Jeff in the loop and I'll also note,
3 you know, the comments on Larry's presentation
4 which I also thoroughly enjoyed and learned a lot
5 from.

6 And we'll just note that as we think
7 this, you know, Larry hit the nail on the head
8 there. You know, where we are right now with
9 the, with utilizing uncrewed systems.

10 And trying to figure out, well okay,
11 where does this make the most sense? Yes, this
12 is very cool technology, and it, where can we
13 insert that and where can we plan to insert that
14 in the future as the technology improves even
15 further, where could we slot that in now in a way
16 that makes sense?

17 Where can we be ready to slot it in in
18 the future? And so as you hear us talking about
19 our utilization of uncrewed systems and as we
20 plan for further utilization of uncrewed systems
21 with the new Class B ships, you hear a lot about
22 that building in that flexibility now to utilize

1 those systems now, where it makes sense to do so
2 and ensuring we have the ability to do so in the
3 future.

4 And then the last comment I'll make is
5 that, again, I think this was Julie's comment
6 about the, about the Director's presentations.
7 I'll simply note that this is largely your
8 meeting to the Panelists.

9 And so if you feel that you would like
10 to see additional time for those Director
11 updates, I as having given one of those and
12 feeling like I was racing through my
13 presentation, if that's something the Panel would
14 like to hear more of, that's certainly a
15 conversation we can have about adjusting the
16 agenda to ensure that there's more space.

17 Again, we don't want certainly the
18 Directors don't want to suck all the air out of
19 the room. It's not all about us. We really want
20 you to have time to hear from the local Panels
21 and the Panels of experts that we're putting
22 together to meet your interests.

1 But the agenda can be, can be
2 adjusted. We're not stuck with that, that
3 format. So I think I'll stop there, pass it back
4 to Sean for any final comments as we wrap up this
5 session.

6 And then I just have a, I just have
7 some administrative reminders before we move on
8 to the next session.

9 CHAIR DUFFY: Thank you, Admiral. And
10 I'm going to be very quick and figure out as
11 Chair have a place at some point to talk. There
12 were a lot of comments that are relevant.

13 I think I could lead in intro into the
14 next Panel. Mississippi River changes,
15 challenges, relative sea level rise, saltwater
16 encroachment, subsidence, beneficial use of
17 dredge material, active crevasses.

18 We're at a very challenging place
19 here. It's part of the reason I enjoy this so
20 much is I can look at real world situations,
21 what's impacting navigation on the river and hit
22 a group of experts that can provide some insight,

1 help come up with some ideas.

2 And with that, I'll again, probably
3 have some longer-winded comments at some point,
4 but we'll try to keep this on time and let the
5 preparation for the next Panel go.

6 I know, Admiral, you have some
7 comments and that our Vice Chair Nathan Wardwell
8 is going to moderate the next Panel. I'll be
9 close in case there's anything I can help with,
10 but I'll turn that over to Nathan when you're
11 ready, sir.

12 RMDL EVANS: Hey, Sean. Yes, thank
13 you. And I'll just, I'll be very quick here
14 because I think we've covered some of this. But
15 again, I want to make a note about public
16 comments.

17 We do have a public comment period
18 here at the end of the session. Thank you,
19 again, to the participants who have provided
20 comments in advance, to the stakeholder staff and
21 others joining the webinar.

22 I encourage your public comments and

1 input. If you have a comment, please type it in
2 the webinar under the questions box. It will be
3 read into the public record and/or put on the
4 screen as time permits.

5 All comments from meeting that are on
6 topic will be included in the official meeting
7 minutes. When comments are received in advance,
8 it will be shared and highlighted at the meeting
9 as well as become part of the public record.

10 I welcome and encourage comments from
11 any group directly or individuals during the
12 public comment period. And then, again, a
13 reminder about privacy and a disclaimer.

14 These sessions are being recorded,
15 transcribed and posted to the NOAA HSRP website.
16 The speakers are provided their written
17 permission to do so.

18 Your individual permission is required
19 for use of your photo, video and voice on audio.
20 The meeting webinar will be retained and
21 disseminated on the meeting website and
22 accessible to the public.

1 You can decline by abstaining from
2 speaking or dropping off the webinar. And so
3 with that, Sean, with your permission, I think
4 I'll just go straight to Nathan who will be
5 leading our next session, Adaptive and Resilient
6 Ports: Managing climate change impacts to port
7 infrastructure and operations. You've got the
8 floor, Nathan. Thank you.

9 VICE CHAIR WARDWELL: All right.
10 Thank you, Rear Admiral Ben Evans. Yes, so I
11 have the honor of moderating this next session so
12 as Ben mentioned, it's the Adaptive and Resilient
13 Ports: Managing climate change impacts to port
14 infrastructure.

15 Let's see here. So Assistant
16 Administrator Nicole LeBoeuf will be providing an
17 introduction. Hello, Nicole. Thank you for
18 joining us. I am, let me pull up the -- and then
19 we have, we're going to have two presentations
20 after the introduction.

21 We'll have Justin Luedy, Senior
22 Environmental Specialist with the Port of Long

1 Beach and then Rosemarie Fusco, Marine Affairs
2 Department with University of Rhode Island. Is
3 that correct, Rosemarie?

4 MS. FUSCO: (No audible response)

5 VICE CHAIR WARDWELL: Great. And I
6 apologize if I got your names incorrectly. I
7 have not met either of you and have not confirmed
8 the proper pronunciation.

9 But then after those presentations,
10 there will be a discussion, we'll have about 30
11 minutes or so for a discussion. And I look
12 forward to it, this, the only thing I'll add is,
13 you know, ports are not necessarily my expertise.

14 And ports in Alaska are substantially
15 different I think than some of the major ports in
16 Long Beach. We do deal with sea ice and do deal
17 with large tides.

18 There was actually an article in the
19 local paper here recently about potentially in
20 the next decade the Arctic being ice free for
21 periods of time throughout the year.

22 So that would be a significant change

1 and would affect shipping so I look forward to
2 this conversation. Nicole, the floor is yours.

3 MS. LEBOEUF: Yes, thank you so much,
4 Nathan. Can everyone hear me? Good. Oh,
5 awesome. Thank you. I'm absolutely thrilled to
6 be here to talk with HSRP about this work that
7 we're doing.

8 It's emerging, it's collaborative,
9 it's kind of uncharted waters for us. So and I
10 just want to say, I was on for the last few
11 minutes and heard the last comments about the
12 previous session and regarding infrastructure
13 investments and Admiral Evans' comments about
14 geospatial infrastructure needed for those
15 investments.

16 And I couldn't have teed this session
17 up any better. So with that, I wanted to note
18 that and I mentioned this to you all yesterday,
19 I'm going to be wearing two hats today.

20 One as the Head of the National Ocean
21 Service and the other as the Chair of the U.S.
22 Committee on the Marine Transportation Systems

1 Coordinating Board or as we like to just say, the
2 CMTS.

3 And I am really here a little bit with
4 both hats. But I'm here on behalf of NOAA asking
5 you all for your expert input and consideration
6 of how we might work together to accelerate port
7 resilience.

8 So and first, I'll be a little cheeky
9 and say I have to give the HSRP credit for what
10 is now a very keen interest of mine in this
11 topic. It's all your fault that you taught me
12 how much to love and respect our ports.

13 And I've been following that ever
14 since I started coming to these meetings. So
15 specifically, I want to say that this work
16 centers around what we want to do at NOAA which
17 is to make sure our ports are fully applying the
18 authoritative guidance.

19 And NOAA's trusted environmental data
20 when they plan their infrastructure investments.
21 This includes planning for sea level rise, but
22 also extreme weather events and other coastal

1 hazards that are changing over time.

2 From you all, I hope, to and our
3 Panelists, I hope to learn more about whether you
4 believe that ports have sufficient authoritative
5 data and guidance for detecting coastal change
6 over time.

7 And the technical capacity to make
8 sure that their infrastructure plans will last
9 for decades to come. All right, next slide. As
10 the HSRP is well aware, NOS has many products and
11 services designed to promote safe and efficient
12 maritime transportation, nautical charts, a
13 precision marine navigation and, of course, our
14 human capital expertise in NOS's regional
15 navigation managers who work with pilots,
16 mariners, port authorities and recreational
17 borders on a daily basis.

18 In addition, NOS leads our coastal
19 planning and management in this country including
20 working with coastal communities and industries
21 to create resilience and to promote adaptation to
22 climate change.

1 NOS also as you know, measures our
2 elevation and subsidence and oversees much of our
3 nation's coastal and ocean observations measuring
4 tides, currents, and sea level rise.

5 Now, of course, none of this touches
6 on what else NOAA does like at the National
7 Weather Service, but right now we focus on NOS.
8 And I also want to note that we have skin in the
9 game when it comes to coastal adaptation.

10 And our preparations for climate
11 change because most of NOS's people and
12 facilities are located in the coastal zone.
13 Planning for a resilient future for NOS is so
14 important that it cuts across all of our programs
15 and our recently released NOS strategic plan.

16 It just means that much to us. Next
17 slide please. So a little bit more. If you're
18 not familiar with the CMTS Coordinating Board, it
19 is the Federal body for agencies whose missions
20 support U.S. sports and maritime operations.

21 At the CMTS table agencies like NOAA,
22 via the Department of Commerce talk about their

1 MTS concerns or work to solve complex issues
2 together and combine our expertise for the
3 benefit of the U.S. MTS.

4 As the current Chair, I have included
5 as one of my top priorities, addressing port
6 resilience in this year's work plan. Next slide
7 please. And I know you know this, but I want to
8 say it out loud. Ports are important.

9 Ports provide \$1.5 trillion annually
10 to the U.S. economy and support over 13 million
11 jobs. Our coastal and ocean-related economies
12 contribute disproportionately to our nation's GDP
13 with over 90 percent of our goods and products
14 being reliant upon our ports and related maritime
15 industries.

16 And as I like to say when anyone will
17 let me get up on a podium, most Americans cannot
18 go a single day without eating, wearing or using
19 something that's come through our ports.

20 Ports fundamentally support our way of
21 life and as such, they are too big to fail.
22 These efforts are being undertaken in an effort

1 to make sure that they do not. Next slide
2 please. So I grew up coastal.

3 Coastal change in the coastal zone is
4 not new. What is new is the pace of change and
5 what we know about it, including the degree to
6 which coastal hazards are impacting our ability
7 to plan for the future.

8 Coastal change is impacting more
9 people in the industries than ever before because
10 more than ever, humans are living along the
11 coast, 40 percent of the U.S. population live in
12 coastal counties and that number continues to
13 grow.

14 We know that the rates of change in
15 the ocean and along our coast are occurring
16 faster than anywhere else on the planet. And
17 that those rates of change are accelerating.

18 Many ports are located in low-lying
19 coastal areas which makes up especially
20 vulnerable to innovation and coastal change
21 therefore threatens our national security, U.S.
22 competitiveness and our U.S. supply chain whether

1 we're talking about bananas, speakers, speakers
2 or sneakers, medical supplies, or fuel.

3 At the same time, ports themselves are
4 facing rapid change within their own industry of
5 placing pressure on them to transform their daily
6 operations and infrastructure while
7 simultaneously planning for climate change.

8 Next slide please. Planning for the
9 future is essential, but extreme weather and
10 climate change are here now impacting the United
11 States and ports around the world.

12 Globally, a total of \$81 billion in
13 trade and \$122 billion in economic activity is
14 estimated to be at risk annually due to climate-
15 related impacts.

16 Oxford University published a study
17 last year estimating that the annual cost of
18 physical damage and resulting trade losses for
19 more than a thousand ports around the world.

20 They found, not surprisingly, that
21 large ports in high-income nations faced the
22 largest financial losses including the Port of

1 Houston which faces the potential loss of \$169
2 million from natural hazards each year.

3 It's the highest in the world. These
4 economic impacts, of course, would extend well
5 beyond the Port of Houston and into the
6 surrounding economies and communities creating
7 supply chain disruptions and shortages of all
8 manner of things. Next slide please.

9 So how do we keep track of what's
10 going on with climate change? Well we have a
11 good starting point. As you know, NOAA and NOS
12 in particular, is a trusted source of
13 environmental information particularly for short-
14 term operational port and shipping activities.

15 NOS's Office of Coast Survey and our
16 Center for Operational Oceanographic Products and
17 Services deliver products like Precision Marine
18 Navigation and our new monthly high-tide flooding
19 outlook among many others. Next slide please.

20 In addition to data and services as
21 support daily, weekly and monthly, port
22 operations' authoritative NOAA climate data also

1 exits. What do I mean by climate data? Next
2 slide please.

3 Climate data is simply data that tells
4 us about environmental conditions at longer
5 intervals such as years or decades. NOAA
6 collects observations and disseminates watches
7 and warnings and forecasts, of course, at
8 multiple time scales, seven day forecasts,
9 monthly, seasonal outlooks.

10 NOAA uses these data to inform our
11 predictions at climate timescales like those
12 depicted here and by the way, down in the right-
13 hand bottom corner there's an explicit call app
14 in this scientific paper about climate change for
15 port resilience and port infrastructure planning.

16 I do apologize for the graininess of
17 the image. I found this yesterday and decided to
18 pop it in and didn't have a chance to reach out
19 to the authors who are NOAA scientists also.

20 Anyway, NOAA uses our ocean and
21 coastal observations that you're well familiar
22 with. But other foundational data as well like

1 our measurements of elevation and subsidence from
2 the National Geodetic Survey to feed our
3 predictive models to understand the what, where,
4 how and who of climate impacts.

5 Tell me more you say. National
6 Geodetic Survey, for example, the NGS data is
7 used to measure the elevation changes over time
8 and we can add that to our projections for ocean
9 heat to better provide predictions for sea level
10 rise at specific locations.

11 Knowing this, we can build a more
12 holistic picture of what ports could face and
13 therefore should be planning their infrastructure
14 for.

15 What we're doing in our work and what
16 we're asking today is if we think that ports, we
17 being the HSRP as well, if we all think that
18 ports are using these climate data and
19 predictions or whether there's something we can
20 do differently to support port planning needs.

21 Next slide please. Of course, port
22 planning, planning for port infrastructure is

1 inherently complex requiring authoritative data
2 and approaches to ensure reliable adaptation and
3 resilience.

4 In recent years, guidance documents
5 for report planning resilience have been
6 developed. Last year, the Cyber Security and
7 Infrastructure Security agency or CISA and the
8 U.S. Army Corps of Engineers released the Marine
9 Transportation Resilience Assessment Guide.

10 And an infrastructure resilience plan
11 and framework. NOAA and the Gulf of Mexico
12 alliance also developed a similar document called
13 the Port Resilience Index, a port management
14 self-assessment document just a few years before
15 that.

16 These are just a couple of examples of
17 guidance that was made with industry and Federal
18 agency input including those agencies on the
19 scenes, yes.

20 So some ports are already using these
21 resources, but many are not. And for those that
22 are not, we'd like to understand more about why.

1 Next slide please.

2 So resilience experts at Federal
3 agencies and in academic institutions are working
4 with ports to directly, directly to understand
5 how best to design and plan Coastal Resilient
6 Port Infrastructure.

7 NOS works with communities including
8 ports to support local decision making. We have
9 visualization tools online such as in the digital
10 coast which is a website that has a deep
11 collection of data visualization, training and
12 resilience decision support tools.

13 Also, NOAA Sea Grant affiliated
14 institutions are becoming experts in port
15 resilience like the Universities of Rhode Island
16 and Wisconsin that are featured here and others
17 as well.

18 There's also a Department of Defense-
19 led working group that has built a database
20 including with help from NOAA to assess and
21 project sea level and coastal risk, coastal
22 risks, sorry, for installations, DoD

1 installations and facilities for a while.

2 But of course, some of you know that
3 major ports are sometimes located right next door
4 to some of these DoD installations. So we have
5 all of this authoritative expertise.

6 It should be in forming port
7 resilience planning. And on top of that at the
8 present time, we have a lot of Federal funding
9 going in to support climate resilient
10 infrastructure including with ports.

11 The American Association of Port
12 Authorities has done this great summary of all
13 the funding that's out there and they estimate
14 that over \$6.5 billion is intended exclusively
15 for ports in the Infrastructure Investments and
16 Job Act with another \$27 billion that ports are
17 eligible to apply for.

18 One example includes the MARAD port
19 infrastructure development program, but also
20 under the Inflation Reduction Act there is the
21 EPA's clean ports program creating financial
22 incentives for ports to make resilient

1 infrastructure plans. This is free money.

2 Right? But we're trying to figure out
3 if there's barriers to ports applying for those
4 funds and when they do apply for those funds, are
5 they using authoritative data and guidance at the
6 Corps? Next slide please.

7 Of course, all of that sounds very
8 Washington, D.C. focused. Outside of D.C. in the
9 real world, ports are going about their business
10 and they have busy daily operations.

11 And all kinds of expertise in how to
12 plan for their futures. So knowing this, we have
13 engaged directly with the AAPA to gauge their
14 level of interest and concern on this issue. Not
15 surprisingly, AAPA gets it.

16 I was invited to give a keynote
17 remarks at a recent POWERS summit which is a new
18 initiative the AAPA has launched to build a
19 resilient port planning for the future.

20 And I will be participating in their
21 upcoming legislative summit in D.C. in just a
22 couple of weeks. I believe that NOAA working

1 with the CMTS, AAPA, Sea Grant Institutions, the
2 HSRP and others can really help to narrow any
3 uncertainty that ports may have when it comes to
4 planning for climate change.

5 But that does include identifying any
6 barriers and closing any gaps that ports may have
7 for use of authoritative information and
8 guidance. Next slide.

9 So the good news is there are folks
10 who want to enhance U.S. Ports' Authoritative
11 Information. NOAA seems yes, University of Rhode
12 Island and like I said, others at AAPA are trying
13 to build a cross sectorial collaborative approach
14 with Federal, Non-Federal academic private sector
15 and other actors to really try and keep the ports
16 ahead of the climate curve.

17 Next slide please. One of our first
18 actions is being led by the CMTS. The CMTS is in
19 the process of developing a Request for
20 Information that they hope will publish in the
21 Federal Register this spring.

22 In the RFI we will be seeking

1 information from port planners, as well as others
2 who play a role in planning for port resilience
3 such as engineering and contracting firms that
4 are hired by ports to assist them as well as
5 academic institutions that are working in the
6 space and becoming experts on port resilience
7 planning.

8 Some of the questions that we plan to
9 include in the RFI are here for your
10 consideration. With this information, we're
11 really hoping to get a better understanding, like
12 I said of any barriers to using authoritative
13 guidance documents and data like NOAA's climate
14 predictions.

15 Though the CMTS is the lead for the
16 RFI, of course, NOAA has a big role to play and
17 that's why I wanted to seek input from HSRP and
18 why I'm really looking forward to hearing from
19 our invited guests.

20 I would like to thank Rosemarie Fusco,
21 a graduate student at URI as well as Justin
22 Luedy, Senior Environmental Specialist at the

1 Port of Long Beach who are here to share with us
2 their experiences in planning for climate
3 resilient ports.

4 Welcome Rosemarie and Justin to the
5 HSRP. It's really wonderful to meet you. I'm
6 thrilled to have you here. With that, I'm going
7 to turn the mic back over to Nathan. Thank you
8 so much for your attention.

9 VICE CHAIR WARDWELL: Thank you for
10 that great introduction, Nicole. I did notice
11 that on your slide for about climate data and
12 infrastructure planning where you had the red
13 circle.

14 It really looked like it mentioned
15 planning for Artic Commercial shipping in there
16 so very timely with the article that I read this
17 morning about continued loss of sea ice in the
18 Artic.

19 So really looking forward to the rest
20 of the session. I believe Mr. Justin Luedy, you
21 are up with the first presentation and the floor
22 is yours.

1 MR. LUEDY: All right, good morning.
2 Thank you, Nathan, and thank you, Administrator
3 LeBoeuf, that was a really great introduction on
4 ports and really good information for the, for
5 all the attendees today on really the scale and
6 the importance of sea ports here.

7 And especially on the West Coast so
8 that's a great introduction to my own
9 presentation. I'll be talking again this is
10 Justin Luedy of the Senior Environmental
11 Specialist for the port.

12 I'm an ecologist, but I also really
13 focus on adaptation planning. The infrastructure
14 side of adaptation planning for the Port of Long
15 Beach.

16 We'll talk a little bit about the
17 difference between adaptation and some of our
18 mitigation efforts. But in terms of scale, just
19 some basic highlights for the group is the Port
20 of Long Beach is the third busiest container sea
21 port in the U.S. just after Port of L.A. and then
22 New York-New Jersey.

1 We are a major gateway for U.S.-Asia
2 trade. And quite an economic engine for the
3 region and the nation as a whole. So you can see
4 why the topic of resiliency is important for us.

5 Oh, and we move about I think over
6 \$200 billion in cargo each year. So that's a bit
7 of context for our troupe out here at the port.
8 So next slide please.

9 So why is resiliency important? So as
10 you can imagine, there is quite a potential for
11 impact here on our port complex and I say port
12 complex, that's the Long Beach and Los Angeles
13 ports together as our San Pedro Bay ports.

14 And so we are already seeing impacts
15 from climate change here. Our primary concerns
16 at this point are sea level rise and storm
17 surges.

18 That's where we've already seen
19 impacts and that's where we're really looking
20 into the future, but actually on the next slide
21 I'll talk a little bit about the greater
22 frequency and magnitude of storms.

1 I've got a couple of case studies to
2 share and what we've already experienced here.
3 Go back please. So and we're also seeing
4 certainly a greater number of hot weather days
5 here in the harbor which is stressing our
6 electrical systems.

7 So resiliency really is become a key
8 topic of concern when it comes to decision
9 making. That's really for our port and our
10 executive team, or Board of Harbor Commissioners,
11 you know, we work under a Board of five
12 Commissioners as well as our tenants and
13 stakeholders.

14 Long Beach is a landlord port so we
15 have married tenants that, you know, are doing
16 all sorts of industrial activities here in the
17 harbor.

18 And how do we, you know, the question
19 is really how do we prioritize resources
20 especially in the face of a rapidly changing
21 climate.

22 This is an on-going discussion we have

1 here internally as Harbor Department Staff, but
2 also with our tenants and other folks in the
3 region.

4 So this, it really drives this
5 investment in maritime infrastructure. We have a
6 really robust large capital improvement program
7 so we have, you know, everything from small to
8 large development and redevelopment projects all
9 within that improvement project program.

10 Notably, our Pier Wind, some folks
11 here especially in California, probably are
12 familiar with the, our newest push to produce a -
13 - rather build a facility for the staging and
14 development of offshore wind turbines for
15 placement offshore and central California as well
16 as our expansion of rail.

17 Rail is a big topic out here in the
18 port right now, expanding rail for better
19 efficiency of cargo. Energy resilience also has
20 become a really hot topic really within the last
21 five or six years.

22 We've had more of a push for energy

1 resilience programs and really coming up with
2 strategies to address our energy concerns. And
3 that's both within our harbor district but also
4 within the larger city context.

5 We are working on a variety of power
6 resistance resilience programs to support our
7 terminals and then lots of projects, large and
8 small, under way for critical port facilities.

9 So those are things like fire
10 stations, fire boat stations, our very robust
11 security systems as well as our command center.
12 So we're looking at, you know, how to generate
13 renewable energy, store that energy.

14 And then really figure out the best
15 way to convey power to ports of our own
16 facilities as well as everything that we lease
17 and operate.

18 So that is really a big push within
19 our, especially here in our environmental team as
20 energy resilience as it pertains to climate
21 change. Next slide please.

22 Okay, so as mentioned, we're seeing

1 that greater frequency in magnitude of storms
2 here in Southern California. A couple of case
3 studies that have really highlighted the need for
4 resiliency planning and going beyond status quo
5 and really becoming leaders in this, in this
6 field are two past hurricanes.

7 So back in August of 2014 we
8 experienced Hurricane Marie. This was a storm
9 over 300 miles off the coast of Southern
10 California, but the surge from that storm --
11 we're a south facing beach and port city by the
12 way and so that puts us at a certain position
13 geographically that, you know, can be troublesome
14 for storm surge.

15 And so Hurricane Marie came just at
16 that right angle and caused significant damage at
17 our Navy Mole and Pier F shorelines. Over \$7
18 million there.

19 Significant damage to our break water,
20 the break water system here protected Ports of
21 L.A. and Long Beach is a total of nine miles long
22 in three different sections.

1 So two gates in the center, four
2 access. And so we saw three large holes and over
3 80 breaches of the break water during that event.
4 Well over \$21 million of repairs.

5 That number has probably become much
6 larger after all the work that was done up there.
7 And then almost two weeks of access restricted to
8 rail operations, fueling centers, and some of our
9 other critical facilities and tenants so that was
10 a huge wakeup call for us and our Board.

11 And then most recently, last August
12 2023, we saw Hurricane Hilary. So Hurricane
13 Hilary made landfall as a tropical storm which
14 was certainly great news for our region.

15 We got lucky on this one and minimal
16 impact to the port and the city, but you know,
17 this was absolutely a wake-up call as well or it
18 certainly highlighted the need for a greater more
19 centralized response when these sorts of storm
20 events come our way and probably are more
21 frequently in the future.

22 And so this, and so we produce an

1 incident management team. This really was a, you
2 know, pulling representatives from various
3 departments, rather divisions within our harbor
4 department which is our port to coordinate on all
5 of the potential concerns and issues that could
6 come from a storm like this.

7 We checked our pump stations, we
8 installed temporary pumps. Our maintenance team
9 was, are the on-the-ground folks who did all of
10 our equipment checks, made sure everything was up
11 and operating.

12 And then a really robust notification
13 system to our tenants about storm water concerns.
14 And so the, you know, the tropical storm Hilary
15 was a great way for us to prepare in advance and
16 make sure that we had something really
17 centralized and strong for future storms.

18 Next slide please. So all of this,
19 you know, talk of resilience and planning began
20 quite a while ago and it was sort of framed in
21 the context of how will the port, large
22 international sea port like Long Beach evolve and

1 adapt over time?

2 And so it really started with this,
3 the production of a climate adaptation and
4 coastal resiliency plan or CRP. And this really
5 is our guiding document. It's a living document.

6 It's grown over time with various
7 updates, but it really centralizes our approach
8 to adaptation planning and ensure resilience and
9 business continuity in the face of climate
10 change.

11 And so this is a really robust process
12 that took over three years starting with a really
13 over-arching inventory of our port assets. It is
14 everything that we lease, own, operate.

15 Even our private facilities were
16 included in that. Then on to risk and
17 vulnerability assessments of those assets and
18 then the development of, excuse me, of adaptation
19 strategies.

20 And those ranged from, you know, the
21 governance side of things so, you know, port
22 plans and policies considering climate impacts,

1 all the way to infrastructure enhancements.

2 So certainly a wide suite of
3 adaptation strategies came of that. The first
4 strategy really looked at incorporating
5 considerable rise in extreme heats and storm
6 search considerations into some really large port
7 documents for our strategic plan, our design at
8 electrical guidelines, all sorts of risk
9 assessments that we do and actually what's now
10 underway.

11 Under developed is a stormwater
12 infrastructure master plan so Step 1 was really
13 making sure that we're accounting, updating our
14 plans and policies, accounting for climate
15 considerations in what was existing as well as
16 what was coming.

17 Also, we are charged with by the
18 California Coastal Commission on issuing harbor
19 development permits. And within the very
20 specific geographic boundaries of our harbor
21 district.

22 And so we enhanced our harbor

1 development permit application and that's used by
2 both port staff for port projects as well as our
3 tenant projects.

4 So they all use the same application
5 form. We really wanted to capture, sort of cast
6 the net wide at the beginning of the process to
7 ensure that development and redevelopment
8 projects we're considering climate vulnerability,
9 sea level rise impacts and extreme heat.

10 And so with this, HDP application, our
11 applicants use coastal vulnerability zone maps
12 that allows them to locate their project on a map
13 that shows both temporary and permanent
14 inundation potential.

15 And then really guides them through a
16 process by which they can say, you know, is my
17 project vulnerable? What sort of options might I
18 have for adaptation? And we get them thinking
19 about that and, of course, we work with them on
20 that as we issue permits.

21 So and then once we went through all
22 that process then we have, we provided a both our

1 port engineers as well as our tenants with a
2 large suite of sealable rise inundation maps to
3 help them with their own planning and design.

4 The early maps were based on an old
5 model so back in December 2022 we updated our
6 inundation maps based on the best available
7 science and the latest guidance and here in the
8 State of California.

9 And those are now, without our, you
10 know, within a GIS system They can, you know,
11 they're very usable, very user friendly. Those
12 maps look at 20/30, 20/50, 20/80, 2100 and 2120
13 at three different risk aversion scenarios.

14 And then we have two suites of maps
15 produced. One for the mean higher high water and
16 then one based on more extreme case of the 100-
17 year storm tide.

18 So these maps have really proved super
19 helpful especially to our own internal staff here
20 at the port as our design team, you know, really
21 assesses primarily larger scale, longer lifespan
22 port projects looking outward.

1 And so we typically focus port assets
2 of the 20/80 horizon at this point. And that's
3 somewhat standard here at least in my experience
4 here on the west coast as the other sea ports are
5 looking out that far too with the, what we
6 consider like life span or the design life of a
7 port asset.

8 And that's very different than the
9 cities that surround us. They adapt and evolve
10 differently. Obviously a very different set of
11 stressors and assets and so port infrastructure,
12 you know, it really requires that roughly 50-year
13 life span looking outwards of the 20/80 up to
14 approximately 4.3 feet of rise for the Los
15 Angeles region.

16 And then for folks on the line here
17 who are working in California and doing climate
18 considerations here in the state, you probably
19 are aware of the newest draft guidance from the
20 Ocean Protection Council released back in late
21 January proposed for finalization in probably
22 early June.

1 And the port is really looking at, you
2 know, what is that new guidance saying? How does
3 that compare back to the 2018 guidance and what
4 might that change for short and long-range
5 planning? Next slide please.

6 So this just gives an idea as one of
7 the provide one snapshot of what our maps look
8 like and so right now what you're looking at in
9 the darker grey area is our harbor district.

10 The is the geographic scope of our
11 port and what you're seeing here is inundation,
12 the blue shades represent inundation in feet and
13 then the shades of yellow to orange-brown
14 represent the over topping potential.

15 So where we're seeing access points
16 within the harbor for potential inundation and
17 then the areas that are sort of the hatch marks
18 in purple represent large scale proposed or
19 either recently completed or proposed port
20 development from year 2018 onward.

21 And so you can see some of the, some
22 of the potential impacts on new port projects.

1 You'll also notice that when you look outward
2 into our harbor district parts of Pier G, Pier J
3 and T, those are the newer developments and so
4 those areas are relatively safe at this point.

5 At least not the 20/80 horizon. But
6 what we see here in the older parts of the port,
7 North Harbor parts of Pier A, S and B, that's
8 where we see the concern.

9 These are older areas of the harbor.
10 These are also areas that subsided resulting from
11 oil extraction over many decades and so these are
12 areas of priority.

13 Certainly of vulnerability and where
14 we'll prioritize assets. Next slide please.
15 Okay, this is actually my last slide. I don't
16 want to spend a lot of time here.

17 I just wanted to show that the, that
18 this is the mitigation side so while I work on
19 the adaptation side, the, you know, the port has
20 to really take a two-pronged approach to climate.

21 So we have the adaptation side, how
22 will we evolve? We understand that this, the

1 issue is upon us and our infrastructure needs to
2 be resilient.

3 But we also have a really incredible
4 air quality team here working on mitigation
5 strategies. Most of that falls within our Clean
6 Air Action Plan so these are, you know,
7 greenhouse gas reductions, a transition to zero
8 emissions, cargo handling equipment and trucks.

9 We have a new robust ZEERO Policy
10 which is, you know, all things zero emissions,
11 greenhouse gas reduction strategies. These are,
12 this is a huge point of the, a huge part of the
13 decarbonization efforts here in the harbor.

14 So I didn't want to leave that out
15 simply because it is really part of our climate
16 strategy overall. And then lastly, we contribute
17 to the City of Long Beach's climate action plan.

18 So we are one adaptation plan as part
19 of a much larger approach here in the City of
20 Long Beach for reducing local impacts and
21 addressing climate change together with other
22 City Departments. And that wraps up my slides.

1 Thank you.

2 VICE CHAIR WARDWELL: Thank you for
3 that great presentation, Justin. We're just
4 about right on time. Rosemarie, you've got the
5 floor so go right ahead.

6 MS. FUSCO: Can you hear me clearly?

7 VICE CHAIR WARDWELL: Yes, I can hear
8 you great. Thank you.

9 MS. FUSCO: Okay, great. Thanks. So
10 thank you to Nicole and to Justin. That was very
11 motivating. This presentation should fit well
12 into the examination of how Federal tools fit
13 into the port resilience on the ground.

14 And in this case, my presentation will
15 be talking about how we're using academia as a
16 conduit for that implementation. So my name is
17 Rosemarie Fusco.

18 I am a professional urban planner and
19 a fourth year PhD student in the Department of
20 Marine affairs at the University of Rhode Island.
21 I'm going to talk about incorporating CISA's
22 Infrastructure Resilience Planning Framework into

1 a port master plan process in the Port of
2 Providence, Rhode Island.

3 And the Infrastructure Resilience
4 Planning Framework is the IRPF, something that
5 you saw briefly in Nicole's slides so. It's out
6 of the Department of Homeland Security and I'll
7 talk a little bit more about that. Next slide
8 please.

9 So I just want to go over the project
10 team for this because it is a public-private
11 partnership and then you have academia thrown in
12 there as well.

13 So this is kind of a great look at how
14 a team would be made to implement port resilience
15 in a wider scope. This project that I am talking
16 about is funded by the Department of Homeland
17 Security as I said through the CISA, the Cyber
18 Security Infrastructure Resilience Agency.

19 So you or I brings a significant
20 portion of funding to the table in this scenario.
21 However, the rest of the master plan, of course,
22 is funded through bonds attained by the port

1 operator Waterson Terminal Services.

2 And through a partnership with the
3 City of Providence because the land is primarily
4 leased from the City of Providence. So in this
5 project, the Waterson Terminal Services, WTS,
6 will be hiring a private consultant as part of
7 the project to run the master planning process.

8 But they will be collaborating and
9 running the process alongside you or I who will
10 contribute a few components. I'm going to talk
11 about that more, but I just want to say that
12 there are these very significant pieces to the
13 puzzle here.

14 And so while port resilience is a
15 major component of what we do in my Department
16 and you or I in the MACRL, it's the Marine
17 Affairs Coastal Resilience Lab where port
18 resilience is a key component of our work.

19 Most of our projects have been funded
20 by the U.S. Army Corps of Engineer, the
21 Department of Homeland Security, National Science
22 Foundation, DOT, Rhode Island Sea Grant.

1 This is kind of a new component so I
2 just wanted to make sure that landscape is put
3 out there. Next slide please. So the
4 infrastructure resilience planning framework was
5 released by CISA in November of 2022, the end of
6 November.

7 The IRPF is a Federal framing
8 framework for port planning processes that is
9 mostly traditional, but has some very significant
10 resources and components that support port
11 resilience in a very tangible way.

12 So CISA collaborated with the
13 Department of Homeland Security Center of
14 Excellence for testing and implementing this
15 Federal planning tool.

16 They started with a case study in
17 Kentucky in 2019 and they released a request to
18 find other possible case studies after that. And
19 the Marine Affairs Department reviewed the
20 planning landscape that we are a part of.

21 And because of our robust ties to the
22 port and to maritime resilience in the State of

1 Rhode Island, we were able to find out that the
2 ProvPort was looking to do their master plan.

3 The first, by the way, the first
4 master plan for the Port of Providence in history
5 and we were able to bring them onboard as a
6 project champion and allow us to implement this
7 IRPF process through their core master plan right
8 from the bat.

9 So URI was able to collaborate them
10 with the ProvPort, with the city, on releasing
11 their RFP to hire a consultant and that is still
12 underway. They're in the final stages now of
13 releasing a notifications to the contestants and
14 choosing a consultant next week, I believe.

15 And we should just say the ProvPort
16 case study is one of three case studies for the
17 IRPF in progress right now, along with Norfolk
18 and Galveston. But I believe Providence was the
19 only one that is specifically in a designated
20 port area. The other planning case studies are
21 in a wider community, more wider coastal
22 community. Providence is, of course, port-

1 specific.

2 So here is just a quick look at the
3 study area. The purple parcels are the parcels
4 leased for ProvPort. The orange parcels and the
5 area within the dotted line are going to be the
6 study areas.

7 So, one of the initial benefits off
8 the bat of incorporating a Federal planning
9 process into this master plan is that it expands
10 the study area and brings the components of risk
11 assessment and components of vulnerability
12 assessments to a wider area than if it was just
13 contained to private port parcels.

14 And I should mention that ProvPort has
15 been a petroleum port historically and is
16 undergoing a major transformation right now to
17 support the offshore wind industry which is, of
18 course, very influential in the State of Rhode
19 Island right now.

20 So ProvPort itself, the operator of
21 ProvPort has a need to expand and to incorporate
22 some new types of supportive mechanisms for that

1 market. Next slide please.

2 So the overall goal of the IRPF
3 portion of the project are these specific five
4 things. So they, the IRPF, means to incorporate
5 these following tasks into this case study.

6 Right?

7 But the thing about it is that it is
8 expanding what would traditionally be the core
9 master planning process for ProvPort and adding
10 some new components to that planning process.

11 So, the inclusion of the Federal
12 framework is actually growing the master planning
13 process beyond what it would traditionally be.

14 And what our role is, you or I's role is, is
15 essentially to see how that planning process is
16 working, how it's being incorporated into this
17 live action master plan for the core of problems
18 in Providence.

19 And then report back to CISA on what
20 is working, what's not working, what resources
21 are being used, what is valuable, what is maybe
22 not so valuable, what the gaps are and other

1 things that pop up as we walk through the
2 planning process step by step.

3 And I'm going to go through some of
4 the IRPF process for you now. But first, I want
5 to talk about the goals of ProvPort's master
6 plan, right, for the Port of Providence because
7 those are very important.

8 And the application of the IRFP
9 process, its goals overlap with these goals
10 somewhat. But it's important to note that the
11 master plan should already be evaluating the land
12 and land use.

13 And the other components that are
14 already present in this space that it would
15 ideally target properties for expansion or areas
16 for improvement, ways to grow the market that the
17 port needs.

18 And it would also have some sort of
19 stakeholder engagement component that would
20 identify ways to benefit the community, things
21 like job creation.

22 But also other potentially more

1 environmentally related issues like environmental
2 justice issues or just aesthetic things, and also
3 public access to the water is a really important
4 one for this project.

5 And one thing that I should add which
6 is very important, the last two presenters talked
7 about, is that a big goal of the master plan just
8 inherently for ProvPort and the City of
9 Providence is to identify, but to create material
10 so that they can be supported to apply for new
11 and large Federal funding opportunities.

12 And that is something that has already
13 been discussed in the master plan and that's one
14 of the very useful things that will come out of
15 this master plan. So that's a big one.

16 So, the goals of the IRPF and the
17 ProvPort overlap. There's some major components
18 that underpin resilience and their shared goals.
19 These are some of them.

20 The stakeholder engagement process
21 will be enhanced and grown because of the
22 inclusion of the Federal framework into this

1 report master plan. Are you behind me on -- oh,
2 I'm sorry, can you go forward one slide.

3 Thank you. I jumped ahead, so this is
4 a slide that explains the overlap of the goals
5 between this as a project and the ProvPort's
6 master plan.

7 So the major components that overlap
8 include things like stakeholder engagement, how
9 risk affects the businesses within the port, and
10 how key infrastructure interdependencies
11 influence the master plan and vulnerability for
12 the port, and then the addition of risk
13 assessment to the master plan.

14 And this is a big piece of the value
15 of implementing a Federal planning process into
16 the port master plan, is the addition of risk
17 assessment at the level that you or I can
18 provide.

19 And also a more detailed examination
20 of business-to-business risk and
21 interdependencies within the space. So, next
22 slide please.

1 So, I want to get into the nuts and
2 bolts a little bit about the IRPF and how we're
3 going to implement that, and just leave you with
4 that.

5 So the IRPF outlines five key steps as
6 their sections to incorporate into the planning
7 process as existing planning processes. In this
8 case, a live one that enhance resilience by
9 addressing like critical infrastructure
10 dependencies.

11 And to support these five steps, it
12 provides tools, guidances, things that are very
13 basic like a meeting facilitation guide to things
14 that are more advanced like mechanisms to fund
15 resilience and solutions.

16 So, within these five steps, we are
17 taking some and implementing them through your
18 eye and then some are going to be done through
19 the consultant and the ProvPorts portion of the
20 master plan.

21 And you or I is contributing the
22 identification of critical infrastructure and of

1 highly detailed risk assessment beyond what would
2 traditionally be done in the master plan.

3 And the consultant's role in this, so
4 the private sector's role in this, is to help
5 develop actions and the implementation and
6 evaluation that comes later in the planning
7 process.

8 But we are going to work together on
9 the laying of the foundation, which is like
10 identifying project champions and designing the
11 stakeholder engagement strategy.

12 Those are going to be things that are
13 very collaborative. Next slide please. And
14 here's a little more of the nuts and bolts so you
15 can see this is a, what is going to be a very
16 basic outline of the master plan components.

17 The orange items, community engagement
18 and infrastructure and dependencies, are things
19 that are being added because of the IRPF's role
20 in this port master plan.

21 And the blue items are things that you
22 or I will take the lead on because of their

1 inclusion in the process and grow beyond what
2 would traditionally be in the port master plan
3 because of funding limitations and just other
4 capacity limitations.

5 So, the community engagement plan is
6 very, is going to be something that's
7 significantly influenced by the IRPF. We already
8 know because the stakeholder engagement strategy
9 due to other Federal resources like the
10 Metropolitan Transportation Guide is, are going
11 to have big roles to play and are already
12 influencing the way ProvPort thinks about their
13 stakeholder engagement plan.

14 So, next slide please. And so, just
15 a little bit about the value of including
16 academia in this type of case study. You or I
17 will be using two major platforms that are
18 developed through the University.

19 And used at the state level to further
20 -- to grow the risk assessment component of this
21 master plan. So RI-CHAMP is the Rhode Island
22 Coastal Hazards Analysis Modeling and Prediction

1 platform.

2 And that is a deterministic platform
3 that uses storm scenarios with a very high
4 resolution mesh, coastal mesh, so that you can
5 have very specific idea of what impacts from
6 natural hazards there will be at a very specific
7 point.

8 And that coupled with data that we
9 collect when we visit the site and talk to
10 business owners, we get very detailed information
11 about like where a doorway is, the things that
12 are very important on the ground.

13 Where a generator is, and that
14 information coupled with the scenario, the
15 scenario storm modeling from the deterministic
16 models gives businesses, organizations or at the
17 state level, very specific ideas of what they can
18 expect in a given scenario and how to prepare for
19 that.

20 So this RI-CHAMP is used by the
21 emergency management organizations in the State
22 of Rhode Island. And the other component that

1 URI uses is called STORMTOOLS. And that's a
2 probabilistic model so 10, 20, 30 year
3 probabilistic model that's used in long-term
4 planning.

5 And that, this platform is used by the
6 state of Rhode Island when examining land use
7 changes and other permitting aspects. So, the
8 combination of those two things really gives you
9 an idea of the type of risk and vulnerability in
10 different areas and different parcels and change
11 over time.

12 And one thing that we learned from
13 doing this already is that sensitive information
14 and security is really important to some of the
15 core components that we deal with, particularly
16 small businesses.

17 So, we are -- in this project with the
18 IRPF, we are going to provide individualized risk
19 assessments to the businesses that participate
20 with us, and that will contain sensitive and
21 confidential data that they do not agree to have
22 us share with anybody.

1 But they will get that information so
2 that they can increase the resilience in their
3 capacity. But the public access information and
4 information that we are allowed to share will be
5 the component that goes into the publicly
6 available master plan.

7 And that is part of a larger picture
8 that will, that goes into the two models that
9 we'll also be providing to the master plan. And
10 next slide please.

11 So, and then a little bit about the
12 stakeholder engagement because it's so important,
13 right. So, the port master plan would normally
14 have a baseline engagement that would be dictated
15 by the City.

16 And I think it's, yes, so for core
17 community meetings and awards and a public
18 engagement of -- a public hearing rather -- at
19 the end of it.

20 But because the IRPF process is being
21 involved and because URI is going to help design
22 the stakeholder engagement strategy, there will

1 be more expansive involvement.

2 And the involvement will start earlier
3 on. So, there's going to be a stakeholder
4 mapping exercise, and because of URI's robust
5 ties to community groups that are already in the
6 area, the people's port authority and other
7 active groups, they will be brought in earlier in
8 the process.

9 So, it's kind of like a, think of like
10 a double bond, it's more of like a connective
11 tissue that is able to be added to this process
12 and just strengthen the process from the start to
13 the end.

14 And so, with that said, the
15 stakeholder engagement has not started yet. The
16 consultant is about to be selected and we're
17 really excited to get started on this. So, next
18 slide.

19 I'll show you where we are. We're
20 just in the second phase of the project where we
21 start our risk assessment and we design our
22 stakeholder engagement.

1 And the data collection should take
2 place over the late spring and into the summer
3 with the report out at the end of the year. So,
4 hopefully we'll be back in front of you with more
5 findings from this research.

6 And a really good look at how to live
7 action a Federal planning process into a local
8 master plan and report. And this is a small
9 examination of it.

10 But I think we'll have some really
11 important information to report back to CISA, so
12 we're very excited. So, if you want some more
13 information about this project, you can contact
14 our principle investigator, Dr. Austin Becker,
15 and the Chair of the Department of Marine Affairs
16 here, myself, or one of our Coastal resilient
17 specialists.

18 And so hopefully we'll be back with
19 you at the end of this year. So, thanks for
20 having me.

21 VICE CHAIR WARDWELL: Thank you very
22 much for that, Rosemarie. That's a significant

1 effort that you're undertaking. Let's see, so
2 now we have 20 minute -- less than 20 minutes or
3 so for discussion.

4 I don't know if the Panel Members can
5 turn their cameras on or if that's going to slow
6 things down for the interpreters. But --

7 MS. CHAPPELL: Nathan, I think if the
8 Panel Members who want to make a comment just
9 turn their cameras on so we know.

10 VICE CHAIR WARDWELL: Okay, sorry for
11 the confusion. I was just thinking about the
12 speakers, not necessarily the HSRP Panel Members,
13 but I guess as you have a, if you have a
14 question, just turn your camera on.

15 And I would also offer the opportunity
16 to Nicole also if she has questions or input
17 while we're, people are gathering their thoughts
18 from the great presentations we just had.

19 MS. LEBOEUF: Yes, Nathan, I'll buy a
20 little time. I just want to thank our invited
21 guests. Those were really amazing and impressive
22 conversations.

1 And I would love to think that our
2 ports around the country are all as well off and
3 as far advanced as moving out as much as Long
4 Beach and Rhode Island.

5 And maybe they are, but if they're
6 not, I think we're also standing by to help
7 understand some of that and how we can spread
8 those best practices through port-to-port sharing
9 and other means.

10 Anyway, just so excited to have this
11 conversation teed up and would love to hear more
12 from the HSRP about what they see as some needs
13 there.

14 And just for our invited guests, a
15 quick, I guess, sort of point of clarification.
16 The Hydrographic Services Review Panel advises
17 the NOAA Administrator on a range of issues
18 associated with, you know, this and other things
19 in the marine transportation and navigation
20 sectors.

21 So this, anything we hear from them
22 that we can take to heart and then build right

1 back into a partnership is with you also.

2 Anyway, that's all I've got.

3 VICE CHAIR WARDWELL: Great, thanks,
4 Nicole.

5 MS. LEBOEUF: Yes. Hopefully that
6 bought some time.

7 VICE CHAIR WARDWELL: You broke the
8 ice for us to now -- I love this --

9 MS. LEBOEUF: That's right.

10 VICE CHAIR WARDWELL: There's a new
11 Panel Member that looks like she has a question,
12 so Rebecca, why don't you go ahead? And I think
13 you're on mute, Rebecca. I can't hear you.

14 MEMBER QUINTAL: Thanks. Rosemarie,
15 enjoyed your talk. I'm a fellow Rhode Islander,
16 so it's very pertinent for me. I'm interested in
17 the RI-CHAMPS.

18 I think that was the right tool that
19 you're using for predictive -- for coastal
20 hazards for the port. And you mentioned, you
21 know, having in the data base, you know, where
22 doors are, where generators are, et cetera.

1 I'm wondering if it also includes
2 dwellings that are below ground floor. I'm
3 thinking about Hurricane Sandy and, you know,
4 just walls of water coming into people's
5 apartments and, you know, how dangerous that was.

6 Is that kind of information included
7 in the model?

8 MS. FUSCO: That's a, can you hear me
9 okay? Yes, okay. The answer is a little bit --
10 there are a couple of things, parameters here, so
11 our data is only collected in areas that are
12 designated under our projects.

13 So, and that doesn't often include
14 residential. So, in short, we don't often --
15 like I have not collected any data on underground
16 dwellings so far.

17 However, the data collection model,
18 and the process that we use, and the platform
19 collects all information about the facility that
20 would make it vulnerable or have inundation
21 points or have a component that would result in
22 cascading consequences for the property and for

1 the area.

2 So if we collect data on a building
3 that has an underground residence, we will
4 collect information on that. And, specifically,
5 on what points to the exact location, what points
6 would be vulnerable for that specific place.

7 So, for example, if it flooded on one
8 side of the building and not on the other, we
9 would know if an inundation point had been
10 affected by the water.

11 And which points were vulnerable. So,
12 that's the essence of it. So, not many
13 residential points so far, but we're always
14 growing the data base.

15 MEMBER QUINTAL: Thank you.

16 MS. FUSCO: Thank you.

17 VICE CHAIR WARDWELL: Julie, go ahead.

18 MEMBER THOMAS: Yes. Oh, Qassim too.
19 I don't have to go first, but do you include the
20 storm drains, Rosemarie?

21 MS. FUSCO: Yes. Yes, Yes.

22 MEMBER THOMSAS: Yes. So that does a

1 lot to also, I think, predict some of the
2 underground or the flooding that might happen.

3 Yes, thank you all for your comments.

4 It was really interesting. Nicole, I
5 kind of laughed because I thought oh, my gosh, I
6 knew she is really going to like hearing here
7 that Houston has the highest, what was it,
8 natural disasters or something.

9 I thought, well that's very
10 appropriate for this Panel to know. Justin, I
11 also note, well I'm from San Diego, but it was
12 interesting, your climate guidance from state
13 agencies.

14 I kind of have followed CoSMoS, Cal-
15 Adapt, OPC, Scripps actually has some inundation
16 work, and I find -- and this goes a little bit to
17 what you both spoke about, Rosemarie too, with
18 the stakeholder engagement.

19 One of the things that I get push back
20 a little bit is when I attend a stakeholder
21 meeting or even I'll say my local City Council
22 sometimes they have asked me to come.

1 And it's like, you know, we had -- I
2 mean climate change is so unpredictable, but it's
3 just unpredictability, like how do we deal with
4 it? Which model do we follow? Which publication
5 do we follow? Which IPCC graph do we follow?

6 And I'm just wondering if you found
7 that in dealing, and I find it's very hard to
8 talk with stakeholders because they have, many of
9 them are already very educated on a lot of facets
10 and have already said, yes, we have a problem
11 here.

12 And almost many different agencies,
13 people have gone to them and said what can we do
14 to help out, but then when it comes right down to
15 it, you know, there could be either a dearth of
16 information or you have these models that
17 sometimes don't agree.

18 So, I'm just throwing that out there.
19 Maybe both of you could comment on that, Justin
20 and Rosemary, like how you're dealing with that.

21 MR. LUEDY: Sure. I can comment.
22 This is Justin. And pardon me, I don't have

1 camera access through the GoToWebinar program so
2 only voice for me today.

3 MEMBER THOMAS: No worries.

4 MR. LUEDY: But that's a great
5 question. And you know, we talked a lot about,
6 by the way I should have mentioned in my
7 presentation that we use the AECOM for the
8 production of our adaptation plan and our
9 inundation mapping.

10 And they're a fantastic team in the
11 Bay area and so they certainly deserve that
12 credit. And for us, the OPC model, you know,
13 here in California we're such a different animal
14 in so many ways in the state.

15 And when it comes to, you know,
16 coastal resiliency planning, OPC, the Ocean
17 Protection Council guidance really is the best
18 for sea port planning.

19 We, first, we are privy to the
20 California Coastal Commission and the California
21 State Lands Commission. And so those two
22 agencies really do sanction this, the OPC models.

1 And so, it made the most sense for us
2 to use that model for inundation mapping of our
3 harbor district simply because we knew we'd have
4 the congruency there with, you know, with the
5 state agencies.

6 They are, they approve our coastal
7 development permits and they have quite a purview
8 over sea ports here. And so that was, you know,
9 to me it was sort of a no-brainer in a sense that
10 we would use the OPC model.

11 But we have looked into the past at
12 CoSMoS. The City of Long Beach used the CoSMoS
13 model for its inundation mapping as part of their
14 climate action plan.

15 And so we're always certainly aware of
16 the other models in place, but OPC really was the
17 more appropriate choice for our port.

18 MEMBER THOMAS: Okay, great. And
19 Rosemarie, what has your interaction been with
20 the stakeholders? Have you had enough
21 interaction already to have any feedback like,
22 you know, what you --

1 MS. FUSCO: Yes.

2 MEMBER THOMAS: -- can tell us?

3 MS. FUSCO: Yes, so there is, so the
4 Waters and Terminal Services of the Port of
5 Providence and URI both have active and robust
6 connections to the neighboring communities.

7 And then communities around Rhode
8 Island as well in regard to like port planning
9 and the interaction of the port with its
10 neighbors and the impact of the environmental
11 outcomes of the port on the neighbors.

12 And I feel like this is a good moment
13 because you get to hear from Justin in a very
14 kind of large port community and then from me
15 where port of Providence port community is very
16 small compared to California.

17 And for us, the neighboring
18 communities for ProvPort are low income or multi-
19 lingual and they are organized and already have a
20 lot of information and have a vision for what
21 they would like to see from the port over the
22 next 10 to 20 years.

1 So we have a really good starting
2 point. But one of the things that is problematic
3 is that the information that everybody uses is
4 different as we say.

5 So one of the things that helps us is
6 we use these different types of modeling
7 platforms to show the audience, the end users
8 that there are varying degrees of information.

9 But, even though there's uncertainty,
10 what is certain is that things are going to
11 change, right? And so what is certain that there
12 is going to be a level of impact even if we don't
13 know what level of impact that is yet.

14 There is going to be impact. And so,
15 just saying that for everybody is like this
16 unifying force and it kind of just, it adds a
17 sense of cohesion like we're all working towards
18 the same goal.

19 And so we've seen that over past
20 interactions. We'll see how this port master
21 plan works out. I think there's more at stake
22 now and we're, the conversation is changing a

1 little bit because the port is undergoing
2 transformation and engaging with emerging
3 markets.

4 So we'll see how the conversation
5 hashes out now, but we have found that despite
6 the level of uncertainty and the myriad sources
7 that can be used to contribute to this
8 conversation.

9 Just saying that we, you know, that
10 there is the need for adaptation or the need for
11 resilience as a starting point. I hope that
12 answers your question.

13 MEMBER THOMAS: Sure, thank you.
14 Thanks, Nathan.

15 VICE CHAIR WARDWELL: Yes, thanks,
16 Julie. Qassim, yes. Why don't you go ahead.

17 MEMBER ABDULLAH: Yes, thank you.
18 Thank you both. Thank you, Nicole. Great
19 information, Justin and Rosemarie. I have a
20 comment and a question.

21 And please don't feel obligated if you
22 don't know the answer because probably you're not

1 involved on the concept of digital twin element I
2 want to bring.

3 Because looking at the two ports and
4 for two sea ports the digital twin will come as a
5 big help in case of climate change emergency
6 planning, that sort of plan, and digital twin I'm
7 talking about like both have physical digital, no
8 digital replica for the physical environment of
9 the boat.

10 Everything there, navigation tunnel,
11 building, the utilities and that will help a lot.
12 In cases like this it will help in assessing the
13 risk and getting mitigation strategy for it.

14 So I'm wondering, especially for
15 Rosemarie, with the master plan for Rhode Island,
16 are they thinking of building digital twin? And,
17 Justin, is the same way.

18 Do you know if there are -- I'm pretty
19 sure there isn't, didn't exist, but are they
20 going that way? Are they thinking that way to
21 build the digital twin for their ports? Thank
22 you. Qassim out.

1 MS. FUSCO: I'll answer for me. I
2 actually don't know. I haven't heard any, that
3 has not been brought to the table when I've been
4 there. I have not heard of that, of them doing
5 that. It's a great, great question. Maybe I'll
6 bring it up.

7 MEMBER ABDULLAH: Thank you.

8 MS. FUSCO: Thank you.

9 MR. LUEDY: I agree here. This is
10 Justin. I'm not aware of that either, but a
11 great question.

12 VICE CHAIR WARDWELL: All right, thank
13 you, Qassim. I'm glad you got your digital twin
14 in there. I'm waiting for it patiently.

15 MEMBER ABDULLAH: Yes.

16 VICE CHAIR WARDWELL: Mary Paige, why
17 don't you go ahead? And we have, we might have a
18 little bit of extra time here. And so if there
19 are questions, go ahead and try to get them in.
20 All right, Mary Paige?

21 MEMBER ABBOTT: Great, thank you. I
22 enjoyed listening to both of the presentations,

1 especially because they, both East and the West
2 Coast being represented.

3 And my area of, my focus is that of
4 the recreational boater. And when I listen to
5 the presentation speaking about ports, I don't
6 want anyone to forget about the public and
7 private marinas that are used by the, by the
8 boaters in the area.

9 And a lot of time, the access is the
10 exact same physical water base. It's just gone
11 non-commercial. It's a recreational standpoint.
12 The economic impact of a recreational boater in
13 the United States is about a \$230 billion annual
14 impact.

15 We've got 12 billion, excuse me, 12
16 million registered recreational boats in the
17 U.S., and in Rhode Island for instance, it's a
18 \$1.7 billion economic impact with over 7,000 jobs
19 that are impacted as well as 381 direct
20 businesses.

21 So as a stakeholder in Rhode Island,
22 and then the numbers in California are a tad

1 larger by additional zeros, but regardless, the
2 point is, hopefully the stakeholders are
3 including this in a huge, huge group to the data
4 collection as well as the impact on that.

5 So I just wanted to make that
6 statement and hear an affirmative from both of
7 you that you are including us.

8 MS. FUSCO: That's a great, great
9 point for the ProvPort master plan. There, so
10 far, is no plan to include those stakeholders in
11 an active way outside of community meetings.

12 So I'm glad you brought that up
13 because I am going to bring it up to our next
14 team meeting. I think, are you in Rhode Island,
15 this is a hot topic in Rhode Island because Rhode
16 Island's economy so greatly depends on our
17 recreational boaters and also our fisheries.

18 So the impact of the increase in port
19 traffic through the Narragansett Bay has a
20 significant potential impact for the State of
21 Rhode Island.

22 So it's a part of the master plan in

1 process, but I think that, I'm glad you said
2 this, because I think it needs to be brought up
3 more specifically next time we talk about it
4 particularly once the consultant is selected.

5 MEMBER ABBOTT: Perfect. Perfect,
6 thank you.

7 MS. FUSCO: Thank you.

8 MR. LUEDY: And for us here in Long
9 Beach, the Port of Long Beach actually highly
10 discourages recreational boating. It's something
11 that our Harbor Patrol and others really just, we
12 just really try to, I wouldn't say it's strictly
13 forbidden because it certainly happens, but we
14 really try to avoid that.

15 We only have one it's like a
16 sportfishing organization. They're actually
17 located outside of our harbor district, but they
18 do use the port for transiting and navigation.

19 Obviously, that's what generally
20 occurs further out off the coast outside of our
21 break waters. But we don't, we didn't account
22 for recreational boating in our adaptation plan

1 simply because it's not what we don't see it as a
2 stakeholder.

3 Now Port of Los Angeles is a different
4 story. Port of L.A., our neighbor here in the
5 port complex absolutely has commercial fishing
6 and boating and so they certainly had to account
7 for that.

8 But here in Long Beach, there's just
9 not something that we do. The City of Long Beach
10 in its own climate action plan does account for
11 that.

12 Obviously, we're a large coastal City
13 here in California and so that's been taken into
14 account. But in the harbor district,
15 specifically our plan does not address it.

16 MEMBER ABBOTT: Interesting.
17 Interesting, I appreciate that information and
18 thank you for sharing it.

19 MR. LUEDY: Sure. Although we do have
20 one fishing pier that we consider to be public.
21 We, it's specifically designed, we put fishing
22 platforms but the angler can, we did want to make

1 sure because there is sustenance fishing here in
2 our region.

3 And so we did want to account for
4 that, but again, that's just the fishing
5 community.

6 MEMBER ABBOTT: I have a question and
7 then please don't consider me flip on this, but
8 so I'm a boater. I was a sailor and stink
9 potter.

10 But the point is, you know, I might
11 need big signs out in front of your port or in
12 the channel saying recreational boaters not
13 wanted.

14 So it just, that concerns me from the
15 standpoint that not everybody has the choice
16 especially if there's a dangerous situation
17 occurring, being occurred, but I'll have to take
18 a look at my ENCs and my other data available to
19 me as a recreational boater as to what's keeping
20 me out of that, out of that harbor. But thank
21 you very much.

22 MR. LUEDY: Yes.

1 MEMBER ABBOTT: For sharing that.

2 MR. LUEDY: Sure. And in short, the
3 response to that in short is just really based on
4 the industrial nature of our port. We are a huge
5 marine terminals. Right?

6 With lots of private and public
7 facilities and intense shipping traffic and so
8 it's just not the appropriate environment in
9 terms of recreational boating. So that --

10 MEMBER ABBOTT: Got you.

11 MR. LUEDY: -- would be the reason you
12 probably would get from others on our staff, yes.

13 MEMBER ABBOTT: Okay, thank you.

14 MR. LUEDY: Sure.

15 VICE CHAIR WARDWELL: All right,
16 great. Thank you for that. So we have two more
17 minutes I believe and I see Nicole and Julie up
18 here and I have a question too.

19 I don't know if I can fit it in there,
20 but Nicole, why don't you go ahead and we'll see
21 how much time we have left.

22 MEMBER ELKO: Okay, I'll try to be

1 quick. I was having glitching weird issues with
2 my software when you all were presenting so my
3 question is, you may have said this already and
4 if so, I apologize.

5 I understand that you did a lot of
6 modeling, inundation modeling, but then are you
7 looking ahead to a certain time, 2050 -- some
8 year in the future?

9 And are you adding an amount of
10 inundation on top in planning toward that time?
11 And I ask because NOAA has a fantastic report
12 published with the interagency Panel that a lot
13 of our coastal communities are using, you know,
14 with the one foot by 2050 guidance.

15 MS. FUSCO: Yes, so Justin, do you
16 mind if I? I'll go quickly.

17 MR. LUEDY: Sure.

18 MS. FUSCO: So far in this master
19 plan, the planning horizon is not set yet. It's
20 likely to be 75 years. And with that planning
21 horizon, then we will zero in on what exact
22 scenarios we're going to use in our deterministic

1 modeling.

2 And then the probabilistic modeling,
3 how that hashes out and which curves we're going
4 to use, but we will do inundation on top of sea
5 level rise. Absolutely, so that's absolutely a
6 part of all of the models we'll use.

7 But so for us, we just don't know yet
8 what it's going to be because the planning
9 horizon isn't secured. As we move through the
10 next three months, then they'll know in the plan.
11 Thank you for asking that.

12 MR. LUEDY: And that's ultimately the
13 same for us here in Long Beach. So we were over
14 the last few years and in our work, were in this
15 large phase of largely development projects and
16 most of them have been designated a 50-year
17 lifespan.

18 And so for that reason, when it comes
19 to the early stages of program management,
20 engineering, the design and development of
21 engineering drawings and plans right now, we
22 really look to the 2080 horizon per the Ocean

1 Protection Council Guidance.

2 And that really helps us to understand
3 sort of based on the life span, average life span
4 of a port infrastructure and redevelopment
5 project. We'd be looking as a 2080 and then, you
6 know, obviously that will shift and change over
7 time as we move forward on projects.

8 But that's really where we look right
9 now unless it's a critical facility, something
10 that the Coastal Commission has been, has
11 designated as critical which typically is water
12 and transportation assets.

13 Then we might look beyond to 2100, but
14 that's pretty uncommon for us at this point.

15 VICE CHAIR WARDWELL: All right,
16 thanks for that question, Nicole. All right,
17 since I'm the moderator, I'm going to try to fit
18 in my last question here, Sean.

19 I see you hop in there, but I figure
20 I should get an opportunity. So there's a lot of
21 data sources out there and a lot of places where
22 these data can be accessed.

1 And being provided by NOAA, you know,
2 as this Panel, you know, our role is to advise
3 the administrator on what other needs are out
4 there.

5 And I don't know, I just want to ask
6 the question and provide you the opportunity if
7 there are any gaps in the information you need
8 for doing your assessment?

9 And, yes, if you have identified any
10 gaps in data or products, to do your assessment
11 and there's a way that NOAA can help with that.

12 MS. FUSCO: I'm sorry to say that's
13 the hot topic and that's the goal of the project
14 that I presented to you really is so we hope to
15 identify some of what those significant and
16 impactful gaps are in the resilience world of
17 port planning.

18 And see if the Federal planning
19 process of the IRPF contributes some solutions to
20 those gaps or if there are some barriers to
21 implementing the IRPF, for example.

22 And what those barriers are so I think

1 I don't have a specific answer for that because
2 that is a question that we're working on and I
3 think probably one of the most impactful for port
4 resilience right now.

5 MR. LUEDY: And in the interest of
6 time for me, I'll really point to heat. I would
7 say, you know, we've got a lot of great, excuse
8 me, great guidance on sea level rise.

9 But extreme heat I think would be
10 something interesting to see, you know, more
11 reliable information in modeling that could help
12 us plan for -- especially with our energy
13 resilience efforts and initiatives here.

14 VICE CHAIR WARDWELL: Okay. Great.
15 You've heard that. All right, I'll hand it back
16 over to you, Sean. I believe you're on mute.

17 CHAIR DUFFY: Good, yes, right. So
18 one of the things we really didn't get to touch
19 on yesterday I'm going to hit real quick is this
20 is both Nathan's first time moderating and first
21 HSRP as Vice Chair and my first role as Chair, so
22 there's a lot of moving pieces.

1 I'm going to try to keep it all on
2 time and be quick. I wanted to thank Ms.
3 LeBoeuf, Nicole, excellent idea of Panel. As a
4 Louisiana, Mississippi River person a port
5 resilience is one thing.

6 I also have a concern related to
7 waterway resilience. The most resilient port
8 here may not survive some of the changes we see,
9 but with that, excellent Panel, thank you,
10 Nathan.

11 You did a great job. I'm going to
12 turn it over to Admiral Evans. I think we have a
13 public comment period, but I will silence myself,
14 sir. The floor is yours.

15 RDML EVANS: Thank you, Sean. And I
16 just want to, before our Panelists jump off, I
17 want to thank them for their input and their time
18 as a really outstanding discussion and I'm glad
19 we were able to extend it at that.

20 But at this point, we are at another
21 public comment period. This is a request for
22 public comments and attendees are encouraged to

1 enter their comments in the question box.

2 Please target your comments to the
3 HSRP Members and NOAA, focus on what NOAA can
4 improve for the navigation observations of
5 positioning products, data and services.

6 This is not a request or an
7 opportunity to ask the presenters questions. So
8 I'm going to turn this over to Ashley Chappell to
9 read and summarize the comments we're received.

10 We will show the comments on the
11 screen and they will be collated into a document
12 shared with the HSRP Members and NOAA. After the
13 meeting, the comments will be posed at the HSRP
14 website included in the public record.

15 So, Ashley, can you please show us and
16 summarize the comments.

17 MS. CHAPPELL: Sure. They should be
18 on the screen. Hopefully you can see these.
19 Thanks, Amanda, for posting them. So actually,
20 Captain, Carolyn Kurtz generated a lot of
21 comments after I think it was Mary Paige's
22 question about standardization of PPU's.

1 So Frank Rabena from Virginia Pilots
2 just notes that you can't always generalize
3 expertise across local areas so it's a good
4 clarification.

5 Jon Dasler also has a comment noting
6 that the Coast Guard doesn't -- purposely does
7 not regulate PPU software in order to drive
8 flexibility and noting that regulation can impede
9 and slow progress with customized displays and
10 the like.

11 So, you know, noting how unique each
12 port area is. Guy Noll also building off of
13 Captain Kurtz's comments actually poses a
14 question to the HSRP so you all might just take a
15 look at this.

16 To pre-qualify ports for their survey
17 data incentivizing port communities toward
18 ownership of the port approaches of their
19 information assets and encouraging funding for
20 maintaining under keel clearance and air gas.

21 So this is information infrastructure,
22 not just physical infrastructure. Lindsay Gee

1 also comments on PPU's and he makes a leap in this
2 comment from, you know, acquisition of surveying
3 data to certifying a port who compiles their own
4 ENC or updates, ENC data, you know, within their
5 area.

6 So that is a big jump from our
7 external source data process now, but something
8 to think about. I'm going to skip ahead. Bob
9 Moshiri, Johnson Outdoors appreciated the
10 comments from Mary Paige in support of
11 recreational boaters.

12 And reiterates his comment from
13 yesterday about more emphasis on surveying near
14 shore areas and the Great Lakes. I did see, I'm
15 going to jump to it.

16 This will be a little more ragged
17 because this came in after we had updated our
18 sheet. But Lindsay sent, submitted another
19 comment about the Alaska Coastal Mapping Strategy
20 and the imbalance of services delivered to
21 underserved communities.

22 Has there been any discussion or

1 progress on establishing a similar strategy for
2 the remote Pacific that has the largest unmapped
3 area in the EEZ?

4 So this brings us back around to our
5 bathymetric gap analysis and ties in underserved
6 communities as well. So we will get that comment
7 posted into this document during the break.

8 And if we, Admiral, what do you think,
9 do we have time to open the phone, open the line
10 rather?

11 RDML EVANS: I think we should. We
12 got a couple of minutes here and so I assume it's
13 technically feasible that if there are any
14 attendees who would like to make a verbal
15 comment, again, addressing NOAA or the HSRP Panel
16 Members, we can, we can open the line at this
17 point for them to do so. But I believe there's a
18 hand raise --

19 MS. CHAPPELL: Excellent.

20 RDML EVANS: -- raise function for the
21 --

22 MS. CHAPPELL: Exactly.

1 RDML EVANS: -- attendees that they
2 can use to signify their interest in speaking.

3 MS. CHAPPELL: Exactly. There is a
4 hand raise function and then we can turn your
5 microphone on. And you could also keep that in
6 mind for tomorrow's public comment too.

7 If you're not prepared today, but want
8 to say something tomorrow. All right, I'm
9 scrolling through and I don't see any raised
10 hands.

11 RDML EVANS: Me either.

12 MS. CHAPPELL: So why don't we wrap up
13 this public comment period and look forward to
14 tomorrow's. All right?

15 RDML EVANS: Yes. I think that makes
16 sense. Thank you to everyone who submitted
17 public comments. There's a lot of really good
18 questions embedded in there which we'd be happy
19 to dig into further. And some outstanding ideas.

20 At this point, I believe we have a
21 break coming up so I'll turn it back to Sean
22 briefly for any closing comments before the break

1 and to take us out.

2 CHAIR DUFFY: Thank you, sir. So we
3 do have a 15-minute break. I like to hit some
4 quotes every now and then. I'm going to read one
5 of my favorites from Steve Jobs.

6 It kind of goes with my approach to
7 the Panel Members. To build a strong team, you
8 must see someone else's strength as a compliment
9 to your weakness and not a threat to your
10 position of authority.

11 I thought that was very fitting.
12 Counting on a lot of you to help explain the hard
13 stuff to me. But with that, look forward to
14 reconvening in 15 minutes and we officially have
15 a time out.

16 (Whereupon, the above-entitled matter
17 went off the record at 11:00 a.m. and resumed at
18 11:18 a.m.)

19 CHAIR DUFFY: All right, well welcome
20 back from break, everybody. I see Nathan was
21 noted on here, but I'll just go to turn it over
22 to capable hands of Eric and Mary Paige on the

1 working group discussion on issue papers. The
2 floor is yours.

3 MEMBER ABBOTT: Well, good afternoon
4 and first what Eric and I have just to quickly
5 review, we have decided to split the
6 responsibilities here.

7 And he will be championing the issue
8 paper focus and I will be helping maintain the
9 matrix and such. And as such, we are not going
10 to take a look at the matrix at this moment.

11 We were going to go straight into the
12 issue papers as those which have been presented
13 to the group and Eric, you may have the floor.

14 MEMBER PEACE: So good afternoon.
15 We've got to the point where we have the geodesy
16 issue paper was complete and posted. So that one
17 is finished, the geodesy crisis.

18 The second one that is currently
19 awaiting approval is the digital twin. So in
20 your, in your documents, you'll see that the
21 results were in paper which has been drafted and
22 has been put in there.

1 It's got the top part like six, seven
2 down on the actual Google drive. Has anybody had
3 a chance to look at it? I guess a better way to
4 phrase it is, anybody not had a chance to review
5 the final draft of the digital twin paper?

6 It's dated the 25th of February of
7 this year.

8 MEMBER THOMAS: I think that I'm good
9 with, this is Julie, Eric. And I think that my
10 changes or edits were included in that so that's
11 fine with me.

12 CHAIR DUFFY: This is Sean. I'll just
13 say I second that. I saw we made a bunch of
14 changes, been edited a bunch, but I'm fine with
15 the version as discussed.

16 MEMBER PEACE: Like I said before, is
17 anybody not ready to vote on the digital twin
18 paper as to whether to move forward with it? All
19 right, great.

20 I guess then we take the vote at this
21 point. It sounds like it's been seconded, first
22 and seconded by Julie and Sean and all those in

1 favor, say aye.

2 (Chorus of aye.)

3 MEMBER PEACE: Any opposed? Thank
4 you. Great so the digital twin paper will go
5 forward from here. And with that said, I won't
6 belabor the point.

7 I know Qassim has been definitely
8 looking forward to this day with the digital
9 twin. But --

10 MEMBER QASSIM: I am now.

11 MEMBER PEACE: Moving on, is there any
12 other additional digital twin papers or excuse
13 me, not digital twin, any additional papers we
14 want to put forward or propose working on?

15 I know Deanne had talked a little bit
16 about the sand waves. I don't know if that's
17 still in her consideration if anybody else wants
18 to get on that or if there's any other topics
19 that we want to bring up for an issue paper.

20 MEMBER QASSIM: Eric, I have
21 suggestion. We are probably going to or we are
22 planning to discuss it next, the technology

1 folks, as you ask I can just bring it up as a
2 placeholder.

3 We are thinking about the importance
4 of interoperable land and sea which is connecting
5 all our coastal bathy data, the BlueTopo to the
6 3DEP, the NWLON, the USGS.

7 It is very important for all the
8 things we are talking about coastal resilience,
9 modeling, we really need that connection. So I'm
10 seriously thinking about drafting after I talk to
11 the few individual, Admiral Evans at length for
12 me.

13 I didn't have a chance, I was focusing
14 on the digital twin. But after this meeting, I
15 will start brainstorming with NOAA staff on it
16 and see what we can do. That's all I can say
17 now.

18 MEMBER PEACE: Okay. And Deanne, are
19 you still with us?

20 MEMBER HARGRAVE: Yes. I'm here.

21 MEMBER PEACE: Any further thoughts on
22 the sand waves?

1 MEMBER HARGRAVE: Well, they're still
2 out there and they're still moving around. And I
3 think about them a lot. But I may be unique in
4 that.

5 Although, you know, I did hear, you
6 hear about it, tangentially in a lot of the other
7 conversations, coastal resilience, the
8 presentations we've had in the last day and a
9 half. I think it's still relevant.

10 I'm not quite sure if it's quite ready
11 for a paper just yet. I really like the idea
12 that Qassim just floated about the transition
13 between offshore and onshore.

14 And I think that it's a little bit
15 related to building the mobile seabed as well.
16 Like that's a, that could be a component of that
17 issue paper or the transition issue paper could
18 kind of have some bits that come out of it.

19 And one of those more focused areas
20 could be the sea bed mobility or, you know, other
21 things of interest. Yes, that's just kind of
22 where my head's at, at this moment.

1 I don't know if others of you have had
2 a chance to think about that as well or have
3 other thoughts the seabed mobility.

4 MEMBER PEACE: Well I do and the
5 reason I say that in particular to the Great
6 Lakes here we're typically a shallow essentially.
7 I mean, yes, we do have beds, but we've seen, I
8 hate to say this because again, I look like a
9 crazy man out in front of an icebreaker.

10 But the lack of ice out here on the
11 Great Lakes and the increased intensity of storms
12 has driven more sediment along the shoreline in
13 that open water and moved it into the harbors as
14 opposed to tributaries dumping sediment in.
15 We're actually getting more movement on the
16 bottom which is shoving sediment into the harbor
17 entrances. And it's also moving into our track
18 lines out in open water where those essentially a
19 sand waves are pushing up because of the heavy
20 winds and stuff that we've been getting in the
21 storms.

22 And then couple that with staged in

1 Lake Erie, which is a big, basically a big
2 bathtub. It's sucking sediment back and forth
3 between Buffalo and Toledo and pushing it into
4 those harbors as well.

5 And so I think it's an interesting
6 topic. I think it's something that we could
7 predict or maybe look at those a little bit
8 closer. Maybe it's something we look at in the
9 future, but I think it's something important.

10 MEMBER HARGRAVE: Yes, I think, I
11 think it ties to the really the conversation
12 we've been having here about I mean to be able to
13 predict sand waves, you need to have data.

14 You need to have the bathymetry data,
15 the exact kind of data that NOAA produces
16 fantastic, right? But not just at one point in
17 time. Right? Not the data from 1948.

18 You need to have sequential data that
19 you can use to analyze that fourth dimension
20 time. And so I think it links to kind of a
21 broader topic of you can build a, you can build a
22 model at any point in time and it's a great model

1 for that point in time, but things change.

2 And so, the model is only as good as
3 it was when the inputs were valid. And so the
4 more and more that we build tools that are great
5 tools and we're using those and we become
6 dependent on those, the more important it is that
7 we're able to add new data.

8 And continue to keep the tool or the
9 model relevant, otherwise, it loses its effect.
10 And the key bit there where I think, you know,
11 maybe we can help explain the importance of that
12 sequential data or repeat surveys, is where it
13 comes into the budget in thinking about okay, if
14 you, if you want to build a tool, you have to
15 plan for not only building the tool, but for
16 maintaining it for the lifetime of the usability
17 of that tool. Right?

18 So I don't know, my brain just went on
19 a little bit there at the end. Sorry for that.

20 RDML EVANS: Julie, did you have
21 something?

22 MEMBER THOMAS: I do. I was thinking

1 about the seabed mobility during these talks
2 today, Deanne, and that issue paper. And I'm
3 wondering if it doesn't fit more with the, and
4 Nicole Elko should definitely chime in here.

5 But there's been talk of sediment
6 movement, the channel of Long Beach, some of the
7 coastal resilience talks and what Eric just
8 commented on the Great Lakes.

9 I'm wondering if we don't want to make
10 it a little bit broader than just, you know, wind
11 farm seabed mobility, but talk about the
12 influences or the challenge of sediment movement,
13 seabed movement, seabed mobility, sediment
14 management, whatever.

15 And we could wrap it -- you know, I
16 think that there's people on this Panel that have
17 expertise in a certain area that they could
18 contribute a paragraph as another example or
19 something like that.

20 And so we kind of tie it into a larger
21 picture of sediment management and how do we
22 monitor, how do we observe that, how do we

1 monitor it, the effects, whatever?

2 That was my thought. Great issue
3 paper. Nicole, do you have a comment on that?

4 MEMBER ELKO: I do, thanks, Julie.
5 That's okay, I'm expecting Julie's remarks that I
6 was thinking the same thing like, you know, I
7 think in my mind the goal of this paper should be
8 to motivate the cause of the themes coming.
9 Right? We need more data in the near shore, and
10 this is one very, very compelling reason why.
11 And then we can link it back to the NOAA mission
12 as like resilience navigation of others.

13 Yes, it's just, you know, when it
14 comes to sediment for me, this is like my world
15 and Tuba's world and, you know, trying to narrow
16 it down is a big challenge. We struggle with
17 that and --

18 MEMBER THOMAS: But I think we should
19 take advantage of your expertise, both of you and
20 Tuba and some of these challenges that other
21 people on the Panel are seeing, and, you know, I
22 could see an issue paper coming together that was

1 kind of this larger picture and whether or not we
2 do the topo hydro, I hadn't really thought of
3 merging that as an issue paper, because to me
4 that might be such a big challenge. I don't know
5 enough about the actual status of that or what
6 efforts have been done and so I guess that would
7 leave it up to I don't know, Evans and Qassim to
8 see if it would be merged in.

9 But, you know, all of these topics I
10 think are good is what I'm saying.

11 CHAIR DUFFY: I'd just like to jump in
12 real quick and say when we were talking about
13 offshore, I didn't have much to say, but sediment
14 transport on Mississippi River is a huge issue,
15 not a great deal of information.

16 I will throw out that I mentioned I
17 think at the last meeting I had co-authored a
18 paper with some scientists from Tulane Coastal
19 Studies.

20 We are, they invited me back for a
21 second goal and that is related to sediment
22 transport on the Mississippi River. I would just

1 say, I'd like to see it, of course, I'm not the
2 scientist on this, but I would be happy to share
3 that information that came from other scientists
4 just to help improve, but I'll even say we call
5 sand waves sediment kind of moving on the bottom
6 of the river. Probably not the most accurate
7 scientific term, but it's what a lot of the CORS
8 and Pilots Navigation Members talk about where
9 those speeds sometimes of change in draft or
10 change in water depth of over five feet in a 24-
11 hour period. So very relevant, like to see this
12 happen and contribute. Thank you.

13 MEMBER PEACE: Admiral Evans, do you
14 have something?

15 RDML EVANS: Thanks, Eric. I
16 certainly, you know, I'm always sensitive to my
17 role here and these discussions and don't intend
18 to tell the Panel it's business.

19 I would just offer that we could, if
20 the Panel is interested, work to put together a
21 discussion at a future meeting or a future
22 working group meeting focused on seabed mobility,

1 where it matters, where it doesn't, the various
2 tools and techniques utilized or available to
3 tracking it.

4 Because not in all cases do you need
5 to perform a full re-survey. They're remote
6 sensing techniques and others that can be
7 utilized to help with recognizance to identify
8 these areas with where the seabed is moving.

9 And I would offer that could be a
10 first step to get us all a little bit smarter on
11 the topic before going ahead to an issue paper.
12 That said, if the Panel feels that they know what
13 they need to know on this, and they want to move
14 ahead, it's not my place to stand in the way of
15 that. I certainly wouldn't want to, but I would
16 just offer that through the meeting process we
17 might be able to pull this together a little
18 tighter.

19 MEMBER ABDULLAH: So, Eric, if I can
20 add to this, maybe it's a good idea to plan on a
21 Panel on the topic in the next meeting would be
22 good. I think that's what Admiral Evans probably

1 alluding to. I think it would be a good to
2 educate ourself more about it.

3 MEMBER OZKAN-HALLER: I agree. I
4 really like that idea. If I can jump in, may I?
5 I think this topic also dovetails really well
6 with what we heard yesterday about Long Beach
7 hardware.

8 And we talked about how they, you
9 know, generally enjoy a bathymetry that varies
10 relatively little compared to some of these other
11 places like the Mississippi River or yesterday
12 too I mentioned the mouth of the Columbia River.

13 Not the Columbia River, right? Four
14 million cubic yards of sediment dredged every
15 year. That's like, that fills up multiple Empire
16 State Buildings with sand every year.

17 I mean, that's all sand that fills in
18 and we don't actually know if that happens during
19 the first storm or the last storm or, you know,
20 equal amounts over the course of time so there's
21 a lot there.

22 And Admiral Evans, I also liked your

1 comment about there are, you know, technologies.
2 There are ways of observing the bottom changing
3 once we have a baseline.

4 And so it would be really good to have
5 a session where we can talk about some of those
6 innovative new ideas and yes, and family
7 certainly ties in, ties in with, you know,
8 offshore wind development and things like that
9 too.

10 I wonder though, like how much does
11 NOAA view sediment as its, you know, as its main
12 worry or issue? Is there, am I reading, is there
13 an issue there at all?

14 Like is that something that NOAA's
15 like oh, no, that's somebody else's purview and
16 not ours? Thank you, Ben, for coming online for
17 that one.

18 RDML EVANS: Sure and I'll try to
19 address that. And I would, you know, ask any of
20 the other NOAA experts or office directors who
21 may have an opinion here to offer it and I think
22 that, I think the answer to that is it depends.

1 Certainly from the Hydrographic
2 Services Review Panel perspective, from a purely
3 navigation perspective and from a, you know,
4 where is the seabed?

5 You know, we care about that because
6 that's our job. Right? We, you know, our job is
7 to ensure, you know, that fundamentally safety of
8 service navigation within U.S. waters more
9 generally provide accurate seabed model water
10 levels geodesy that support a wide range of
11 navigation and non-navigation uses.

12 And certainly seabed mobility sand
13 waves, sediment transport is part of that because
14 it affects the answer. Now as a practical
15 matter, but do we regard, you know, the science
16 of tracking those, of tracking sand waves for
17 instance?

18 That is less squarely in our wheel
19 house. That's probably more say a USGS emission,
20 understanding the physics of how and why sand
21 waves move.

22 There may be other pieces of NOAA that

1 have a strong interest in that potentially in the
2 fishery service or the other components of the
3 agency.

4 But I think it's, you know, we again,
5 you having an interest in responsibility for
6 understanding the shape and character of the
7 seabed, this does fit.

8 I think for us, you know, thinking
9 about limited resources, part of that would be
10 all right, well where does it matter most? And
11 I'm drawn back to and I think Deanne and I shared
12 this example with you when you brought this up at
13 the last meeting. Right?

14 These huge sand waves, Long Island
15 Sound that I remember surveying as a junior
16 officer on the Rude more than 20 years ago. And
17 yes, they had moved significantly.

18 And then kind of wondering to myself,
19 well does this really matter? Right? You have a
20 control in depth is the same here and yes, that
21 sand wave moved maybe a quarter of a mile, the
22 peak of that sand wave.

1 But the controlling depth is still the
2 same so how much does it, is this a dangered
3 navigation? Is this not a dangered navigation?
4 Clearly, it needed to be portrayed on the chart,
5 but was it a crisis, you know, that somebody was
6 going to hit this thing that was 30 feet below
7 the sea floor or before below the surface?

8 I think those are the sorts of
9 questions that we wrestle with a little bit in
10 terms of whether we dedicate resources to
11 tracking these on a regular basis.

12 Now, but again, if we understood the
13 requirements better, for instance, in offshore
14 wind, that might influence our decision making
15 and, you know, to Tuba's point, maybe there are
16 remote sensing or the recognizance techniques we
17 could use to identify where things are moving so
18 that we can, we can react appropriately.

19 MEMBER PEACE: To put into exact
20 context of the Admiral's statement, so for the
21 first time ever, we've actually had encroachment
22 of a shoal in the open lake.

1 So typically open lake is obviously
2 not maintained by the Army Corps, there's no
3 dredging out there. But now we have one of our
4 traffic separation scheme routes which is our
5 recommended route sitting on top of a shoal that
6 moved on us over the last year and a half or so.

7 So that would be someplace where
8 probably NOAA would have an interest because I've
9 got nowhere else to go. I've got to go to NOAA
10 for that one because the Corps won't do anything
11 with it.

12 But as we plan and as the Coast Guard
13 like if you look at Nathan, if even they start,
14 the Coast Guard starts laying out these paths,
15 the traffic separation or I forget what they call
16 it now, port access, between different areas,
17 those are going to be planned routes.

18 And so if we know that there's
19 something moving in that area that could impact
20 navigation, you wouldn't put that planned route
21 on that location. Well, good discussion. I
22 guess we'll open it up. Is there any other

1 issues, working group I know we want to save some
2 time here for Nathan to talk about the Artic,
3 anything else anyone wants to discuss? Julie, I
4 see a finger.

5 MEMBER THOMAS: Can I just say one
6 thing? I would really, I just put it in the chat
7 too. I would propose taking advantage of our
8 working group meetings to take Ben up on his
9 offer here to see if we could get a little bit
10 more educated about what NOAA is doing in this
11 sediment realm.

12 And to kind of get a head start
13 particularly if we're going to do an issue paper.
14 Rather than just wait for a Panel at the next
15 meeting, I think we, this could be a good
16 discussion over the next six months is what I'm
17 saying.

18 MEMBER PEACE: I agree.

19 MEMBER HARGRAVE: That sounds like a
20 nice approach, Julie. Definitely, you know,
21 helpful to understand what is already being done.

22 MEMBER THOMAS: Worth talking, yes.

1 MEMBER HARGRAVE: Yes, and also to
2 give us a little bit more time to frame the
3 potential issues. Right? And then line those up
4 with where it does align with NOAA's or the
5 analyst's core mission.

6 I think that makes a lot of sense.
7 Maybe and that is a bit of a two-way conversation
8 of understanding what NOAA is already doing, but
9 also having some you know, some of Eric, you
10 know, your example having a few industry experts
11 or whoever come in and talk about how this is
12 relevant to what they're doing.

13 And I think we, like you said, Julie,
14 we have a lot of that expertise here on the Panel
15 to have some of those conversations.

16 MEMBER PEACE: I just have a really
17 quick question, Admiral. When we have hurricane
18 response after a hurricane moves through an area,
19 is NOAA doing -- are they looking at anything for
20 movement on the shifting bottom?

21 RDML EVANS: Absolutely. So I think
22 and I don't want to speak out of turn, it really

1 depends on the nature of the impacted area. So
2 you know, often the, well let's take Port of
3 Virginia, for example.

4 The approaches of the Chesapeake.
5 Depending on what the Coast Guard identifies as
6 the impacted area or the portion, the draft
7 restrictions they may have implemented, the
8 portion of channel, if any, that they have, you
9 know, shut down.

10 That would be our first priority to
11 survey to give them confident to re-open. As
12 part of that, we're looking for any change in the
13 character of the seabed or things on the seabed.

14 Whether that's, you know, seabed
15 mobility, you know, shifting sand or, you know,
16 debris that may have washed into a guts channel
17 or into a navigation channel.

18 It's really any or all of the above so
19 we're not exclusively looking, for instance, for
20 a lost container and ignoring shoaling or
21 shifting sand.

22 It's looking for change detection of

1 any sort in the assigned area.

2 MEMBER PEACE: That definitely sounds
3 like a climate resiliency issue to me, but okay.

4 RDML EVANS: So as I muddle through
5 this, anything else with the issue papers anybody
6 would like to bring out?

7 MEMBER HOLTZ: This is Kim. I had a
8 question because obviously being new, you know,
9 like topics for issue papers, but I was, we're
10 talking about precise navigation, you know, like
11 I was surprised of Port of L.A. hadn't switched
12 to that, you know, completely in their port where
13 the Port of Long Beach has.

14 And I'm wondering, you know, we've
15 been so successful because we're doing our own
16 surveys, submitting them to NOAA for CATZOC
17 rating.

18 Would that be an appropriate issue,
19 paper to talk about how one port is successful
20 and how other ports could start providing their
21 surveys to NOAA for a higher rating for precise
22 navigational purposes?

1 I would say it would probably be the
2 larger ports, you know, commerce ports. But I
3 wasn't sure so it was more question.

4 MEMBER PEACE: Anyone?

5 RDML EVANS: I'll just say, you know,
6 I don't want to speak for the Panel, but I would
7 say that from a NOAA perspective, having that
8 story told would be very powerful for us.

9 And I think we could also incorporate
10 into that discussion of our external source data
11 pipeline. And improvements that we, you know, I
12 think depending on how we wanted to approach
13 this, we could talk about the Panel could address
14 the external source data pipeline in general.

15 Or in -- or specific to particular
16 large ports that may be conducting their own
17 survey work. I think there's, it's in some
18 respects, there's a good story to tell there.

19 And so for us that's always good to
20 have to be able to point to, but I think there's
21 also some technical work and some connecting that
22 we could get at through a paper like that as

1 well.

2 RDML EVANS: Julie, you're -- Julie,
3 you're on --

4 MEMBER THOMAS: Muted. Can I talk for
5 just a -- I just have a question about these S
6 products. Does someone have to, because it came
7 up this morning about I think it was Captain
8 Kurtz that mentioned about the, you know, she was
9 talking about the different PPU's.

10 And I've seen many of the varieties
11 that are out there, but does it have to, do the
12 PPU's have to be of a certain quality, power, it's
13 not a highly -- to run the S products, you don't
14 need anything special as far as the operation of
15 PPU goes?

16 RDML EVANS: So maybe I'll tackle that
17 and I would offer, you know, Caroline or others
18 who are more knowledgeable. So there, you know,
19 as has been noted, there's no regulatory, there's
20 no regulations on PPU's.

21 Different pilots associations are free
22 to use whatever they would like and call it a

1 PPU. Some of them have things on tablets, some
2 of them have laptops. It really runs the gamut.

3 There is definitely a probably a
4 performance limit of the hardware and the
5 software below which you are not going to be able
6 to realistically utilize.

7 And that's S-102 or a file or suite of
8 S-102 files and cut contours, customized contours
9 from that data as that product is intended to
10 support.

11 I don't know if we've explored that
12 limit. But I suspect that there is a floor below
13 which you're just not going to get the kind of
14 performance you need.

15 MEMBER THOMAS: I guess I was just
16 wondering how many PPUs out there and obviously
17 this is kind of jumping ahead, but you know, if
18 we were going to do a paper on how great this
19 product, these products are, I guess we would
20 like to have some ideas too that were -- we want
21 to make sure we get the full gamut of the pilots.
22 Right?

1 And what their, if there are
2 restrictions. And I don't know enough about this
3 so I see Captain Kurtz and Qassim both have
4 something here to contribute. Much more than me.

5 MEMBER PEACE: I'll call Caroline
6 first. I think that just dovetails nicely and go
7 ahead Caroline.

8 MEMBER KURTZ: Yes, so right. So
9 there are no standards for this. And I can only
10 speak from my own personal use of the devices
11 over the years.

12 And we've had several different
13 evolutions of the equipment. The SEAIq software
14 seems to be very accommodating. Many of us were
15 downloading the Army Corps soundings because we
16 work on dredge channels with center lines.

17 So that's like a primary piece of
18 information that we're using as cross track error
19 from the center line. And so, you know, we just
20 were able to go right to the Army Corps website
21 and get those files and load them up on SEAIq.

22 So I imagine that would be similar for

1 using the S-100, 102, you know, whatever those
2 products are. And the vendor, SEAIq, they'll
3 make any kind of software adjustments, you know,
4 they're very accommodating to customize the
5 product for the user.

6 So you know, typically, if pilots need
7 the equipment, they're going to get the best
8 equipment they can get so that it's useful.

9 Because the idea is that, you know,
10 you're doing this in fog or in rain or, you know,
11 whatever the, your enhanced, circumstances are
12 where you need more help than maybe just looking
13 out the window.

14 Anyway, so that's just a little bit of
15 how that works, but it's been my experience every
16 time we've gotten a different system, we're able
17 to customize it for the port.

18 So you know, you certainly do a survey
19 of pilot associations, you know, as simple as
20 sending out a questionnaire to every group.
21 There's a, you know, like a master list and, you
22 know, what equipment do you use.

1 And are you able to, you know, expand
2 what you're doing with what you have? So.

3 MEMBER PEACE: Next we go to Qassim
4 and then Kim and then Sean looks like he's ready.
5 Go ahead Qassim.

6 MEMBER ABDULLAH: I'm sorry, I was
7 muted. Thank you, Eric. That's great discussion
8 and can you just give me a thought about maybe
9 it's time we do kind of technology showcase.

10 Where we write a few of these PPU
11 manufacturers because I just got informed Garmin,
12 they have two events. I'm not sure how good this
13 is, but where I can work with Caroline or anybody
14 and we can put kind of Panel for these
15 manufacturers to adjust that.

16 Because as it's hit directly to our
17 precision navigation efforts, you know, so we
18 would know how they, their software committee are
19 open for data or the Corps of Engineers data or
20 something like that.

21 What's capability? What's accuracy?
22 I think it would be a really great time at the

1 next meeting. We can organize manufacturer
2 showcase if that's okay with you guys.

3 MEMBER PEACE: Thanks, Qassim. I
4 don't think there's any objection. Kim, did you
5 have a comment?

6 MEMBER HOLTZ: Yes, I was just going
7 to say so in Long Beach, you know, Jeff Ferguson
8 from NOAA, Jon Dasler from DEA, the port
9 surveyors and Jacobsen Pilots, we all kind of
10 worked because we were kind of the test for
11 Precise Navigation files.

12 So once we got it set up, it seems
13 like it's pretty seamless or seamless for them
14 when they want to update files. The one comment
15 we just got back from Jacobsen Pilot is, you
16 know, because we're doing our surveys and we go
17 out every year and do half the port, they want
18 that data the next day.

19 Well, you know, we have to submit it
20 to NOAA to be, you know, to get into the system.
21 So we're trying to work out that mechanism with
22 them now because, you know, as we've given them

1 more precise data and every pilot you know, in
2 the port of homage is using it, they don't want
3 to wait six months to get an updated S-102 file.

4 So, you know, that is an issue that
5 could come up, you know, as you give them better
6 data, they want it quicker and quicker. So I
7 just wanted to make that comment.

8 CHAIR DUFFY: So I wanted to chime in
9 and first I think the Admiral made an good
10 audible suggestion there instead of an issue
11 paper to look at a Panel.

12 Qassim I will say not to be
13 disagreeable, but I think like a technology
14 showcase is a little out of our bounds. There
15 are technology showcases that exist.

16 I can recommend them where a lot of
17 the pilot PPU manufacturers attend. One of the
18 more famous ones is NAVTEQ, but there are others.
19 And I'll say that for, you know, and make a
20 statement.

21 I think close to a third of the pilots
22 in the country reside along the Mississippi

1 River. And we don't have like even going back to
2 CATSAG, we can't do that on the river because we
3 rely on single-beam data because the bottom
4 changes so much.

5 There's a 30-mile stretch from Venice
6 to the sea buoy that you can see five to seven
7 foot changes in a 24-hour period. By the time
8 the multi-beam survey would be ready, it would be
9 irrelevant.

10 So kind of, I think part of our
11 efforts should be to know more about what's out
12 there not try to look at standardizing the pilot
13 units, but here one of the big lacking things is
14 the amount of surveys and sensors.

15 There's probably about a 150 miles or
16 more of the Mississippi River that are not
17 surveyed or routinely surveyed. And, you know,
18 although Jon Dasler was mentioned, David Evans
19 and Associates did a hydrographic survey as a
20 Polish Ship Channel.

21 I think it was completed in 2019, but
22 it's five years old. It was a great effort and

1 update, but actual real time data is missing and
2 I would just be careful about that.

3 And although I think it's good to, you
4 know, talk in some of the groups and discussions
5 here, we'll familiarize ourself with what is out
6 there, what's available and I think trying to
7 standardize PPU that's trying to like tell
8 Microsoft and Apple how to do their programming.
9 And I think that's beyond our effort.

10 MEMBER PEACE: I'm getting the virtual
11 hook here. We have five, four minutes now. So
12 with that, I'll turn it back over to Sean and
13 we'll have another session that's similar to this
14 next time tomorrow.

15 So we can expand on some other issues
16 then. Sean, you want to close us out?

17 CHAIR DUFFY: Sure. I will exactly,
18 I didn't want to cut anybody off and, of course,
19 went back on mute for about a second there. So a
20 lot of great discussion.

21 I want to try to keep us on time and
22 give the Admiral a chance to comment as well.

1 Again, you know, this team is amazing. There's a
2 lot of experts in varied fields and trying to
3 keep us pointed in the right direction is, you
4 know, a challenge, but it's great to hear all the
5 talks.

6 Eric and Mary Paige, I'll thank you.
7 I've worked on a bunch of issue papers since
8 being here and the wordsmithing going back and
9 forth and multiple versions, that digital twin
10 paper gave you a lot of experience to see that.

11 With that, I'm going to turn it over
12 to the Admiral for any final thoughts before we
13 close out for the day.

14 RDML EVANS: Yes, thank you, Sean.
15 And thank you, Eric and Mary Paige for marshaling
16 that last conversation. I was getting all
17 excited and into it and then realized that we
18 only had five minutes left.

19 So Eric, thank you for bringing that
20 to a close. Although I think as you said,
21 there's a lot more to unpack there. I'll just
22 note that we have your starting at 8:30 a.m.

1 Eastern, 11:30 a.m. Pacific tomorrow morning.

2 First up will be another hour as we
3 had this morning for round robin and reflection
4 on today. So be ready for that. But I realize
5 it feels like we're kind of drawing a hard line
6 here at the end of what's been a very productive
7 day.

8 Although we'll have some time to think
9 on it and reflect tomorrow morning when we
10 reconvene. So with that, I think that's
11 everything I wanted to share. Thanks again to
12 the Panelists.

13 And to our attendees, any of whom are
14 still on with us. Sean, if there's nothing
15 further, I think we can adjourn for the evening,
16 the afternoon.

17 MEMBER CHAPPELL: Can I interrupt just
18 for a quick second. This is Ashley.

19 RDML EVANS: Yes, sure Ashley.

20 MEMBER CHAPPELL: Just to be clear,
21 it's 8:30 a.m. Pacific time, 11:30 a.m. Eastern.

22 RDML EVANS: Okay, sorry if I --

1 MEMBER CHAPPELL: No worries, no,
2 worries. Just got flipped around.

3 CHAIR DUFFY: That's part of the
4 problem between knowing whether it's morning or
5 afternoon.

6 MEMBER CHAPPELL: I know.

7 CHAIR DUFFY: Kind of in the middle
8 here. So -- We appreciate all the efforts. A
9 lot of great teamwork here. I'm happy with the
10 progress and process and everybody's
11 contributions.

12 Welcome the new Members, remember some
13 of the old Members and I'd be remiss if I haven't
14 mentioned Lynne Mersfelder-Lewis. Ashley, you've
15 done a great job. The team's been great.

16 A lot of support. There is a lot
17 going on that nobody else will know, but well
18 done. Thank you. I'm ready to close this
19 meeting out and see you tomorrow.

20 Qassim, I think are you here to say
21 good bye? Or you have a --

22 MEMBER ABDULLAH: Yes, no, I just say

1 good evening to you. You are doing a great job.

2 CHAIR DUFFY: I just want to make
3 sure. Don't ever want to stop any brilliant
4 minds, so thank you, team. Let your jerseys get
5 washed tonight and freshen them up for tomorrow.
6 Look forward to seeing you in the morning.

7 (Whereupon, the above-entitled matter
8 went off the record at 12:00 p.m.)

9

10

11

12

13

14

15

16

17

18

19

20

21

22

A	
a.m 1:11 5:2 149:17,18 183:22 184:1,21,21	Act 79:16,20
A1 39:6,9	action 47:20 99:6,17 106:17 117:7 126:14 135:10
AAPA 80:13,15,18 81:1 81:12	actions 81:18 111:5
Abbott 1:15 4:13 9:2,7 131:21 134:5 135:16 136:6 137:1,10,13 150:3	active 52:21 62:17 116:7 127:5 133:11
ABDULLAH 1:15 11:1,4 129:17 131:7,15 162:19 178:6 185:22	activities 74:14 86:16
ability 48:11,13 61:2 72:6	activity 73:13
able 6:9 20:20 26:11 29:19 32:5 38:5 47:22 56:13 104:1,5,9 116:11 143:19 156:12 157:7 162:17 173:20 175:5 176:20 177:16 178:1	actors 81:15
aboard 36:14 41:12 43:6	actual 151:2 160:5 182:1
above-entitled 149:16 186:7	adapt 31:17 92:1 96:9 123:15
absence 19:17	adaptation 4:8 69:21 70:9 77:2 84:13,14,17 92:3,8,18 93:3 94:18 98:19,21 99:18 125:8 129:10 134:22
absolutely 21:6 59:2,20 67:5 90:17 135:5 139:5,5 170:21	adaption 32:3
absorbing 50:10	Adaptive 4:3 65:5,12
abstaining 65:1	add 34:11 41:16 48:5 50:1 57:18 66:12 76:8 108:5 157:7 162:20
academia 100:15 101:11 112:16	added 13:3 111:19 116:11
academic 78:3 81:14 82:5	adding 106:9 138:9
Academy 41:21	addition 21:2 69:18 74:20 109:12,16
accelerate 68:6	additional 51:18 61:10 133:1 152:12,13
accelerating 72:17	address 42:19 88:2 135:15 164:19 173:13
access 6:3,19 30:17 90:2,7 97:15 108:3 115:3 125:1 132:9 168:16	addressing 8:3 71:5 99:21 110:9 147:15
accessed 140:22	adds 128:16
accessible 64:22	adequate 6:1
accommodate 45:22	adjacent 14:22
accommodating 176:14 177:4	adjourn 184:15
account 134:21 135:6 135:10,14 136:3	adjust 178:15
accounting 93:13,14	adjusted 62:2
accuracy 11:15 18:4 178:21	adjusting 61:15
accurate 161:6 165:9	adjustments 177:3
acknowledge 57:15	ADMINISTRATION 1:3
acquiring 36:4	administrative 5:16 7:8 62:7
acquisition 146:2	administrator 2:9,11 57:5 65:16 84:2 119:17 141:3
acronyms 41:18	Admiral 7:10 16:16 24:11,16 56:22 62:9 63:6 65:10 67:13 143:12 147:8 153:11 161:13 162:22 163:22 170:17 180:9 182:22 183:12
	Admiral's 167:20
	advance 63:20 64:7 91:15
	advanced 110:14 119:3
	advancing 56:17
	advantage 48:11 159:19 169:7
	advise 23:14 141:2
	advises 119:16
	advisors 53:1
	Advisory 42:6
	advocates 52:17
	AECOM 125:7
	aesthetic 108:2
	affairs 3:4 66:1 100:20 102:17 103:19 117:15
	affect 24:7 31:8 67:1
	affiliated 78:13
	affirmative 133:6
	afternoon 5:4 41:11 47:3 49:18,19 50:19 53:22 150:3,14 184:16 185:5
	agencies 37:13,15,20 38:19 70:19,21 77:18 78:3 123:13 124:12 125:22 126:5
	agency 77:7,18 101:18 166:3
	agenda 7:17 8:5 14:4 61:16 62:1
	ago 15:11 32:14 35:3 91:20 166:16
	agree 11:5 114:21 124:17 131:9 163:3 169:18
	agreement 21:10
	ahead 12:13 17:12 81:16 100:5 109:3 120:12 122:17 129:16 131:17,19 137:20 138:7 146:8 162:11 162:14 175:17 176:7 178:5
	AI 17:10 25:20,22
	air 56:17 61:18 99:4,6 145:20
	AIS 43:13
	Alaska 66:14 146:19
	align 170:4
	alliance 77:12
	allotted 23:7
	allow 104:6
	allowed 115:4
	allows 59:9 94:12
	alluding 163:1
	alongside 102:9
	alphabetically 8:20
	alternate 8:5
	Amanda 2:19 144:19
	amazing 14:1 17:18 40:16 41:16 45:4 55:9 118:21 183:1
	amazingly 54:11
	Amber 2:15 5:15 7:7
	American 79:11
	Americans 71:17
	amount 9:15 16:2 36:3 138:9 181:14
	amounts 163:20
	amplify 13:20
	analysis 112:22 147:5
	analyst's 170:5
	analyze 156:19
	and/or 64:3
	Andy 2:2 49:15,18,18 50:17 54:3,14 56:14
	Angeles 47:18 85:12 96:15 135:3
	angle 89:16
	angler 135:22
	animal 125:13
	Anne's 15:16
	annual 73:17 132:13
	annually 71:9 73:14
	answer 44:20 121:9 129:22 131:1 142:1 164:22 165:14
	answers 129:12
	antenna 26:16
	Anuj 1:16 12:8,8,11 13:11
	anxiety 15:15
	anybody 54:16 114:22 151:2,4,17 152:17 172:5 178:13 182:18
	anymore 42:17
	anyway 44:19 46:5 75:20 119:10 120:2 177:14
	Anyways 9:8
	apartments 121:5
	apologies 12:11 32:9
	apologize 31:20 32:3 66:6 75:16 138:4
	app 75:13
	applause 13:20
	Apple 182:8
	applicants 94:11
	application 94:1,4,10 107:8
	apply 79:17 80:4 108:10
	applying 68:17 80:3
	appreciate 8:13 22:17 29:7 40:20 51:11 53:6 53:11,15,19 56:12 135:17 185:8

appreciated 146:9
approach 81:13 92:7
 98:20 99:19 149:6
 169:20 173:12
approaches 77:2
 145:18 171:4
appropriate 43:8
 123:10 126:17 137:8
 172:18
appropriately 167:18
approval 150:19
approve 126:6
approximately 96:14
area 33:12 42:22 48:13
 97:9 104:20 105:3,5
 105:10,12 116:6
 122:1 125:11 132:3,8
 145:12 146:5 147:3
 158:17 168:19 170:18
 171:1,6 172:1
areas 25:12 35:18 43:2
 72:19 97:17 98:4,9,10
 98:12 105:6 107:15
 114:10 121:11 145:3
 146:14 154:19 162:8
 168:16
arm 51:20
ARMSTRONG 2:2
 49:19
Army 77:8 102:20 168:2
 176:15,20
arrange 24:2
Artic 66:20 83:15,18
 169:2
article 66:18 83:16
Ashley 2:16 144:8,15
 184:18,19 185:14
asked 24:1 33:9 123:22
asking 15:10 68:4
 76:16 139:11
ASL 6:2,14
aspects 20:5 114:7
assess 78:20
assesses 95:21
assessing 130:12
assessment 77:9
 105:11 109:13,17
 111:1 112:20 116:21
 141:8,10
assessments 59:10
 92:17 93:9 105:12
 114:19
asset 96:7
assets 92:13,17 96:1,11
 98:14 140:12 145:19
assigned 172:1
assist 82:4
Assistant 2:9,11 57:4

65:15
associated 46:18
 119:18
Associates 181:19
association 10:14 13:4
 79:11
associations 43:4
 174:21 177:19
assume 38:1 147:12
assuming 38:4 41:11
athlete 34:6
ATMOSPHERIC 1:3
attached 7:17
attained 101:22
attend 12:12 47:22
 123:20 180:17
attendance 8:13
attendees 6:19 84:5
 143:22 147:14 148:1
 184:13
attending 54:16
attention 41:2 50:5,10
 50:15 83:8
audible 66:4 180:10
audience 128:7
audio 64:19
August 89:7 90:11
Austin 117:14
authoritative 68:18
 69:4 74:22 77:1 79:5
 80:5 81:7,10 82:12
authorities 35:6 69:16
 79:12
authority 116:6 149:10
authors 75:19
automated 16:5
autonomous 36:3
availability 12:4
available 44:8 48:9 49:7
 95:6 115:6 136:18
 162:2 182:6
average 140:3
aversion 95:13
avoid 43:3 134:14
awaiting 150:19
awards 115:17
aware 40:2 69:10 96:19
 126:15 131:10
awareness 29:12
awesome 30:21 67:5
aye 152:1,2

B

B 60:21 98:7
back 5:5 6:16 7:2 8:8
 23:9 37:7 47:21 54:12
 58:8 62:3 83:7 86:3
 89:7 95:5 96:20 97:3

106:19 117:4,11,18
 120:1 123:19 142:15
 147:4 148:21 149:20
 156:2 159:11 160:20
 166:11 179:15 181:1
 182:12,19 183:8
background 34:12,22
 47:7,14
bad 22:10 56:21
balance 5:21 6:19
bananas 73:1
band 6:1
bands 9:7
bare 13:6
barrel 11:21
barriers 80:3 81:6
 82:12 141:20,22
base 120:21 122:14
 132:10
based 8:15 95:4,6,16
 137:3 140:3
baseline 115:14 164:3
basic 84:19 110:13
 111:16
basically 156:1
basins 39:22
basis 19:2 69:17 167:11
bat 104:8 105:8
bathtub 156:2
bath 153:5
bathymetric 147:5
bathymetry 38:22 39:11
 40:14 156:14 163:9
Bay 41:8 42:1,2 85:13
 125:11 133:19
beach 3:6 4:8 22:6
 36:22 39:13 44:15
 47:18 48:20 51:12,15
 59:14 66:1,16 83:1
 84:15,20 85:12 86:14
 89:11,21 91:22 99:20
 119:4 126:12 134:9,9
 135:8,9 139:13 158:6
 163:6 172:13 179:7
Beach's 99:17
Becker 117:14
becoming 78:14 82:6
 89:5
bed 154:20
beds 155:7
began 91:19
beginning 94:6
behalf 68:4
beignets 19:19,21
belabor 152:6
believe 10:14 21:8 34:8
 69:4 80:22 83:20
 104:14,18 137:17

142:16 147:17 148:20
Ben 5:8 23:6 33:18
 56:22 65:10,12
 164:16 169:8
beneficial 62:16
benefit 71:3 107:20
benefits 105:7
BENJAMIN 2:12
berth 40:5
best 9:19 19:7 30:9
 43:17 53:17 78:5
 88:14 95:6 119:8
 125:17 177:7
better 28:7,14 30:17
 31:9,18 55:21 67:17
 76:9 82:11 87:18
 151:3 167:13 180:5
beyond 74:5 89:4
 106:13 111:1 112:1
 140:13 182:9
big 8:16 21:2,2 28:3
 31:10 38:15 39:9,17
 71:21 82:16 87:17
 88:18 108:7,15
 109:14 112:11 130:5
 136:11 146:6 156:1,1
 159:16 160:4 181:13
bigger 28:4 29:18 58:19
BIL 16:3
billion 73:12,13 79:14
 79:16 85:6 132:13,15
 132:18
billions 58:21
bit 6:10 24:5 25:10,15
 29:8 32:6 40:19 41:20
 57:17 68:3 70:17
 84:16 85:6,21 101:7
 110:2 112:15 115:11
 121:9 123:16,20
 129:1 131:18 152:15
 154:14 156:7 157:10
 157:19 158:10 162:10
 167:9 169:9 170:2,7
 177:14
bits 33:6 154:18
black 26:12
blow 56:20
blue 97:12 111:21
BlueTopo 153:5
board 49:4 68:1 70:18
 86:10,11 90:10
boat 88:10 130:9
boater 132:4,12 136:8
 136:19
boaters 132:8 133:17
 136:12 146:11
boating 134:10,22
 135:6 137:9

boats 132:16
Bob 146:8
body 70:19
bolts 110:2 111:14
bond 116:10
bonds 101:22
borders 69:17
bottom 75:13 155:16
 161:5 164:2 170:20
 181:3
bought 120:6
boundaries 93:20
bounds 180:14
bow 26:18
box 7:13,18 26:12,15
 64:2 144:1
boy 28:5
Brad 2:3 23:6 24:1
 33:19 52:2
brag 51:6
brain 157:18
brainstorming 153:15
Branch 58:9
breaches 90:3
break 89:19,20 90:3
 134:21 147:7 148:21
 148:22 149:3,20
briefly 101:5 148:22
brilliant 186:3
bring 14:14 40:5 45:22
 104:5 130:2 131:6
 133:13 152:19 153:1
 172:6
bringing 24:14 29:10
 183:19
brings 101:19 105:10
 147:4
broader 156:21 158:10
broke 120:7
brought 10:5 29:14
 30:18 40:6 42:20
 116:7 131:3 133:12
 134:2 166:12
brushed 19:21
bubbling 14:17
budget 36:7 157:13
Buffalo 156:3
build 18:13,15 19:3
 76:11 80:18 81:13
 87:13 119:22 130:21
 149:7 156:21,21
 157:4,14
building 19:3 59:11
 60:22 122:2,8 130:11
 130:16 145:12 154:15
 157:15
Buildings 163:16
built 78:19

bunch 23:18 151:13,14
 183:7
buoy 181:6
busiest 84:20
business 80:9 92:9
 113:10 161:18
business-to-business
 109:20
businesses 109:9
 113:16 114:16,19
 132:20
busy 80:10
Butler 2:15 5:15 7:10
 49:8,11
buy 118:19
bye 185:21

C

C-O-N-T-E-N-T-S 4:1
Cal- 123:14
California 25:7 52:22
 58:3 87:11,15 89:2,10
 93:18 95:8 96:17
 125:13,20,20 127:16
 132:22 135:13
call 30:3 40:21 41:7
 75:13 90:10,17 161:4
 168:15 174:22 176:5
called 77:12 114:1
calling 38:7
camera 6:9,16 118:14
 125:1
cameras 7:1,2,3 118:5
 118:9
canyons 27:12
capability 18:9 178:21
capable 149:22
capacity 69:7 112:4
 115:3
capital 69:14 87:6
CAPT 49:19
Captain 1:16,18 2:2
 13:12 24:1,4,10 41:8
 56:2 59:19 144:20
 145:13 174:7 176:3
capture 94:5
care 43:9 50:15 165:5
career 37:1
careful 182:2
cargo 85:6 87:19 99:8
Carnival 56:2
Caroline 174:17 176:5
 176:7 178:13
Carolyn 1:18 41:8
 144:20
carry 43:6,10,11
carrying 26:22
cascading 121:22

case 63:9 86:1 89:2
 95:16 100:14 103:16
 103:18 104:16,16,20
 106:5 110:8 112:16
 130:5
cases 130:12 162:4
cast 94:5
catch 12:12 19:18
 50:20
catching 53:9
Category 39:6,8
CATSAG 181:2
CATZOC 172:16
caught 10:18
cause 20:16 159:8
caused 89:16
center 2:3,6,6,17 74:16
 88:11 90:1 103:13
 176:16,19
centers 68:16 90:8
central 60:1 87:15
centralized 90:19 91:17
centralizes 92:7
certain 23:18 89:12
 128:10,11 138:7
 158:17 174:12
certainly 35:9 61:14,17
 86:4 90:14,18 93:2
 98:13 125:11 126:15
 134:13 135:6 161:16
 162:15 164:7 165:1
 165:12 177:18
certifying 146:3
cetera 22:15 24:8
 120:22
chain 72:22
Chair 1:12,14,14 3:2
 5:12 8:10,14 9:5
 10:20 11:3 12:7 13:11
 13:17 17:14 19:16
 21:18 22:1 27:20 28:3
 28:12 29:1 31:16 32:2
 34:3 36:13,18 40:18
 46:16 49:3,10,12,17
 50:17 52:1 53:14
 56:11 62:9,11 63:7
 65:9 66:5 67:21 71:4
 83:9 100:2,7 117:15
 117:21 118:10 120:3
 120:7,10 122:17
 129:15 131:12,16
 137:15 140:15 142:14
 142:17,21,21 149:2
 149:19 151:12 160:11
 180:8 182:17 185:3,7
 186:2
chaired 42:3,5
chairman 28:1,10

challenge 58:13 59:3
 158:12 159:16 160:4
 183:4
challenges 14:9,17
 15:12 29:10 62:15
 159:20
challenging 5:21 23:8
 36:7 62:18
champion 104:6
championing 150:7
champions 111:10
chance 75:18 151:3,4
 153:13 155:2 182:22
change 4:4,8 24:16
 27:13 65:6,13 66:22
 69:5,22 70:11 72:3,4
 72:8,14,17,20 73:4,7
 73:10 74:7,10 75:14
 81:4 85:15 88:21
 92:10 97:4 99:21
 114:10 124:2 128:11
 130:5 140:6 157:1
 161:9,10 171:12,22
changed 45:20
changes 37:4 59:18
 62:14 76:7 114:7
 143:8 151:10,14
 181:4,7
changing 69:1 86:20
 128:22 164:2
channel 27:14 39:16,20
 45:21 46:3 136:12
 158:6 171:8,16,17
 181:20
channels 39:13 176:16
Chappell 2:16 49:15
 118:7 144:8,17
 147:19,22 148:3,12
 184:17,20 185:1,6
character 166:6 171:13
charged 93:17
chart 167:4
charts 35:6 69:12
chat 169:6
check 23:10
checked 91:7
checking 40:11
checks 91:10
cheeky 68:8
cheering 17:1
Chesapeake 171:4
Chief 56:2
chime 158:4 180:8
chipping 45:13
choice 28:17 126:17
 136:15
choosing 104:14
Chopra 1:16 12:8,10,11

Chorus 152:2
chosen 43:17
circle 83:13
circumstances 177:11
CISA 77:7 101:17 103:5
 103:12 106:19 117:11
CISA's 100:21
cities 96:9
city 37:6 88:4 89:11
 90:16 99:17,19,22
 102:3,4 104:10 108:8
 115:15 123:21 126:12
 135:9,12
clarification 119:15
 145:4
Class 60:21
clean 79:21 99:5
clear 184:20
clearance 24:7 27:3
 44:2 58:4 145:20
clearly 100:6 167:4
climate 4:4,8 11:13
 65:6,13 69:22 70:10
 73:7,10 74:10,22 75:1
 75:3,11,14 76:4,18
 79:9 81:4,16 82:13
 83:2,11 85:15 86:21
 88:20 92:3,9,22 93:14
 94:8 96:17 98:20
 99:15,17,21 123:12
 124:2 126:14 130:5
 135:10 172:3
climate- 73:14
climbing 42:16
close 7:14 41:15 51:13
 63:9 180:21 182:16
 183:13,20 185:18
closely 39:2 46:18 50:9
closer 156:8
closing 81:6 148:22
CMTS 68:2 70:18,21
 81:1,18,18 82:15
Co- 2:2
co-authored 160:17
Co-Director 2:5
co-founded 35:1
CO-OPS 2:7 17:9 59:22
coach 34:7 42:9
Coalition 8:16
coast 2:13,15,19,20 5:9
 9:8 10:12 21:16 42:6
 72:11,15 74:15 78:10
 84:7 89:9 96:4 132:2
 134:20 145:6 168:12
 168:14 171:5
coastal 2:10 14:7,11
 15:20 16:3 68:22 69:5
 69:18,20 70:3,9,12

71:11 72:2,3,3,6,8,12
 72:19,20 75:21 78:5
 78:21,21 92:4 93:18
 94:11 102:17 104:21
 112:22 113:4 117:16
 120:19 125:16,20
 126:6 135:12 138:13
 140:10 146:19 153:5
 153:8 154:7 158:7
 160:18
codes 17:2
cohesion 128:17
collaborate 104:9
collaborated 103:12
collaborating 102:8
collaboration 16:17
 33:14
collaborative 67:8
 81:13 111:13
collated 144:11
collect 113:9 122:2,4
collected 35:10 36:1
 121:11,15
collecting 35:15
collection 16:8 78:11
 117:1 121:17 133:4
collects 75:6 121:19
Columbia 163:12,13
combination 114:8
combine 71:2
come 6:9 31:13,14
 40:10 45:11 54:3 63:1
 69:9 71:19 90:20 91:6
 108:14 123:22 130:4
 154:18 170:11 180:5
comes 31:1 36:4 38:4
 60:1 70:9 81:3 86:8
 111:6 124:14 125:15
 139:18 157:13 159:14
coming 15:18 30:16
 37:22 38:1 55:7 58:12
 68:14 88:1 93:16
 121:4 148:21 159:8
 159:22 164:16
command 88:11
commensurate 59:4,4
comment 4:11 8:4 10:6
 19:19 24:17 27:7
 31:11 59:18 61:4,5
 63:17 64:1,12 118:8
 124:19,21 129:20
 143:13,21 145:5
 146:2,12,19 147:6,15
 148:6,13 159:3 164:1
 179:5,14 180:7
 182:22
commented 158:8
comments 7:19 8:2,3

23:19 25:13 29:14
 30:19 31:17 46:17,22
 47:16 50:12 53:15
 56:12 57:1,11,18,20
 59:16 60:3 62:4,12
 63:3,7,16,20,22 64:5
 64:7,10 67:11,13
 123:3 143:22 144:1,2
 144:9,10,13,16,21
 145:13 146:1,10
 148:17,22
commerce 1:1 35:12
 70:22 173:2
commercial 12:20
 83:15 135:5
Commission 42:3
 93:18 125:20,21
 140:10
Commissioners 86:10
 86:12
committee 40:15 42:7
 67:22 178:18
communicate 15:19
communities 14:11
 15:1,10,14,20 16:1
 25:2 69:20 74:6 78:7
 127:6,7,18 138:13
 145:17 146:21 147:6
community 11:11 14:7
 48:10 104:21,22
 107:20 111:17 112:5
 115:17 116:5 127:14
 127:15 133:11 136:5
company 35:2
compare 97:3
compared 127:16
 163:10
compelling 159:10
competing 44:11
competitive 12:21
competitiveness 12:17
 72:22
compiles 146:3
complaints 55:4
complete 150:16
completed 97:19
 181:21
completely 21:8 172:12
complex 18:14 71:1
 77:1 85:11,12 135:5
complicated 41:4
compliment 149:8
compliments 54:5
component 102:15,18
 103:1 107:19 112:20
 113:22 115:5 121:21
 154:16
components 25:11

102:10 103:10 105:10
 105:11 106:10 107:13
 108:17 109:7 111:16
 114:15 166:2
concept 25:20 34:8
 130:1
concern 10:8,10 16:1
 35:18 40:4 80:14 86:8
 98:8 143:6
concerned 10:4 33:3
concerns 9:21 71:1
 85:15 88:2 91:5,13
 136:14
conditions 46:14 75:4
conducting 173:16
conduit 100:16
Confidence 39:6,9
confident 171:11
confidential 114:21
confirmed 66:7
confusion 118:11
congrats 33:1
congruency 126:4
connect 53:4
connected 52:18,20
connecting 153:4
 173:21
connection 8:6 14:8
 153:9
connections 127:6
connective 116:10
consequences 121:22
consider 96:6 135:20
 136:7
considerable 93:5
consideration 68:5
 82:10 152:17
considerations 93:6,15
 96:18
considering 92:22 94:8
consultant 102:6
 104:11,14 110:19
 116:16 134:4
consultant's 111:3
contact 7:21 8:1 117:13
contain 114:20
contained 105:13
container 84:20 171:20
content 17:19 47:6
contestants 104:13
context 25:22 33:10
 85:7 88:4 91:21
 167:20
continue 20:19 157:8
continued 36:11 83:17
continues 52:14 72:12
continuity 10:10,10,17
 92:9

contours 175:8,8
contract 17:12
contracting 82:3
contractor 35:4
contribute 47:15 71:12
 99:16 102:10 129:7
 158:18 161:12 176:4
contributes 141:19
contributing 110:21
contributions 185:11
control 166:20
controlling 167:1
convergence 55:6
convergent 56:7
conversation 24:12
 52:14 59:21 61:15
 67:2 119:11 128:22
 129:4,8 156:11 170:7
 183:16
conversations 47:17
 118:22 154:7 170:15
conversion 15:15 17:6
 17:7,11
convey 88:15
cool 17:2 60:12
coordinate 37:4,12
 91:4
Coordinating 68:1
 70:18
coordination 33:14
copious 53:6
core 104:7 106:8,17
 114:15 115:16 170:5
corner 75:13
Corps 35:4 77:8 80:6
 102:20 168:2,10
 176:15,20 178:19
correct 66:3
CORS 161:7
CoSMoS 123:14 126:12
 126:12
cost 21:9 43:21 59:11
 73:17
Council 96:20 123:21
 125:17 140:1
counties 72:12
Counting 149:12
country 51:1 53:2 58:21
 69:19 119:2 180:22
couple 5:14 7:3 9:21
 20:6 48:2 59:16 77:16
 80:22 86:1 89:2
 121:10 147:12 155:22
coupled 113:8,14
course 6:17 14:6 19:7
 28:8 43:5 58:13 69:13
 70:5 74:4 75:7 76:21
 79:2 80:7 82:16 94:19

101:21 104:22 105:18
 161:1 163:20 182:18
Court 6:2,15
coverage 48:8
covered 48:1 49:1
 63:14
cram 24:20
crazy 155:9
create 9:18 69:21 108:9
creating 74:6 79:21
creation 107:21
credit 68:9 125:12
crevasses 62:17
crew 39:1
crisis 150:17 167:5
critical 12:17 20:12,18
 35:10 43:22 45:16
 88:8 90:9 110:9,22
 140:9,11
cross 81:13 176:18
crossed 49:14
crowding 29:11
CRP 92:4
crucial 21:5 23:17 27:8
Cruz 13:12
cube 26:11
cubic 163:14
cumbersome 26:3
curious 37:16 38:8,20
current 71:4
currently 38:3 57:13
 150:18
currents 70:4
curve 81:16
curves 139:3
customer 46:1,13
customizable 44:17
customize 48:11 177:4
 177:17
customized 145:9
 175:8
cut 9:7 175:8 182:18
cuts 70:14
Cyber 77:6 101:17
CZERWINSKI 2:16

D

D 40:21
D.C 80:8,8,21
daily 19:1 69:17 73:5
 74:21 80:10
damage 73:18 89:16,19
Dana 23:22 24:10 52:19
dangered 167:2,3
dangerous 121:5
 136:16
darker 97:9
Dasler 145:5 179:8

181:18
data 10:1 11:10,14,15
 12:4,19 14:10 15:7,15
 16:8 17:6 18:6,7,14
 20:20 25:22 30:3,4
 35:10,16,19,22 36:1,4
 36:5,6 37:9 38:17
 39:12 44:22 46:10
 50:3,5 51:17,18 55:17
 68:19 69:5 74:20,22
 75:1,3,3,10,22 76:6
 76:18 77:1 78:11 80:5
 82:13 83:11 113:8
 114:21 117:1 120:21
 121:11,15,17 122:2
 122:14 133:3 136:18
 140:21,22 141:10
 144:5 145:17 146:3,4
 146:7 153:5 156:13
 156:14,15,17,18
 157:7,12 159:9
 173:10,14 175:9
 178:19,19 179:18
 180:1,6 181:3 182:1
database 78:19
dated 151:6
dating 58:7
datum 17:6 37:4,9,22
 38:1,2,6,13 40:22
 59:18
datums 41:4
David 181:18
day 4:2 5:5 8:11,12 11:5
 11:6 15:12 34:1,2
 40:10 43:15 46:15
 71:18 75:8 152:8
 154:8 179:18 183:13
 184:7
days 49:2 56:1 86:4
DEA 179:8
deal 26:6 38:15 39:9
 66:16,16 114:15
 124:3 160:15
dealing 124:7,20
Deanne 1:18 17:15
 19:16 30:7 152:15
 153:18 158:2 166:11
dearth 124:15
debris 171:16
decade 35:7 66:20
decades 35:11 69:9
 75:5 98:11
decarbonization 99:13
December 95:5
decided 75:17 150:5
decision 46:9,11 78:8
 78:12 86:8 167:14
decisions 44:1 45:17

deck 26:12 42:10
decline 65:1
dedicate 167:10
deep 24:14 27:2,12
 39:17 41:22 78:10
Defense- 78:18
definitely 11:6,17 23:22
 29:6 33:22 152:7
 158:4 169:20 172:2
 175:3
degree 47:7 72:5
degrees 128:8
deliver 74:17
delivered 146:20
delivering 36:5
delve 13:7
Dempsey 2:11 57:4
Dentler 2:17 7:22
department 1:1 3:4
 66:2 70:22 78:18 87:1
 91:4 100:19 101:6,16
 102:15,21 103:13,19
 117:15
departments 91:3
 99:22
dependencies 110:10
 111:18
dependent 157:6
depending 5:4 171:5
 173:12
depends 133:16 164:22
 171:1
depicted 75:12
depth 26:21 39:19
 161:10 166:20 167:1
Deputy 2:3,11 57:4
deserve 125:11
design 78:5 93:7 95:3
 95:20 96:6 115:21
 116:21 139:20
designated 2:13 5:10
 104:19 121:12 139:16
 140:11
designed 69:11 135:21
designing 111:10
desired 56:16
despite 129:5
destructions 74:7
detailed 109:19 111:1
 113:10
detecting 69:5
detection 171:22
determine 43:20
deterministic 113:2,15
 138:22
develop 111:5
developed 77:6,12
 93:11 112:18

developing 26:2,10
81:19
development 79:19
87:8,14 92:18 93:19
94:1,7 97:20 126:7
139:15,20 164:8
developments 98:3
devices 176:10
dialog 5:22
dictated 115:14
Diego 22:7 123:11
difference 57:22 84:17
different 10:15 30:12
42:22 50:22 51:1 56:4
66:15 89:22 95:13
96:8,10 114:10,10
124:12 125:13 128:4
128:6 135:3 168:16
174:9,21 176:12
177:16
differently 76:20 96:10
difficult 22:5,15,19
dig 148:19
digesting 30:6
digital 25:20 31:13 78:9
130:1,4,6,7,8,16,21
131:13 150:19 151:5
151:17 152:4,8,12,13
153:14 183:9
dimension 156:19
dimensions 32:20
dinner 25:16
direct 132:19
direction 183:3
directly 64:11 78:4,4
80:13 178:16
Director 2:2,3,6,12 5:9
36:22 52:2 61:10
Director's 61:6
directors 9:20 49:9
56:20 61:18 164:20
Directors' 22:20
disagreeable 180:13
disasters 123:8
disclaimer 64:13
discourages 134:10
discovered 20:14
discuss 23:14 152:22
169:3
discussed 108:13
151:15
discussion 4:2,10,12
6:21 25:15 36:11 53:5
58:1 66:10,11 86:22
118:3 143:18 146:22
150:1 161:21 168:21
169:16 173:10 178:7
182:20

discussions 6:5 22:14
27:3 161:17 182:4
displays 48:6 145:9
disproportionately
71:12
disseminated 64:21
disseminates 75:6
district 88:3 93:21 97:9
98:2 126:3 134:17
135:14
divisions 23:3,15 91:3
document 77:12,14
92:5,5 144:11 147:7
documents 77:4 82:13
93:7 150:20
DoD 78:22 79:4
doing 10:2 15:20 16:21
33:2 39:3 42:15 50:16
51:20,21 53:17 56:5
67:7 76:15 86:15
96:17 114:13 131:4
141:8 169:10 170:8
170:12,19 172:15
177:10 178:2 179:16
186:1
domestic 47:12
door 79:3
doors 120:22
doorway 113:11
DOT 102:22
dotted 105:5
double 40:11 116:10
dovetails 163:5 176:6
downloading 176:15
Dr 1:15,16 2:5,6,18
12:15 50:18 51:2 54:1
117:14
draft 11:20 24:14 27:2
27:14 39:17 45:10,19
96:19 151:5 161:9
171:6
drafted 150:21
drafting 153:10
drains 122:20
drawing 184:5
drawings 139:21
drawn 166:11
dredge 62:17 176:16
dredged 45:12 163:14
dredging 59:7 168:3
drive 22:6 145:7 151:2
driven 155:12
drives 87:4
dropping 65:2
dual 38:5
due 73:14 112:9
Duffy 1:11,14 5:12 8:9
8:10 9:5 10:20 11:3

12:7 13:11,17 17:14
19:16 21:18 22:1
27:20 28:3 31:16 32:2
34:3 36:13,18 40:18
46:16 49:3,10,12,17
50:17 52:1 53:14
56:11 62:9 142:17
149:2,19 151:12
160:11 180:8 182:17
185:3,7 186:2
dumping 155:14
dwellings 121:2,16
dynamics 10:9

E

earlier 12:8 20:3 116:2
116:7
early 95:4 96:22 139:19
easier 18:10 56:21
easily 44:18 57:14
East 9:8 132:1
Eastern 184:1,21
eating 71:18
echo 17:18 28:20 47:16
ecologist 84:12
economic 12:18 20:9
43:4 45:8 73:13 74:4
85:2 132:12,18
economies 71:11 74:6
economy 55:10 71:10
133:16
edges 27:11,16
edited 151:14
edits 151:10
educate 163:2
educated 34:17 124:9
169:10
EEZ 147:3
effect 157:9
effective 19:11
effects 159:1
efficiency 87:19
efficient 9:18 69:11
effort 29:2,7 58:16
71:22 118:1 181:22
182:9
efforts 71:22 84:18
99:13 142:13 160:6
178:17 181:11 185:8
eight 58:7
either 66:7 97:19
124:15 131:10 148:11
electrical 86:6 93:8
element 130:1
elevation 70:2 76:1,7
elevations 37:13
eligible 79:17
Elko 1:16 13:14,16,19
137:22 158:4 159:4
else's 149:8 164:15
embedded 148:18
embraced 56:16
EMCs 48:6
emergency 113:21
130:5
emerging 67:8 129:2
emission 165:19
emissions 99:8,10
emphasis 146:13
Empire 163:15
enables 33:7
ENC 146:4,4
encourage 63:22 64:10
encouraged 143:22
encouraging 145:19
encroached 20:15
encroachment 62:16
167:21
ENCs 136:18
energizing 51:5
energy 87:19,22 88:2
88:13,13,20 142:12
engaged 32:13 33:12
53:3 80:13
engagement 4:12 16:21
107:19 108:20 109:8
111:11,17 112:5,8,13
115:12,14,18,22
116:15,22 123:18
engaging 5:22 129:2
engine 85:2
Engineer 102:20
engineering 82:3
139:20,21
engineers 35:5 77:8
95:1 178:19
enhance 81:10 110:8
enhanced 93:22 108:21
177:11
enhancements 93:1
enjoy 22:20 62:19
163:9
enjoyed 21:15 30:5
33:4,5,20 47:19 60:4
120:15 131:22
enlightening 52:5
ensure 40:11 61:16
77:2 92:8 94:7 165:7
ensuring 6:1,20 61:2
enter 144:1
entrances 155:17
environment 5:19
22:16 36:8 53:13
130:8 137:8
environmental 3:5
65:22 68:19 74:13

75:4 82:22 84:10
88:19 108:1 127:10
environmentally 108:1
EPA's 79:21
equal 163:20
equally 19:3
equipment 43:5,17,21
44:3,8,22 91:10 99:8
176:13 177:7,8,22
Eric 1:19 3:2 4:12 19:18
19:18,22 21:18
149:22 150:4,13
151:9 152:20 158:7
161:15 162:19 170:9
178:7 183:6,15,19
Erie 156:1
error 176:18
especially 30:1 35:17
72:19 84:7 86:20
87:11 88:19 95:19
130:14 132:1 136:16
142:12
essence 122:12
essential 73:9
essentially 106:15
155:6,18
establishing 147:1
estimate 79:13
estimated 73:14
estimating 73:17
et 22:15 24:7 120:22
evaluating 107:11
evaluation 111:6
Evans 2:12 5:3,9 16:16
56:22 57:2 63:12
65:10 143:12,15
147:11,20 148:1,11
148:15 153:11 157:20
160:7 161:13,15
162:22 163:22 164:18
170:21 172:4 173:5
174:2,16 181:18
183:14 184:19,22
Evans' 24:16 67:13
evening 184:15 186:1
event 90:3
events 48:19 68:22
90:20 178:12
everybody 7:4 21:3
51:1 53:11 56:20 57:3
128:3,15 136:15
149:20
everybody's 8:13 53:16
185:10
evolution 54:22
evolutions 176:13
evolve 91:22 96:9 98:22
exact 122:5 132:10

138:21 156:15 167:19
exactly 33:8 147:22
148:3 182:17
examination 100:12
109:19 117:9
examining 114:6
example 11:22 76:6
79:18 122:7 141:21
158:18 166:12 170:10
171:3
examples 77:16
Excellence 103:14
excellent 16:17 17:15
27:21 31:17 46:17
143:3,9 147:19
exception 54:14
excited 30:15 40:15
116:17 117:12 119:10
183:17
exciting 51:8,16,19
exclusively 79:14
171:19
excuse 5:6 57:12 92:18
132:15 142:7 152:12
excused 19:17 34:5
executive 86:10
exercise 116:4
exist 130:19 180:15
existing 93:15 110:7
exits 75:1
expand 58:15 105:21
178:1 182:15
expanding 16:10 87:18
106:8
expands 105:9
expansion 87:16
107:15
expansive 116:1
expect 11:14 113:18
expectation 11:14
expected 39:8
expecting 159:5
experience 37:2 96:3
177:15 183:10
experienced 18:18 86:2
89:8
experiences 83:2
expert 68:5
expertise 17:20 34:13
36:4 66:13 69:14 71:2
79:5 80:11 145:3
158:17 159:19 170:14
experts 61:21 62:22
78:2,14 82:6 164:20
170:10 183:2
explain 30:7 149:12
157:11
explains 109:4

explicit 75:13
explored 175:11
export 58:14
exposure 21:16
extend 74:4 143:19
external 146:7 173:10
173:14
extra 46:5 131:18
extraction 98:11
extreme 48:19 68:22
73:9 93:5 94:9 95:16
142:9
extremely 51:5
eye 10:18 110:18

F

F 89:17
fabulous 9:11 11:6
21:14
FACA 42:6
face 76:12 86:20 92:9
face-to-face 6:11
faced 73:21
faces 74:1
facets 124:9
facilitating 6:20
facilitation 110:13
facilities 70:12 79:1
88:8,16 90:9 92:15
137:7
facility 87:13 121:19
140:9
facing 73:4 89:11
fact 21:15
factors 43:20
facts 24:20
fail 71:21
fall 27:11 32:12
falls 99:5
familiar 70:18 75:21
87:12
familiarize 182:5
family 164:6
famous 180:18
fantastic 18:20 42:18
125:10 138:11 156:16
far 33:2 43:14 46:6 96:5
119:3 121:16 122:13
133:10 138:18 174:14
farm 158:11
fast 29:6 46:3
faster 72:16
fat 28:5
fault 68:11
favor 152:1
favorites 149:5
feasible 147:13
featured 78:16

February 151:6
Federal 2:13 5:10 70:19
77:17 78:2 79:8 81:14
81:21 100:12 103:7
103:15 105:8 106:11
108:11,22 109:15
112:9 117:7 141:18
feed 76:2
feedback 51:9 52:6
53:6,8 126:21
feel 23:2,17 33:10,17
43:8,16 56:8 57:10
61:9 127:12 129:21
feeling 22:10 55:8,12
61:12
feels 162:12 184:5
feet 39:19 96:14 97:12
161:10 167:6
fellow 120:15
Ferguson 10:5 179:7
field 89:6
fields 183:2
fight 43:2
figure 30:6 60:10 62:10
80:2 88:14 140:19
figures 24:20
file 175:7 180:3
files 175:8 176:21
179:11,14
fill 28:3
fills 163:15,17
final 62:4 104:12 151:5
183:12
finalization 96:21
finalized 48:8
finally 17:5 33:16
financial 73:22 79:21
find 51:5 103:18 104:1
123:16 124:7
findings 117:5
fine 151:11,14
finger 169:4
finished 150:17
fire 88:9,10
firms 82:3
first 9:1,11 19:4 22:19
28:14 34:1 40:7 41:14
58:9 68:8 81:17 83:21
93:3 104:3,3 107:4
122:19 125:19 142:20
142:20,21 150:4
151:21 162:10 163:19
167:21 171:10 176:6
180:9 184:2
fisheries 2:18 133:17
fishery 166:2
fishing 135:5,20,21
136:1,4

fit 33:6 40:1,2 100:11
100:12 137:19 140:17
158:3 166:7
fitting 149:11
five 38:21 40:13 86:11
87:21 106:3 110:5,11
110:16 161:10 181:6
181:22 182:11 183:18
fixed 44:12
flat 36:7
flexibility 60:22 145:8
flip 136:7
flipped 185:2
floated 154:12
flooded 122:7
flooding 15:12 74:18
123:2
floor 47:1,9 65:8 67:2
83:21 100:5 121:2
143:14 150:2,13
167:7 175:12
focus 9:18 14:5 70:7
84:13 96:1 132:3
144:3 150:8
focused 80:8 154:19
161:22
focusing 153:13
fog 177:10
folks 32:17 49:20 50:3
50:5 52:13,15,18 81:9
87:2,10 91:9 96:16
153:1
follow 23:19 24:18
124:4,5,5
followed 123:14
following 24:9 68:13
106:5
FONTANA 2:18
foot 11:20 20:22 21:3
27:13 45:19 138:14
181:7
forbidden 134:13
force 128:16
forecast 30:18
forecasts 75:7,8
forget 132:6 168:15
form 94:5
format 48:7 58:12 62:3
forming 79:6
forth 37:7 156:2 183:9
fortunate 33:17
forward 12:14 13:9
15:19 17:10 19:14,20
30:14 34:1 36:9,11,19
46:15 49:2 53:8 66:12
67:1 82:18 83:19
109:2 140:7 148:13
149:13 151:18 152:5

152:8,14 186:6
found 73:20 75:17
124:6 129:5
foundation 102:22
111:9
foundational 16:8
75:22
four 22:9,17 37:6 46:20
90:1 163:13 182:11
fourth 100:19 156:19
fraction 59:11
frame 170:2
framed 91:20
framework 77:11
100:22 101:4 103:4,8
106:12 108:22
framing 103:7
Frank 145:1
frankly 57:18
free 57:10 66:20 80:1
174:21
Freeman 1:17 34:18,20
frequency 11:16 12:5
18:4 85:22 89:1
frequently 90:21
freshen 186:5
friendly 95:11
friends 41:6
front 23:1 50:18 53:17
117:4 136:11 155:9
fruition 58:12
fuel 73:2
fueling 90:8
full 6:4 18:8 162:5
175:21
fully 44:3 68:17
fun 51:6
function 20:11 147:20
148:4
fund 110:14
fundamentally 71:20
165:7
funded 21:8 44:3
101:16,22 102:19
funding 16:3,4,7 33:10
79:8,13 101:20
108:11 112:3 145:19
funds 80:4,4
further 29:13 59:12
60:15,20 112:19
134:20 148:19 153:21
184:15
Fusco 3:4 4:9 66:1,4
82:20 100:6,9,17
121:8 122:16,21
127:1,3 131:1,8 133:8
134:7 138:15,18
141:12

future 47:21 60:14,18
61:3 70:13 72:7 73:9
80:19 85:20 90:21
91:17 138:8 156:9
161:21,21
futures 80:12

G

G 98:2
GALEN 2:20
Galveston 104:18
game 70:9
gamut 175:2,21
gap 147:5
gaps 56:18 81:6 106:22
141:7,10,16,20
Garmin 178:11
gas 99:7,11 145:20
gates 90:1
gateway 85:1
gathering 118:17
gauge 80:13
GDP 71:12
Ge 145:22
general 31:3 173:14
generalize 145:2
generally 134:19 163:9
165:9
generate 88:12
generated 144:20
generation 16:13 17:4
generator 113:13
generators 120:22
geodesy 150:15,17
165:10
geodetic 2:4,19,20 37:3
38:17 76:2,6
geographic 93:20
97:10
geographically 89:13
geologist 37:5,6
geology 47:8
geospatial 59:5 67:14
getting 16:4 29:17
30:20 31:9 37:10
39:17 43:12 48:12
51:13 52:13 58:19
130:13 155:15,20
182:10 183:16
GIS 95:10
give 7:8 34:11 46:21
68:9 80:16 170:2
171:11 178:8 180:5
182:22
given 49:4 54:6 61:11
113:18 179:22
gives 97:6 113:16 114:8
giving 51:9 52:6 53:7

glad 15:3,15 52:19
131:13 133:12 134:1
143:18
glasses 9:3
glitching 138:1
globalization 18:7
Globally 73:12
go 6:11 10:21 13:14
19:9 23:9 25:14 27:4
27:16,19 31:22 34:13
40:9 42:10 43:14 46:3
46:6,11 49:8 50:19
52:7 53:20 63:5 65:4
71:18 86:3 100:5
101:9 107:3 109:2
120:12 122:17,19
129:16 131:17,19
137:20 138:16 149:21
150:11 152:4 168:9,9
176:6,20 178:3,5
179:16
goal 9:5,6 106:2 108:7
128:18 141:13 159:7
160:21
goals 16:14 107:5,9,9
108:16,18 109:4
goes 16:12 23:3 29:3
35:15 45:1 115:5,8
123:16 149:6 174:15
going 5:14 8:8,16,19
14:22 16:7 20:3,16
24:1,6,15 25:12,19
28:14,14,16 31:7,9,19
33:13 34:10 35:21
36:15 38:2,9 39:18,19
39:21 41:7,15 44:12
46:5 49:8,20 50:20
52:19 57:15,16 62:10
63:8 65:19 67:19
74:10 79:9 80:9 83:6
89:4 100:21 102:10
105:5 107:3 110:3,18
111:8,12,15 112:6,10
114:18 115:21 116:3
118:5 123:6 128:10
128:12,14 130:20
133:13 138:22 139:3
139:8 140:17 142:19
143:1,11 144:8 146:8
146:15 149:4 150:9
150:11 152:21 162:11
167:6 168:17 169:13
175:5,13,18 177:7
179:6 181:1 183:8,11
185:17
good 5:3,4 8:10 9:5
11:2,3 12:10 13:8,16
13:17 17:12,15,17

18:12 19:22,22 20:1
 28:11,12 34:18,20
 36:4,5,5 40:19 41:6
 41:10,12 46:16 47:1,2
 49:3,17,19 50:19,19
 53:21,22 55:13 56:8
 56:11,13 67:4 74:11
 81:9 84:1,4 117:6
 127:12 128:1 142:17
 145:3 148:17 150:3
 150:14 151:8 157:2
 160:10 162:20,22
 163:1 164:4 168:21
 169:15 173:18,19
 178:12 180:9 182:3
 185:21 186:1
goods 71:13
Google 151:2
gorgeous 9:10
gosh 123:5
GoToWebinar 125:1
gotten 19:1 38:21
 177:16
governance 92:21
Government 49:5
GPS 43:12
graduate 82:21
graduated 41:21
grain 45:7
graininess 75:16
Grant 78:13 81:1
 102:22
grants 44:5
granularity 48:6
graph 124:5
grasp 31:9
gratifying 57:19 59:13
great 11:5,19 12:5
 13:21 17:2,21 19:14
 20:2 21:1 30:22 31:2
 34:1,3,9 44:17 51:2,4
 51:6,14,18,21 52:3
 53:5 54:6,7 55:19
 58:11 66:5 79:12
 83:10 84:3,8 90:14
 91:15 100:3,8,9
 101:13 118:18 120:3
 125:4 126:18 129:18
 131:5,5,11,21 133:8,8
 137:16 142:7,8,14
 143:11 146:14 151:19
 152:4 155:5,11
 156:22 157:4 158:8
 159:2 160:15 175:18
 178:7,22 181:22
 182:20 183:4 185:9
 185:15,15 186:1
greater 85:21 86:4 89:1

90:18
greatly 133:16
greenhouse 99:7,11
grew 72:2
grey 97:9
ground 100:13 113:12
 121:2
group 4:12 17:22 23:18
 62:22 64:11 78:19
 84:19 133:3 150:1,13
 161:22 169:1,8
 177:20
groups 31:4 43:7,16
 48:10 116:5,7 182:4
grow 72:13 107:16
 112:1,20
growing 106:12 122:14
grown 92:6 108:21
Guard 42:6 145:6
 168:12,14 171:5
guess 34:22 36:15
 50:20 54:3 118:13
 119:15 151:3,20
 160:6 168:22 175:15
 175:19
guests 82:19 118:21
 119:14
guidance 68:18 69:5
 77:4,17 80:5 81:8
 82:13 95:7 96:19 97:2
 97:3 123:12 125:17
 138:14 140:1 142:8
guidances 110:12
guide 77:9 110:13
 112:10
guidelines 93:8
guides 94:15
guiding 92:5
Gulf 9:8 77:11
guts 171:16
Guy 145:12
guys 179:2

H

half 34:2 39:5 46:15
 154:9 168:6 179:17
Hampshire 2:3,6
hand 75:13 142:15
 147:18 148:4
handling 42:10,13 99:8
hands 148:10 149:22
happen 13:22 123:2
 161:12
happened 38:18
happening 17:3 31:5
happens 134:13 163:18
happy 33:17 34:17
 41:19 47:3 49:1

148:18 161:2 185:9
harbor 86:5,10,17 87:1
 88:3 91:3 93:18,20,22
 97:9,16 98:2,7,9
 99:13 126:3 134:11
 134:17 135:14 136:20
 155:16
harbors 155:13 156:4
hard 34:14 124:7
 149:12 184:5
hardest 46:12
hardware 163:7 175:4
Hargrave 1:18 17:16,17
 153:20 154:1 156:10
 169:19 170:1
hashes 129:5 139:3
hatch 97:17
hate 155:8
hats 67:19 68:4
Haussener's 24:19
hazard 20:17
hazards 69:1 72:6 74:2
 112:22 113:6 120:20
HDP 94:10
head 18:3 30:8 41:6
 60:7 67:20 169:12
head's 154:22
hear 8:17 15:3,16 30:3
 31:2,13 32:1 33:18
 51:3 52:10,19 53:1,5
 55:2,22 56:9 57:19
 59:13 60:18,21 61:14
 61:20 67:4 100:6,7
 119:11,21 120:13
 121:8 127:13 133:6
 154:5,6 183:4
heard 9:17 10:14 16:15
 20:6 22:22 26:20
 27:13 29:8,20 50:13
 54:21 55:21 56:1
 67:11 131:2,4 142:15
 163:6
hearing 15:3 30:2,14
 32:16 82:18 115:18
 123:6
heart 17:5 119:22
heat 76:9 94:9 142:6,9
heats 93:5
heavy 21:1 155:19
height 15:6
heights 48:15,16
Hello 65:17
help 14:21 15:11 35:14
 40:21 63:1,9 78:20
 81:2 95:3 111:4
 115:21 119:6 124:14
 130:5,11,12 141:11
 142:11 149:12 157:11

161:4 162:7 177:12
helpful 55:18 95:19
 169:21
helping 14:21,22 15:19
 36:10 52:8 150:8
helps 128:5 140:2
Hey 13:17 21:22 63:12
Hi 12:10 17:17 41:13,13
high 11:15 12:3 35:15
 95:15 113:3
high-income 73:21
high-tide 74:18
higher 11:15 95:15
 172:21
highest 74:3 123:7
highlight 11:18
highlighted 29:13 64:8
 89:3 90:18
highlights 84:19
highly 44:17 111:1
 134:9 174:13
Hilary 90:12,13 91:14
hire 104:11
hired 82:4
hiring 102:6
historically 38:12
 105:15
history 38:14 47:8
 104:4
hit 30:8 60:7 62:21
 142:19 149:3 167:6
 178:16
holes 90:2
holistic 76:12
Holtz 1:17 24:3 36:14
 36:17,21 172:7 179:6
homage 180:2
home 22:7 25:3 36:15
 41:12
Homeland 101:6,16
 102:21 103:13
honestly 35:13
honor 34:21 65:11
hook 182:11
hop 140:19
hope 47:21 48:12 52:14
 69:2,3 81:20 129:11
 141:14
hopefully 7:3 56:20
 117:4,18 120:5 133:2
 144:18
hoping 82:11
horizon 96:2 98:5
 138:19,21 139:9,22
hot 86:4 87:20 133:15
 141:13
hour 161:11 184:2
house 165:19

Houston 74:1,5 123:7
HSRP 1:13 2:1,13 3:2,2
 4:12 5:12 6:8 8:11,14
 34:22 50:8 54:15
 64:15 67:6 68:9 69:10
 76:17 81:2 82:17 83:5
 118:12 119:12 142:21
 144:3,12,13 145:14
 147:15
huge 44:1 90:10 99:12
 99:12 133:3,3 137:4
 160:14 166:14
human 69:14
humans 16:22 72:10
hurricane 89:8,15
 90:12,12 121:3
 170:17,18
hurricanes 89:6
hydro 160:2
hydrographic 1:4,11
 2:3,6 5:6,7 35:1 39:1
 40:9 58:8 119:16
 165:1 181:19
hydroservices.panel...
 8:1

I

I's 106:14
ice 66:16,20 83:17
 120:8 155:10
icebreaker 155:9
idea 97:6 113:5 114:9
 143:3 154:11 162:20
 163:4 177:9
ideally 107:15
ideas 63:1 113:17
 148:19 164:6 175:20
identification 110:22
identified 141:9
identifies 171:5
identify 107:20 108:9
 141:15 162:7 167:17
identifying 81:5 111:10
ignoring 171:20
image 75:17
imagine 85:10 176:22
imbalance 146:20
impact 20:9 24:15
 52:13 85:11 90:16
 127:10 128:12,13,14
 132:12,14,18 133:4
 133:18,20 168:19
impacted 132:19 171:1
 171:6
impactful 48:21 141:16
 142:3
impacting 62:21 72:6,8
 73:10

impacts 4:4 65:6,13
 73:15 74:4 76:4 85:14
 85:19 92:22 94:9
 97:22 99:20 113:5
impede 145:8
implement 101:14
 104:6 110:3
implementation 16:2,6
 100:16 111:5
implemented 171:7
implementing 103:14
 109:15 110:17 141:21
importance 11:9,12
 29:15 84:6 153:3
 157:11
important 19:3 24:13
 33:2,15 43:11,19,22
 46:9 50:4 53:11 70:14
 71:8 85:4,9 107:7,10
 108:3,6 113:12
 114:14 115:12 117:11
 153:7 156:9 157:6
impressed 32:16,19
 50:1,8
impression 35:8,13
impressions 32:7
impressive 16:18 45:5
 50:13 118:21
improve 144:4 161:4
improved 29:16
improvement 87:6,9
 107:16
improvements 173:11
improves 60:14
in-person 29:6
incentives 79:22
incentivizing 145:17
inch 26:11
incident 91:1
include 81:5 82:9 109:8
 121:13 122:19 133:10
included 16:20 24:11
 64:6 71:4 92:16 121:6
 144:14 151:10
includes 68:21 79:18
 121:1
including 69:19 72:5
 73:22 77:18 78:7,20
 79:10 112:15 133:3,7
inclusion 106:11
 108:22 112:1
income 127:18
incorporate 105:21
 106:4 110:6 173:9
incorporated 106:16
incorporating 17:10
 93:4 100:21 105:8
incorrectly 66:6

increase 115:2 133:18
increased 29:9,15
 45:19 155:11
increasing 45:10 48:16
incredible 23:4 99:3
independent 43:12
Index 77:13
individual 64:18 153:11
individualized 114:18
individuals 64:11
industrial 86:16 137:4
industries 69:20 71:15
 72:9
industry 11:10 73:4
 77:17 105:17 170:10
Inflation 79:20
influence 109:11
 167:14
influenced 112:7
influences 158:12
influencing 112:12
influential 105:18
info 8:6
inform 75:10
information 9:15,22
 13:1 17:20 18:13
 25:18 29:18 40:17
 45:16 55:19 74:13
 81:7,11,20 82:1,10
 84:4 113:10,14
 114:13 115:1,3,4
 117:11,13 121:6,19
 122:4 124:16 127:20
 128:3,8 129:19
 135:17 141:7 142:11
 145:19,21 160:15
 161:3 176:18
informative 14:3 47:5
 47:17 50:6
informed 46:8 178:11
infrastructure 4:4
 58:22 59:6,12 65:7,14
 67:12,14 68:20 69:8
 73:6 75:15 76:13,22
 77:7,10 78:6 79:10,15
 79:19 80:1 83:12
 84:13 87:5 93:1,12
 96:11 99:1 100:22
 101:3,18 103:4
 109:10 110:9,22
 111:18 140:4 145:21
 145:22
ingest 23:5
inherently 77:1 108:8
initial 105:7
initiative 80:18
initiatives 142:13
innovation 72:20

innovative 164:6
input 51:10 64:1 68:5
 77:18 82:17 118:16
 143:17
inputs 157:3
insert 60:13,13
insight 17:15 62:22
installations 78:22 79:1
 79:4
installed 91:8
instance 132:17 165:17
 167:13 171:19
institutions 78:3,14
 81:1 82:5
instruction 42:11
instructor 42:8
integrated 44:18
intend 161:17
intended 79:14 175:9
intense 137:7
intensity 155:11
interaction 126:19,21
 127:9
interactions 128:20
interactive 22:5,12
interagency 138:12
interdependencies
 109:10,21
interest 30:20 35:22
 48:2 51:17 59:19
 68:10 80:14 142:5
 148:2 154:21 166:1,5
 168:8
interested 37:21 48:3,9
 48:14,17 51:12
 120:16 161:20
interesting 8:12 14:3
 18:1 19:8,10 24:19
 25:10,21 123:4,12
 135:16,17 142:10
 156:5
interests 61:22
internal 95:19
internally 87:1
international 47:12
 91:22
interoperable 153:4
interpreters 6:2,15
 19:21 118:6
interrupt 184:17
intervals 75:5
intro 62:13
introduce 34:15 56:22
introduction 4:6 53:20
 65:17,20 83:10 84:3,8
inundation 25:8 94:14
 95:2,6 97:11,12,16
 121:20 122:9 123:15

125:9 126:2,13 138:6
138:10 139:4
inventory 92:13
investigator 117:14
investment 59:5 87:5
investments 67:13,15
68:20 79:15
invited 80:16 82:19
118:20 119:14 160:20
involved 16:5 24:4
38:17,22 52:4 115:21
130:1
involvement 116:1,2
iPhone 18:19
IPPC 124:5
IRA 16:3
IRFP 107:8
IRPF 101:4 103:7 104:7
104:17 106:2,4 107:4
108:16 110:2,5 112:7
114:18 115:20 141:19
141:21
IRPF's 111:19
irrelevant 181:9
Island 3:5 66:2 78:15
81:12 100:20 101:2
102:22 104:1 105:19
112:21 113:22 114:6
119:4 127:8 130:15
132:17,21 133:14,15
133:21 166:14
Island's 133:16
Islander 120:15
issue 20:11 21:13 80:14
94:20 99:1 150:1,7,12
150:16 152:19 154:17
154:17 158:2 159:2
159:22 160:3,14
162:11 164:12,13
169:13 172:3,5,9,18
180:4,10 183:7
issues 71:1 91:5 108:1
108:2 119:17 138:1
169:1 170:3 182:15
issuing 93:18
items 111:17,21

J

J 98:2
Jacobsen 24:1,4,10
40:1 179:9,15
Jacobsen's 30:20
59:19
January 96:21
Jeff 10:5 60:2 179:7
jersey 28:4 84:22
jerseys 49:4 186:4
Jim 24:18

job 13:21 46:8 79:16
107:21 143:11 165:6
165:6 185:15 186:1
jobs 71:11 132:18
149:5
Johnson 146:9
join 8:6 32:6 46:21
joined 5:11
joining 63:21 65:18
Joint 2:3,6
Jon 145:5 179:8 181:18
Juliana 52:4
Julie 1:20 21:19,20 22:2
27:20 32:7 52:19
59:18 122:17 129:16
137:17 151:9,22
157:20 159:4 169:3
169:20 170:13 174:2
174:2
Julie's 30:19 61:5 159:5
jump 143:16 146:6,15
160:11 163:4
jumped 109:3
jumping 175:17
June 96:22
junior 166:15
justice 108:2
justified 59:2
Justin 3:5 4:7 65:21
82:21 83:4,20 84:10
100:3,10 123:10
124:19,22 127:13
129:19 130:17 131:10
138:15

K

Karsten 25:16
Kearse 2:3 52:2,3
keel 24:7 27:3 44:2 58:4
145:20
keen 68:10
keep 18:15,17 35:21
51:20 52:17 60:2 63:4
74:9 81:15 143:1
148:5 157:8 182:21
183:3
keeping 136:19
Kentucky 103:17
key 86:7 102:18 109:10
110:5 157:10
keynote 80:16
kick 7:6
kicked 58:9
Kim 24:3,3,10 172:7
178:4 179:4
Kimberly 1:17 36:14
kind 14:12 16:19 20:7
22:10 23:12 24:13

29:13 31:3 33:14 37:7
44:12,19 51:10,20
55:2 67:9 101:13
103:1 116:9 121:6
123:5,14 127:14
128:16 149:6 154:18
154:21 156:15,20
158:20 160:1 161:5
166:18 169:12 175:13
175:17 177:3 178:9
178:14 179:9,10
181:10 184:5 185:7
kinds 80:11
knew 123:6 126:3
know 10:16 14:3,5,10
14:12,15,18 15:5,8,18
16:4 17:9,21 18:8,12
18:17,18 19:6,17 20:8
22:8 23:16 24:11,14
24:22 25:3,7,11 26:5
26:18 27:5 28:13,15
28:20 29:12 31:3
32:13 33:1,7,9,22
34:4 35:20 37:11,15
37:18,19 38:3,18
39:16 40:7,11,19 44:7
45:3,7,12 48:4,7
49:20 51:14 52:7,12
52:14,21 53:8,10 56:2
56:3,4,6 57:14,19
58:18 59:3,7 60:3,7,8
63:6 66:13 70:1 71:7
71:7 72:5,14 74:11
79:2 86:11,15,18 87:7
88:12 89:13 90:16
91:2,14,19 92:20,21
94:16 95:10,10,20
96:12 97:2 98:19 99:6
99:10 112:8 118:4,9
119:18 120:21,21
121:3,5 122:9 123:10
124:1,15 125:5,12,15
126:4,8,22 128:13
129:9,22 130:18
131:2 136:10 137:19
138:13 139:7,10
140:6 141:1,2,5 142:7
142:10 145:11 146:2
146:4 152:7,15,16
154:5,20 155:1
157:10,18 158:10,15
159:6,13,15,21 160:4
160:7,9 161:16
162:12,13 163:9,18
163:19 164:1,7,11,19
165:3,5,6,7,15 166:4
166:8 167:5,15
168:18 169:1,20

170:9,10 171:2,9,14
171:15,15 172:8,10
172:12,14 173:2,5,11
174:8,17,18 175:11
175:17 176:2,19
177:1,3,6,9,10,18,19
177:21,22 178:1,17
178:18 179:7,16,19
179:20,22 180:1,4,5
180:19 181:11,17
182:4 183:1,4 185:6
185:17
knowing 76:11 80:12
185:4
knowledgeable 174:18
knows 21:3
kudos 9:13 28:21
Kurtz 1:18 41:8,13
144:20 174:8 176:3,8
Kurtz's 145:13

L

L.A. 27:9 84:21 89:21
135:4 172:11
L.A./Long 51:12,15
Lab 102:17
lack 42:20 155:10
lacking 181:13
ladies 46:20
lady 28:5
lake 156:1 167:22 168:1
lakes 20:3,13 21:1
146:14 155:6,11
158:8
land 37:2 102:3 107:11
107:12 114:6 153:4
landfall 90:13
landlord 86:14
Lands 125:21
landscape 103:2,20
laptops 175:2
large 27:11,16 40:7,12
47:9 66:17 73:21 87:6
87:8 88:7 90:2 91:21
93:6 95:2 97:18
108:11 127:14 135:12
139:15 173:16
largely 61:7 139:15
larger 45:22 88:4 90:6
95:21 99:19 115:7
133:1 158:20 160:1
173:2
largest 39:14 40:6
73:22 147:2
Larry 2:5 53:21,21,22
60:7
Larry's 19:5 30:5 33:20
60:3

lastly 99:16
late 32:6,9 34:4 96:20
 117:2
latest 95:7
laughed 123:5
launched 80:18
laying 111:9 168:14
lead 62:13 82:15 111:22
leaders 89:5
leadership 2:8 27:22
leading 65:5
leads 69:18
leap 146:1
learn 23:11 24:5 69:3
learned 40:13 60:4
 114:12
learning 9:14 30:15
 36:19 48:14
lease 88:16 92:14
leased 102:4 105:4
leave 99:14 110:3 160:7
LeBoeuf 2:9 4:6 65:16
 67:3 84:3 118:19
 120:5,9 143:3
led 78:19 81:18
left 49:22 137:21
 183:18
legislative 80:21
length 26:20 153:11
lens 14:12 35:14
let's 19:9 28:13 65:15
 118:1 171:2
level 15:9,13 25:7 30:11
 41:2 48:5 59:5 62:15
 68:21 70:4 76:9 78:21
 80:14 85:16 94:9
 109:17 112:19 113:17
 128:12,13 129:6
 139:5 142:8
levels 165:10
leverage 18:8 19:12
licensed 37:5
lies 47:14
life 71:21 96:6,6,13
 140:3,3
life-long 41:20
lifespan 95:21 139:17
lifetime 157:16
liked 163:22
likeness 7:14
limit 175:4,12
limitations 112:3,4
limited 48:8 166:9
Lindsay 145:22 146:18
line 57:6 96:16 105:5
 147:9,16 170:3
 176:19 184:5
lines 155:18 176:16

lingual 127:19
link 159:11
links 156:20
lip 55:3
list 13:14 41:7 49:7,13
 49:21 177:21
listen 52:6 132:4
listening 51:8 57:9
 131:22
little 6:10 24:5 25:10,15
 26:15 28:7 31:17 32:6
 34:11,22 40:19 41:20
 44:2 46:22 68:3,8
 70:17 84:16 85:21
 101:7 110:2 111:14
 112:15 115:11 118:20
 121:9 123:16,20
 129:1 131:18 146:16
 152:15 154:14 156:7
 157:19 158:10 162:10
 162:17 163:10 167:9
 169:9 170:2 177:14
 180:14
LITTLEJOHN 2:19
live 72:11 106:17 110:8
 117:6
living 72:10 92:5
load 176:21
loaded 26:21
local 15:8 33:10 58:2
 61:20 66:19 78:8
 99:20 117:7 123:21
 145:3
locate 94:12
located 70:12 72:18
 79:3 134:17
location 5:5 122:5
 168:21
locations 76:10
logistics 7:16
long 3:6 4:8 22:6 34:7
 36:22 38:9 39:13
 44:15,19 47:8,18
 48:20 59:14 65:22
 66:16 83:1 84:14,20
 85:12 86:14 89:21,21
 91:22 99:17,20 119:3
 126:12 134:8,9 135:8
 135:9 139:13 158:6
 163:6 166:14 172:13
 179:7
long-range 97:4
long-term 54:13 114:3
longer 75:4 95:21
longer-winded 63:3
look 9:3 15:19 30:14
 34:1 36:9,11,19 46:15
 53:8 62:20 66:11 67:1

95:12 97:7 98:1
 101:13 105:2 117:6
 136:18 139:22 140:8
 140:13 145:15 148:13
 149:13 150:10 151:3
 155:8 156:7,8 168:13
 180:11 181:12 186:6
looked 83:14 93:4
 126:11
looking 12:14 13:9,12
 17:10 19:6,13 49:1
 82:18 83:19 85:19
 88:12 95:22 96:5,13
 97:1,8 104:2 130:3
 138:7 140:5 152:8
 170:19 171:12,19,22
 177:12
looks 120:11 178:4
loop 60:2
Los 47:18 85:12 96:14
 135:3
loses 157:9
loss 74:1 83:17
losses 73:18,22
lost 171:20
lot 14:4 20:7 22:14
 24:20 25:6 27:10
 28:20 29:3 30:11 31:4
 40:14,16 41:15 44:14
 47:6,22 48:22 52:11
 55:3,4 56:3 60:4,21
 62:12 79:8 98:16
 123:1 124:9 125:5
 127:20 130:11 132:9
 138:5,12 140:20,21
 142:7,22 144:20
 148:17 149:12 154:3
 154:6 161:7 163:21
 170:6,14 180:16
 182:20 183:2,10,21
 185:9,16,16
lots 8:12 14:16 37:19
 41:16 88:7 137:6
loud 71:8
louder 15:10
Louisiana 143:4
love 13:19 19:8 52:9
 68:12 119:1,11 120:8
loved 16:19
low 127:18
low-lying 72:18
lower 39:18
lucky 90:15
Luedy 3:5 4:7 65:21
 82:22 83:20 84:1,10
 124:21 125:4 131:9
 134:8 135:19 136:22
 137:2,11,14 138:17

139:12 142:5
Lynne 185:14

M

M 1:11,14
MACRL 102:16
magnitude 48:15 85:22
 89:1
main 29:7 39:16 50:7
 164:11
maintain 150:8
maintained 168:2
maintaining 18:22
 145:20 157:16
maintenance 19:2 91:8
major 66:15 79:3 85:1
 102:15 105:16 108:17
 109:7 112:17
majority 47:9
making 5:19 13:21 20:9
 44:1 57:22 78:8 86:9
 93:13 167:14
man 42:9 155:9
managed 24:20 47:5
management 2:10
 69:19 77:13 91:1
 113:21 139:19 158:14
 158:21
managers 69:15
Managing 4:3 65:6,13
manner 39:4 74:8
manufacturer 26:13
 179:1
manufacturers 178:11
 178:15 180:17
map 94:12
mapping 47:9 116:4
 125:9 126:2,13
 146:19
maps 94:11 95:2,4,6,12
 95:14,18 97:7
MARAD 79:18
March 1:9 30:17
margins 45:14
Marian 2:6 17:8 23:6
 30:18 33:18 50:18
Marie 89:8,15
marinas 132:7
marine 2:18 3:4 41:21
 58:22 66:1 67:22
 69:13 74:17 77:8
 100:20 102:16 103:19
 117:15 119:19 137:5
mariner 41:20
mariners 11:11 69:16
maritime 69:12 70:20
 71:14 87:5 103:22
mark 55:14

market 44:12 106:1
 107:16
markets 129:3
marks 97:17
married 86:15
marshaling 183:15
marvelous 13:21
Mary 1:15 4:13 8:21,22
 10:20 11:5 13:3,8
 15:16 42:19 131:16
 131:20 144:21 146:10
 149:22 183:6,15
master 93:12 101:1,21
 102:7 104:2,4,7 105:9
 106:9,12,17 107:5,11
 108:7,13,15 109:1,6
 109:11,13,16 110:20
 111:2,16,20 112:2,21
 115:6,9,13 117:8
 128:20 130:15 133:9
 133:22 138:18 177:21
material 50:10 62:17
 108:9
matrix 150:9,10
matter 149:16 165:15
 166:10,19 186:7
matters 33:11 162:1
Mayer 2:5 53:21,21
 54:1
mean 11:18 22:13
 25:21 28:16 30:22
 31:21 38:12,16 39:16
 40:1 55:10 75:1 95:15
 124:2 155:7 156:12
 163:17
means 32:13 70:16
 106:4 119:9
measure 76:7
measurements 25:8
 26:9,19 29:15 76:1
measures 70:1
measuring 70:3
mechanism 179:21
mechanisms 105:22
 110:14
medical 73:2
meet 61:22 83:5
meeting 1:6 7:11,12,15
 7:16 13:22 15:4 22:18
 23:2,13 24:2 28:19,22
 29:3 31:2 32:10,11,12
 32:21 35:9 47:22
 50:11 54:10 55:7 61:8
 64:5,6,8,20,21 110:13
 123:21 133:14 144:13
 153:14 160:17 161:21
 161:22 162:16,21
 166:13 169:15 179:1

185:19
meetings 9:14 22:4,19
 51:5 54:15 68:14
 115:17 133:11 169:8
MEGAN 2:20
Member 3:2 9:2,7 11:1
 11:4 12:10 13:16,19
 17:17 20:1 21:22 22:3
 28:2 31:22 32:4 34:20
 36:17,21 41:13 47:2
 120:11,14 122:15,18
 122:22 125:3 126:18
 127:2 129:13,17
 131:7,15,21 134:5
 135:16 136:6 137:1
 137:10,13,22 150:3
 150:14 151:8,16
 152:3,10,11,20
 153:18,20,21 154:1
 155:4 156:10 157:22
 159:4,18 161:13
 162:19 163:3 167:19
 169:5,18,19,22 170:1
 170:16 172:2,7 173:4
 174:4 175:15 176:5,8
 178:3,6 179:3,6
 182:10 184:17,20
 185:1,6,22
members 1:13 2:1 4:2
 6:9 8:18 20:9 22:9,18
 29:14 34:6,9 49:6
 50:9 118:4,8,12 144:3
 144:12 147:16 149:7
 161:8 185:12,13
mention 105:14
mentioned 5:8 14:14
 15:6 20:9 23:11 27:9
 29:19 65:12 67:18
 83:14 88:22 120:20
 125:6 160:16 163:12
 174:8 181:18 185:14
menu 7:18
Merchant 41:21
merged 160:8
merging 160:3
Mersfelder-Lewis
 185:14
mesh 113:4,4
messed 31:19
met 1:11 32:14 34:16
 66:7
Metropolitan 112:10
Mexico 9:9 77:11
mic 83:7
microphone 148:5
Microsoft 182:8
mid-2010s 58:10
Mid-Atlantic 35:2

middle 28:16 42:16
 185:7
mile 166:21
miles 89:9,21 181:15
million 71:10 74:2
 89:18 90:4 132:16
 163:14
mind 138:16 148:6
 159:7
mindful 6:17
minds 186:4
mine 68:10
minimal 90:15
minimum 13:6
minute 118:2
minutes 64:7 66:11
 67:11 118:2 137:17
 147:12 149:14 182:11
 183:18
missing 182:1
mission 159:11 170:5
missions 70:19
Mississippi 8:15 41:3
 46:19 56:16 62:14
 143:4 160:14,22
 163:11 180:22 181:16
mitigation 84:18 98:18
 99:4 130:13
mix 11:7
mobile 154:15
mobility 154:20 155:3
 158:1,11,13 161:22
 165:12 171:15
model 18:15 42:9 95:5
 114:2,3 121:7,17
 124:4 125:12 126:2
 126:10,13 156:22,22
 157:2,9 165:9
modeling 112:22
 113:15 128:6 138:6,6
 139:1,2 142:11 153:9
models 18:11,12,14
 25:8 30:18 48:18
 55:16,17 76:3 113:16
 115:8 124:16 125:22
 126:16 139:6
moderate 63:8
moderating 65:11
 142:20
moderator 4:4 140:17
moderators 3:1 9:13
modernization 23:21
 24:6 30:21 31:4
Mole 89:17
moment 10:19 127:12
 150:10 154:22
momentarily 5:11
money 80:1

monitor 158:22 159:1
monthly 74:18,21 75:9
months 15:11 139:10
 169:16 180:3
morning 5:3,13,17 6:6
 7:7 8:10,17 11:2,3
 12:10 13:16,17 17:15
 17:17 19:22 20:1
 28:11,12 32:9 34:18
 34:20 41:10,12 47:1,2
 49:18 50:19 53:22
 83:17 84:1 174:7
 184:1,3,9 185:4 186:6
Moshiri 146:9
motion 26:1,4,9,16 27:2
motivate 159:8
motivating 100:11
mouth 163:12
move 15:21 18:6 19:18
 19:20 36:14 41:8 49:5
 62:7 85:5 139:9 140:7
 151:18 162:13 165:21
moved 155:13 166:17
 166:21 168:6
movement 155:15
 158:6,12,13 170:20
moves 170:18
moving 8:12 52:1 119:3
 142:22 152:11 154:2
 155:17 161:5 162:8
 167:17 168:19
MTS 71:1,3
muddle 172:4
multi- 127:18
multi-beam 181:8
multiple 5:21 75:8
 163:15 183:9
multitude 27:18
mute 120:13 142:16
 182:19
muted 174:4 178:7
myriad 129:6

N

NAD 37:9,9
nail 43:2 60:7
name 5:8 100:16
names 28:9 34:16 66:6
Narragansett 133:19
narrow 39:20 81:2
 159:15
Nathan 1:14 2:19 3:2
 4:5 28:8,11 31:16
 58:18 63:7,10 65:4,8
 67:4 83:7 84:2 118:7
 118:19 129:14 143:10
 149:20 168:13 169:2
Nathan's 142:20

nation 85:3
nation's 70:3 71:12
national 1:3 2:3,4,10,16
 2:16,18,19,20 13:4
 37:17 52:10 67:20
 70:6 72:21 76:2,5
 102:21
nations 73:21
natural 55:21 74:2
 113:6 123:8
nature 137:4 171:1
nautical 35:5 69:12
nav 52:9 57:5
navigate 29:19
navigation 2:11 8:16
 11:19 12:1,16 20:12
 20:17 21:7,13 33:8
 42:6 45:4,15 47:10,13
 55:15 56:13 62:21
 69:13,15 74:18
 119:19 130:10 134:18
 144:4 159:12 161:8
 165:3,8,11 167:3,3
 168:20 171:17 172:10
 178:17 179:11
navigational 172:22
NAVSAAC 42:5
NAVTEQ 180:18
Navy 89:17
near 146:13 159:9
necessarily 66:13
 118:12
need 16:8 18:14 23:9
 28:4,5 29:18 52:17
 55:14 89:3 90:18
 105:21 129:10,10
 136:11 141:7 153:9
 156:13,14,18 159:9
 162:4,13 174:14
 175:14 177:6,12
needed 35:17 67:14
 167:4
needs 14:10 41:19
 76:20 99:1 107:17
 119:12 134:2 141:3
neighbor 135:4
neighboring 14:22
 127:6,17
neighbors 127:10,11
net 94:6
never 39:12
new 2:2,6 8:15,21 18:19
 18:21 19:9 22:9,17
 34:5,9 37:12,12,16,22
 38:4 46:20 49:4 60:21
 72:4,4 74:18 80:17
 84:22 97:2,22 99:9
 103:1 105:22 106:10

108:10 120:10 157:7
 164:6 172:8 185:12
newer 98:3
newest 87:12 96:19
news 81:9 90:14
NGS 2:4 59:22 76:6
nice 11:7,8 17:18 28:17
 42:17 52:22 56:9
 169:20
nicely 176:6
nicer 22:11,13
Nicole 1:16 2:9 4:6
 13:14,18 17:14 27:7
 49:6 65:16,17 67:2
 83:10 100:10 118:16
 120:4 123:4 129:18
 137:17,20 140:16
 143:3 158:4 159:3
Nicole's 101:5
night 22:6 25:17 42:17
nine 41:22 89:21
no-brainer 126:9
NOAA 1:3 2:2,8,14 11:9
 11:14 12:6 14:20 16:6
 16:11,18 21:4,9 25:1
 25:5,11 28:22 32:17
 35:5 39:2,4 50:4 55:1
 55:8,16,16 56:4 64:15
 68:4,16 70:6,21 74:11
 74:22 75:5,10,19,20
 77:11 78:13,20 80:22
 81:11 82:16 119:17
 138:11 141:1,11
 144:3,3,12 147:15
 153:15 156:15 159:11
 164:11,20 165:22
 168:8,9 169:10 170:8
 170:19 172:16,21
 173:7 179:8,20
NOAA's 5:9 33:11 50:3
 68:19 82:13 164:14
 170:4
NOAA-University 2:2,5
Noll 145:12
non-commercial
 132:11
Non-Federal 81:14
non-navigation 165:11
non-NOAA 10:5,7
non-trivial 54:10
non-voting 2:1 49:6
Norfolk 104:17
normally 115:13
North 98:7
NOS 2:5,7,12,13 16:18
 69:10,18 70:1,7,13,15
 74:11 78:7
NOS's 69:14 70:11

74:15
Notably 87:10
note 57:3 59:17 60:2,6
 61:7 63:15 67:17 70:8
 107:10 123:11 183:22
noted 5:20 11:9 58:18
 149:21 174:19
notes 8:18 18:3 28:18
 34:10 41:17 53:7
 145:2
notice 54:4 83:10 98:1
noticed 11:16 28:8
notification 91:12
notifications 104:13
noting 145:5,8,11
November 103:5,6
NSR 38:7
NSRS 15:17 23:21
 30:21
number 28:18 29:21
 72:12 86:4 90:5
numbers 55:10 132:22
nuts 110:1 111:14
NWLON 153:6

O

objection 179:4
obligated 129:21
obs 52:9 57:5
Observation 2:11
observations 70:3 75:6
 75:21 144:4
observe 158:22
observing 164:2
obvious 14:8
obviously 37:19 96:10
 134:19 135:12 140:6
 168:1 172:8 175:16
occurred 136:17
occurring 72:15 136:17
occurs 134:20
ocean 2:4,10,10,16,16
 35:19 47:9 67:20 70:3
 72:15 75:20 76:8
 96:20 125:16 139:22
ocean-related 71:11
OCEANIC 1:3
OceanMaps 30:16
Oceanographic 2:7,17
 29:21 74:16
oceanography 47:8
oceans 29:11
OCS 2:13 59:19
offer 5:13 54:13 55:1
 118:15 161:19 162:9
 162:16 164:21 169:9
 174:17
office 2:12,15,19,20 5:9

74:15 164:20
officer 2:13 166:16
officers 42:10
offices 57:21
official 5:10 64:6
officially 149:14
offshore 87:14,15
 105:17 154:13 160:13
 164:8 167:13
oh 19:8 67:4 85:5 109:1
 122:18 123:5 164:15
oil 11:21 98:11
okay 21:20 22:1 25:13
 49:10,10,12 51:3
 60:10 88:22 98:15
 100:9 118:10 121:9,9
 126:18 137:13,22
 142:14 153:18 157:13
 159:5 172:3 179:2
 184:22
old 35:20 39:12 95:4
 181:22 185:13
older 39:12 98:6,9
on-going 86:22
on-the-ground 91:9
onboard 104:5
once 18:17 94:21 134:4
 164:3 179:12
ones 180:18
online 28:9 31:18 32:6
 78:9 164:16
onscreen 5:22
onshore 154:13
onward 97:20
OPC 123:15 125:12,16
 125:22 126:10,16
open 147:9,9,16 155:13
 155:18 167:22 168:1
 168:22 178:19
operate 20:20 88:17
 92:14
operating 91:11
operation 174:14
operational 2:7,17
 12:18 20:5 30:17
 74:14,16
operations 4:4 31:8,8
 65:7 70:20 73:6 80:10
 90:8
operations' 74:22
operator 102:1 105:20
opinion 164:21
opportunities 108:11
opportunity 12:5 13:4
 118:15 140:20 141:6
 144:7
opposed 152:3 155:14
optimum 19:11

options 28:15 94:17
orange 105:4 111:17
orange-brown 97:13
order 33:6 34:13 35:21
 145:7
organization 52:8
 134:16
organizations 13:5
 113:16,21
organize 179:1
organized 11:7 127:19
Orleans 8:15
ourself 163:2 182:5
outcomes 127:11
Outdoors 146:9
outline 111:16
outlines 110:5
outlook 74:19
outlooks 75:9
outs 30:3
outside 80:8 133:11
 134:17,20
outstanding 143:18
 148:19
outward 95:22 98:1
outwards 96:13
over-arching 92:13
overall 99:16 106:2
overlap 25:20 107:9
 108:17 109:4,7
oversee 39:1
overseeing 16:7
oversees 70:2
overwhelming 9:15
owners 113:10
ownership 145:18
Oxford 73:16
OZKAN-HALLER 31:22
 32:4 163:3

P

P-R-O-C-E-E-D-I-N-G-S
 5:1
P&E 4:12
p.m 186:8
pace 72:4
Pacific 58:8 147:2
 184:1,21
packed 32:10
page 41:18
Paige 1:15 4:13 8:21,22
 10:20 11:6 13:3,9
 42:19 131:16,20
 146:10 149:22 183:6
 183:15
Paige's 144:21
Panel 1:4,11 5:6,7 6:8
 11:7 29:14 36:10 47:4

50:9,14 52:15 54:19
 61:13 62:14 63:5,8
 118:4,8,12 119:16
 120:11 123:10 138:12
 141:2 143:3,9 147:15
 149:7 158:16 159:21
 161:18,20 162:12,21
 165:2 169:14 170:14
 173:6,13 178:14
 180:11
Panelists 30:4 54:20
 59:17 61:8 69:3
 143:16 184:12
panels 14:2 30:2 50:2
 54:8 55:2 61:20,21
paper 66:19 75:14
 150:8,16,21 151:5,18
 152:4,19 154:11,17
 154:17 158:2 159:3,7
 159:22 160:3,18
 162:11 169:13 172:19
 173:22 175:18 180:11
 183:10
papers 150:1,12 152:12
 152:13 172:5,9 183:7
paragraph 158:18
parameters 121:10
parcels 105:3,3,4,13
 114:10
pardon 124:22
part 49:1 50:14 55:9
 59:20 62:19 64:9
 99:12,15,18 102:6
 103:20 115:7 126:13
 133:22 139:6 151:1
 165:13 166:9 171:12
 181:10 185:3
participants 6:4,20
 63:19
participate 114:19
participating 80:20
particular 23:19 33:12
 46:13 58:3 74:12
 155:5 173:15
particularly 22:8 24:6
 48:19 55:15 74:13
 114:15 134:4 169:13
partners 51:16
partnership 51:15
 59:14 101:11 102:2
 120:1
parts 43:11 52:8 98:2,6
 98:7
pass 62:3
passage 33:7
passionate 15:9
paths 168:14
patiently 131:14

Patrol 134:11
pause 57:11
pay 21:11,12 50:4
paying 41:1 44:6 50:9
pays 50:14
Peace 1:19 3:2 4:12
 19:18 20:1 150:14
 151:16 152:3,11
 153:18,21 155:4
 161:13 167:19 169:18
 170:16 172:2 173:4
 176:5 178:3 179:3
 182:10
peak 166:22
Pedro 85:13
people 5:21 11:13
 16:11 28:21 31:6
 40:21 44:14 46:7 51:7
 55:20 70:11 72:9
 118:17 124:13 158:16
 159:21
people's 116:6 121:4
percent 71:13 72:11
Perfect 134:5,5
perform 162:5
performance 175:4,14
performing 48:18
period 4:11 8:4 37:14
 63:17 64:12 143:13
 143:21 148:13 161:11
 181:7
periods 66:21
permanent 94:13
permission 64:17,18
 65:3
permit 94:1
permits 64:4 93:19
 94:20 126:7
permitting 16:6 114:7
person 6:16 22:11 53:9
 143:4
personal 176:10
perspective 14:13
 165:2,3 173:7
pertains 88:20
pertinent 120:16
petroleum 37:6 105:15
phase 116:20 139:15
PhD 100:19
PHELPS 2:19
phenomenal 32:22
phone 8:7 18:19 147:9
photo 64:19
phrase 151:4
physical 29:20 35:19
 58:22 59:12 73:18
 130:7,8 132:10
 145:22

physically 45:20
physics 165:20
pick 26:16
picture 76:12 115:7
 158:21 160:1
pictures 16:22
piece 21:3 109:14
 176:17
pieces 8:13 33:6 53:4
 102:12 142:22 165:22
pier 87:10 89:17 98:2,2
 98:7 135:20
pilot 10:14 13:3 42:1,2
 42:3,8,16 43:16
 177:19 179:15 180:1
 180:17 181:12
pilot's 13:4 46:8
pilotage 42:22 43:2
piloting 42:14 43:10
pilots 10:11 26:4 40:1
 41:9 42:9 43:1 44:10
 45:7 46:19 48:4 56:16
 69:15 145:1 161:8
 174:21 175:21 177:6
 179:9 180:21
pipeline 173:11,14
pivot 5:19
pivotal 23:17
pivoting 29:5
place 10:9 19:4 41:4
 48:20 54:2 57:13
 62:11,18 117:2 122:6
 126:16 162:14
placeholder 153:2
placement 87:15
places 20:13 25:6 51:1
 140:21 163:11
placing 73:5
plan 39:10 60:13,20
 68:20 70:15 71:6 72:7
 77:10 78:5 80:12 82:8
 92:4 93:7,12 99:6,17
 99:18 101:1,21 104:2
 104:4,7 105:9 106:17
 107:6,11 108:7,13,15
 109:1,6,11,13,16
 110:20 111:2,16,20
 112:2,5,13,21 115:6,9
 115:13 117:8 125:8
 126:14 128:21 130:6
 130:15 133:9,10,22
 134:22 135:10,15
 138:19 139:10 142:12
 157:15 162:20 168:12
planet 72:16
planned 168:17,20
planner 100:18
planners 82:1

planning 4:8,12 15:13
68:21 69:19 70:13
73:7,8 75:15 76:13,20
76:22,22 77:5 79:7
80:19 81:4 82:2,7
83:2,12,15 84:13,14
89:4 91:19 92:8 95:3
97:5 100:22 101:4
102:7 103:4,8,15,20
104:20 105:8 106:9
106:10,12,15 107:2
109:15 110:6,7 111:6
114:4 117:7 125:16
125:18 127:8 130:6
138:10,19,20 139:8
141:17,18 152:22
plans 69:8 80:1 92:22
93:14 139:21
platform 113:1,2 114:5
121:18
platforms 36:2 112:17
128:7 135:22
play 82:2,16 112:11
please 25:1 47:1 60:2
64:1 70:17 71:7 72:2
73:8 74:8,19 75:2
76:21 78:1 80:6 81:17
85:8 86:3 88:21 91:18
97:5 98:14 101:8
103:3 106:1 109:22
111:13 112:14 115:10
129:21 136:7 144:2
144:15
pleased 50:13
pleasure 34:21
plug 43:13
pocket 44:7
podium 71:17
point 13:2,8 28:17
62:11 63:3 74:11
85:16 96:2 98:4 99:12
113:7 119:15 122:9
128:2 129:11 133:2,9
136:10 140:14 142:6
143:20 147:17 148:20
150:15 151:21 152:6
156:16,22 157:1
167:15 173:20
pointed 183:3
points 24:21 27:21
39:21 97:15 121:21
122:5,5,11,13
policies 43:3 92:22
93:14
Policy 99:9
Polish 181:20
pop 75:18 107:1
population 72:11

port 3:6 4:4,8 10:13
14:18 35:6 36:22
37:20 39:1,5,8,10,13
40:7 43:18 47:18,20
51:13 52:20 59:14
65:6,13,22 68:6 69:16
71:5 73:22 74:5,14,21
75:15,15 76:20,21,22
77:13,13 78:6,14 79:6
79:11,18 80:19 82:1,2
82:6 83:1 84:11,14,19
84:21,21 85:7,11,11
86:9,14 87:18 88:8
89:11 90:16 91:4,21
91:22 92:13,21 93:6
94:2,2 95:1,20,22
96:1,7,11 97:1,11,19
97:22 98:6,19 100:13
101:1,1,14,22 102:14
102:17 103:8,10,22
104:4,20 105:13,15
107:6,17 109:9,12,16
111:20 112:2 115:13
116:6 120:20 125:18
126:17 127:4,8,9,11
127:14,15,15,21
128:20 129:1 133:18
134:9,18 135:3,4,5
136:11 137:4 140:4
141:17 142:3 143:4,7
145:12,17,18 146:3
168:16 171:2 172:11
172:12,13,19 177:17
179:8,17 180:2
port- 104:22
port-to-port 119:8
portion 101:20 106:3
110:19 171:6,8
portrayed 167:4
ports 4:3 12:17,20,21
14:4,10,21 20:10 21:4
21:6 29:11,20 30:4
33:4,15 37:18 38:10
44:3,6 51:14,17 53:3
58:16 59:1 65:6,13
66:13,14,15 68:12,17
69:4 71:8,9,14,19,20
72:18 73:3,11,19,21
76:12,16,18 77:20
78:4,8 79:3,10,15,16
79:21,22 80:3,9 81:3
81:6,15 82:4 83:3
84:4,6 85:13,13 88:15
89:20 96:4 119:2
126:8 130:3,4,21
132:5 145:16 172:20
173:2,2,16
Ports' 81:10

posed 144:13
poses 145:13
position 57:8 89:12
149:10
positioning 2:12 29:16
52:9 57:5 144:5
possible 103:18
possibly 51:18
posted 64:15 147:7
150:16
posting 144:19
potential 74:1 85:10
91:5 94:14 97:14,16
97:22 133:20 170:3
potentially 66:19
107:22 166:1
potter 136:9
power 88:5,15 174:12
powerful 173:8
POWERS 80:17
PPU 43:10,11 145:7
174:15 175:1 178:10
180:17 182:7
PPUs 10:11 13:3 42:21
43:7 144:22 146:1
174:9,12,20 175:16
practical 165:14
practices 9:19 119:8
praise 55:1
pre-qualify 145:16
precise 45:15 172:10
172:21 179:11 180:1
precision 11:19 12:1,16
20:20 45:4 55:15
69:13 74:17 178:17
predict 123:1 156:7,13
predicting 48:18
Prediction 112:22
predictions 75:11 76:9
76:19 82:14
predictive 48:18 76:3
120:19
prefaced 18:5
preparation 63:5
preparations 70:10
prepare 91:15 113:18
prepared 148:7
present 1:13 2:8,14
79:8 107:14
presentation 16:17
19:6 24:19 30:5 33:20
60:3 61:13 83:21 84:9
100:3,11,14 125:7
132:5
presentations 11:20
17:19 21:13 61:6
65:19 66:9 118:18
131:22 154:8

presented 9:16 141:14
150:12
presenters 9:13,20
108:6 144:7
presenting 138:2
presiding 1:12
pressure 12:2 45:9,21
73:5
pretty 40:4 130:18
140:14 179:13
previous 67:12
primarily 95:21 102:3
primary 35:8,13 85:15
176:17
principle 117:14
prior 6:5
priorities 71:5
prioritize 33:12 86:19
98:14
priority 98:12 171:10
privacy 7:11 64:13
private 59:14 81:14
92:15 102:6 105:13
111:4 132:7 137:6
privy 125:19
probabilistic 114:2,3
139:2
probably 37:1 39:5 40:6
43:15 54:15 59:22
63:2 87:11 90:5,20
96:18,21 129:22
137:12 142:3 152:21
161:6 162:22 165:19
168:8 173:1 175:3
181:15
problem 58:6 124:10
185:4
problematic 128:2
problems 106:17
proceedings 12:13
process 15:21 81:19
92:11 94:6,16,22
101:1 102:7,9 104:7
105:9 106:9,10,13,15
107:2,4,9 108:20
109:15 110:7 111:7
112:1 115:20 116:8
116:11,12 117:7
121:18 134:1 141:19
146:7 162:16 185:10
processes 103:8 110:7
processing 36:5
produce 87:12 90:22
produced 95:15
produces 156:15
product 26:22 175:9,19
177:5
production 92:3 125:8

productive 184:6
products 2:7,17 57:20
 69:10 71:13 74:16,17
 141:10 144:5 174:6
 174:13 175:19 177:2
profession 42:18 43:10
professional 100:18
program 79:19,21 87:6
 87:9 125:1 139:19
programming 182:8
programs 23:10 70:14
 88:1,6
progress 32:19 33:18
 104:17 145:9 147:1
 185:10
project 24:7 39:18 58:4
 78:21 87:9 94:12,17
 101:9,15 102:5,7
 104:6 106:3 108:4
 109:5 111:10 114:17
 116:20 117:13 140:5
 141:13
projections 76:8
projects 16:9 25:19
 87:8 88:7 94:2,3,8
 95:22 97:22 102:19
 121:12 139:15 140:7
promote 69:11,21
pronunciation 66:8
proper 53:20 66:8
properties 107:15
property 121:22
proportionate 59:4
propose 152:14 169:7
proposed 96:21 97:18
 97:19
proprietary 43:1
protect 25:1,5
protected 89:20
Protection 96:20
 125:17 140:1
protective 43:1
proved 95:18
provide 6:3,10 29:18
 62:22 71:9 76:9 97:7
 109:18 114:18 141:6
 165:9
provided 63:19 64:16
 94:22 141:1
Providence 101:2
 102:3,4 104:4,18,22
 106:18 107:6 108:9
 127:5,15
provides 110:12
providing 6:19 55:8,14
 55:18 57:21 65:16
 115:9 172:20
ProvPort 104:2,10,15

105:4,14,20,21 106:9
 108:8,17 112:12
 127:18 133:9
ProvPort's 107:5 109:5
ProvPorts 110:19
PST 1:11
public 1:6 4:11 7:19 8:2
 8:4 35:22 36:6 59:13
 63:15,17,22 64:3,9,12
 64:22 108:3 115:3,17
 115:18 132:6 135:20
 137:6 143:13,21,22
 144:14 148:6,13,17
public-private 101:10
publication 124:4
publicly 115:5
publish 81:20
published 73:16 138:12
Puerto 32:15
pull 29:2 65:18 162:17
pulled 53:12 54:11
pulling 28:22 48:3
 53:15 91:2
pump 91:7
pumps 91:8
purely 165:2
purple 97:18 105:3
purpose 6:7
purposely 145:6
purposes 172:22
purview 126:7 164:15
push 87:12,22 88:18
 123:19
pushing 155:19 156:3
put 9:2 10:9 26:2,17
 37:12 64:3 103:2
 135:21 150:22 152:14
 161:20 167:19 168:20
 169:6 178:14
puts 89:12
putting 53:19 61:21
puzzle 102:13

Q

Qassim 1:15 10:21 12:7
 12:16 15:5 18:2 25:14
 31:12 122:18 129:16
 130:22 131:13 152:7
 152:10,20 154:12
 160:7 176:3 178:3,5
 179:3 180:12 185:20
QR 17:2
quality 44:22 54:19
 99:4 174:12
quantify 25:10
quarter 166:21
question 7:13 14:15
 55:5 86:18 118:14

120:11 125:5 129:12
 129:20 131:5,11
 136:6 137:18 138:3
 140:16,18 141:6
 142:2 144:1,22
 145:14 170:17 172:8
 173:3 174:5
questionnaire 177:20
questions 7:18,20 8:4
 17:5 33:9 64:2 82:8
 118:16 131:19 144:7
 148:18 167:9
quick 7:8,8 23:7 62:10
 63:13 105:2 119:15
 138:1 142:19 143:2
 160:12 170:17 184:18
quicker 180:6,6
quickly 13:22 37:18
 138:16 150:4
Quintal 1:19 46:21 47:2
 120:14 122:15
quite 23:8 29:8 85:2,10
 91:20 126:7 154:10
 154:10
quizzing 52:18
quo 89:4
quotes 149:4

R

Rabena 145:1
Rachael 2:11 57:4,9
RACHEL 2:18
racing 61:12
ragged 146:16
rail 87:16,17,18 90:8
rain 177:10
rainy 9:8
raise 147:18,20 148:4
raised 13:8 148:9
range 6:4 119:17
 165:10
ranged 92:20
rapid 73:4
rapidly 86:20
rates 72:14,17
rating 172:17,21
rationale 10:16
RDML 2:12 5:3 57:2
 143:15 147:11,20
 148:1,11,15 157:20
 161:15 164:18 170:21
 172:4 173:5 174:2,16
 183:14 184:19,22
re-open 171:11
re-survey 162:5
reach 56:13 75:18
react 167:18
read 18:3 64:3 83:16

144:9 149:4
reading 164:12
ready 20:2 37:10 39:17
 50:19 60:17 63:11
 151:17 154:10 178:4
 181:8 184:4 185:18
real 18:13 29:21 38:19
 51:9,10,20 55:6 56:6
 56:8 62:20 80:9
 142:19 160:12 182:1
real-time 55:18
realistically 175:6
realize 184:4
realized 58:17 183:17
really 11:8 12:2 14:2
 17:2,4 18:8 19:10
 21:15 22:5,11,13,20
 23:10,13,17 24:19
 25:9,12,14,19 26:5,6
 26:18,19 27:6,21 30:5
 30:15,22 31:12 32:13
 32:18 33:3,4,5,17,19
 34:5,8,15 36:10 37:21
 40:14 42:17 43:19
 45:8,9,21 47:19 49:21
 50:13 51:8,10 52:5,5
 52:15,22 53:6,11,14
 54:7,22 55:8,8,12,13
 55:17 56:6,11 57:15
 58:9,11 61:19 68:3
 81:2,15 82:11,18 83:5
 83:14,19 84:3,4,5,12
 85:19 86:7,9,19 87:4
 87:6,20,20 88:1,14,18
 89:3,5 91:1,12,16
 92:2,4,7,11,12 93:4,6
 93:12 94:5,15 95:18
 95:20 96:12 97:1
 98:20 99:3,15 108:3
 114:8,14 116:17
 117:6,10 118:21
 123:4,6 125:17,22
 126:16 128:1 134:11
 134:12,14 137:3
 139:22 140:2,8
 141:14 142:6,18
 143:18 148:17 153:9
 154:11 156:11 160:2
 163:4,5 164:4 166:19
 169:6 170:16,22
 171:18 175:2 178:22
realm 169:11
Rear 7:10 56:22 65:10
reason 44:20 45:2
 46:10 62:19 137:11
 139:18 155:5 159:10
reasons 42:21
Rebecca 1:19 46:21

120:12,13
Recap 4:2
received 64:7 144:9
recognizance 162:7
 167:16
recommend 180:16
recommended 168:5
reconvene 184:10
reconvening 149:14
record 64:3,9 144:14
 149:17 186:8
recorded 7:12,14 64:14
recreational 69:16
 132:4,11,12,16
 133:17 134:10,22
 136:12,19 137:9
 146:11
red 83:12
redevelopment 87:8
 94:7 140:4
reduced 27:14
reducing 99:20
reduction 27:16 79:20
 99:11
reductions 99:7
reference 37:17 52:10
reflect 184:9
reflected 32:11
reflection 184:3
refrain 7:13
regard 127:8 165:15
regarding 17:6 67:12
regardless 133:1
region 35:2 58:3 85:3
 87:3 90:14 96:15
 136:2
regional 69:14
Register 81:21
registered 132:16
regular 167:11
regulate 145:7
regulation 145:8
regulations 174:20
regulatory 174:19
reiterate 12:15 54:5
reiterates 146:12
relatable 14:9,11
related 14:15 37:20
 71:14 73:15 108:1
 143:6 154:15 160:21
relative 62:15
relatively 98:4 163:10
release 30:16
released 70:15 77:8
 96:20 103:5,17
releasing 104:10,13
relevant 62:12 154:9
 157:9 161:11 170:12

reliable 77:2 142:11
reliant 71:14
rely 11:13 181:3
remarks 80:17 159:5
remember 32:12 37:8
 37:11 56:1 166:15
 185:12
remind 46:7
reminder 64:13
reminders 5:16 7:9
 62:7
remiss 185:13
remote 147:2 162:5
 167:16
renewable 88:13
repairs 90:4
repeat 157:12
repetitively 35:18
replica 130:8
replicate 33:13
report 77:5 106:19
 109:1 117:3,8,11
 138:11
reported 33:19
Reporter 6:15
Reporters 6:2
reports 22:21
represent 97:12,14,18
representatives 91:2
represented 132:2
request 81:19 103:17
 143:21 144:6
required 35:21 64:18
requirements 58:2
 167:13
requires 96:12
requiring 77:1
research 117:5
reside 180:22
residence 122:3
residential 121:14
 122:13
resilience 14:16 16:3
 68:7 69:21 71:6 75:15
 77:3,5,9,10,13 78:2
 78:12,15 79:7 82:2,6
 87:19 88:1,6,20 91:19
 92:8 100:13,22 101:3
 101:14,18 102:14,17
 102:18 103:4,11,22
 108:18 110:8,15
 115:2 129:11 141:16
 142:4,13 143:5,7
 153:8 154:7 158:7
 159:12
resiliency 4:8 85:4,9
 86:7 89:4 92:4 125:16
 172:3

resilient 4:3 20:10 65:5
 65:12 70:13 78:5 79:9
 79:22 80:19 83:3 99:2
 117:16 143:7
resistance 88:6
resolution 11:15 12:4
 15:6 18:4 35:15 113:4
resource 7:17
resources 77:21 86:19
 103:10 106:20 112:9
 166:9 167:10
respect 68:12
respects 59:6,8 173:18
response 66:4 90:19
 137:3 170:18
responsibilities 150:6
responsibility 166:5
rest 83:19 101:21
restricted 90:7
restrictions 171:7
 176:2
result 121:21
resulting 73:18 98:10
results 150:21
resumed 149:17
ret 2:2
retained 64:20
reusing 14:16
revert 6:15 7:2
review 1:4,11 5:6,7 13:5
 119:16 150:5 151:4
 165:2
reviewed 103:19
RFI 81:22 82:9,16
RFP 104:11
Rhode 3:5 66:2 78:15
 81:11 100:20 101:2
 102:22 104:1 105:18
 112:21 113:22 114:6
 119:4 120:15 127:7
 130:15 132:17,21
 133:14,15,15,21
RI-CHAMP 112:21
 113:20
RI-CHAMPS 120:17
Rico 32:15
ride 9:19
right 7:18 13:19 14:19
 16:1,10 22:1 23:1
 26:3 28:13 29:12,16
 30:7,8,9 36:18 40:10
 52:18 56:5 60:8 65:9
 69:9 70:7 79:3 80:2
 84:1 87:18 89:16 97:8
 100:4,5 104:7,17
 105:16,19 106:6
 107:6 115:13 119:22
 120:9,18 124:14

128:11 131:12,20
 137:5,15 139:21
 140:8,15,16 142:4,15
 142:17 148:8,14
 149:19 151:19 156:16
 156:17 157:17 159:9
 163:13 165:6 166:10
 166:13,19 170:3
 175:22 176:8,20
 183:3
right- 75:12
rise 15:13 62:15 68:21
 70:4 76:10 85:16 93:5
 94:9 95:2 96:14 139:5
 142:8
risk 59:9 73:14 78:21
 92:16 93:8 95:13
 105:10 109:9,12,16
 109:20 111:1 112:20
 114:9,18 116:21
 130:13
risks 78:22
river 8:15,16 41:3 46:19
 56:17 62:14,21 143:4
 160:14,22 161:6
 163:11,12,13 181:1,2
 181:16
RMDL 63:12
robin 2:16 4:2 5:17 6:7
 6:8 7:1,6 8:17 184:3
robust 6:21 87:6 88:10
 91:12 92:11 99:9
 103:21 116:4 127:5
role 60:1 82:2,16
 106:14,14 111:3,4,19
 141:2 142:21 161:17
roles 112:11
rolls 37:17
room 6:11,13 61:19
Rosemarie 3:4 4:9 66:1
 66:3 82:20 83:4 100:4
 100:17 117:22 120:14
 122:20 123:17 126:19
 129:19 130:15
Rosemary 124:20
Rotterdam 25:16
rough 26:5
roughly 96:12
round 4:2 5:17 6:7,7,22
 7:6 8:17 184:3
route 168:5,20
routes 168:4,17
routinely 181:17
Rude 166:16
run 102:7 174:13
running 46:2 102:9
runs 175:2

S		
S 98:7 174:5,13	125:18 126:8 130:4	149:8,20 150:20
S-100 177:1	139:4 142:8 153:4	153:16 159:22 160:8
S-102 48:5 58:12 175:7	154:20 167:7 181:6	161:1,11 169:4,9
175:8 180:3	seabed 154:15 155:3	176:3 181:6 183:10
safe 9:18 69:11 98:4	158:1,11,13,13	185:19
safely 20:21 29:19	161:22 162:8 165:4,9	seeing 13:13 33:5 45:1
safer 33:7,7	165:12 166:7 171:13	51:13 56:6 85:14 86:3
safety 20:11,12 21:6,12	171:13,14	88:22 97:11,15
35:11 42:6 45:9,13	SEAiQ 44:14 176:13,21	159:21 186:6
47:10,13 165:7	177:2	seek 82:17
sailor 136:8	sealable 95:2	seeking 81:22
Sal 56:2	seamless 179:13,13	seen 14:4 21:19 34:16
salt 45:7	Sean 1:11,14 5:12 7:6	47:20 54:22 55:5
saltwater 62:15	8:9 9:3 11:1 22:3 32:4	85:18 128:19 155:7
San 22:7 85:13 123:11	54:1 57:2 62:4 63:12	174:10
sanction 125:22	65:3 140:18 142:16	selected 116:16 134:4
sand 152:16 153:22	143:15 148:21 151:12	selection 43:20
155:19 156:13 161:5	151:22 178:4 182:12	self-assessment 77:14
163:16,17 165:12,16	182:16 183:14 184:14	sending 177:20
165:20 166:14,21,22	search 93:6	Senior 3:5 65:21 82:22
171:15,21	season 20:2	84:10
Sandy 121:3	seasonal 75:9	sense 31:3 60:11,16
save 11:21 169:1	Seattle 58:9	61:1 126:1,9 128:17
saw 12:8 14:4 90:2,12	second 12:19 13:2	148:16 170:6
101:5 151:13	15:14 116:20 150:18	sensing 162:6 167:16
saying 97:2 128:15	151:13 160:21 182:19	sensitive 114:13,20
129:9 136:12 160:10	184:18	161:16
169:17	seconded 151:21,22	sensor 26:1,4,7,10,16
scale 84:5,18 95:21	sections 89:22 110:6	27:2
97:18	sector 35:12 81:14	sensors 30:12 181:14
scales 75:8	sector's 111:4	sent 146:18
scenario 101:20 113:14	sectorial 81:13	separation 20:16 168:4
113:15,18	sectors 119:20	168:15
scenarios 95:13 113:3	secured 139:9	sequential 156:18
138:22	security 12:18,19 72:21	157:12
scenes 29:2 77:19	77:6,7 88:11 101:6,17	seriously 153:10
scheme 20:16 168:4	101:18 102:21 103:13	serve 34:22
school 42:11	114:14	service 2:5,10,16,16,18
SCHWINDEN 2:20	sediment 14:16 27:7,10	16:19 55:3,9 67:21
science 95:7 102:21	155:12,14,16 156:2	70:7 165:8 166:2
165:15	158:5,12,13,21	services 1:4,11 2:7,10
scientific 75:14 161:7	159:14 160:13,21	2:17 5:7 11:10 57:20
scientist 161:2	161:5 163:14 164:11	69:11 74:17,20 102:1
scientists 75:19 160:18	165:13 169:11	102:5 119:16 127:4
161:3	see 8:21 10:21 13:12	144:5 146:20 165:2
scope 97:10 101:15	17:3,18 19:10,22	servicing 8:14 35:22 36:9
SCOTT 2:20	27:12 28:9,13 29:1	session 19:14 33:4
screen 7:19 10:22	31:18 32:22 34:14	62:5,8 63:18 65:5,11
21:20 34:14 45:1 64:4	35:14 37:16 38:8 49:7	67:12,16 83:20 164:5
144:11,18	50:18 51:16 55:16	182:13
Scripps 123:15	56:22 58:11 61:10	sessions 9:11 33:3
scrolling 148:9	65:15 85:3 97:21 98:6	54:7 64:14
sea 15:13 41:22 62:15	98:8 106:15 111:15	set 23:12 26:12 96:10
66:16 68:21 70:4 76:9	118:1 119:12 127:21	138:19 179:12
78:13,21 81:1 83:17	128:20 129:4 135:1	sets 18:7
84:6,20 85:16 91:22	137:17,20 140:19	setting 26:6
94:9 96:4 102:22	141:18 142:10 143:8	seven 58:7,7 75:8 151:1
	144:18 146:14 148:9	181:6
		shades 97:12,13
		shallow 155:6
		shape 166:6
		share 21:10 41:19 83:1
		86:2 114:22 115:4
		161:2 184:11
		shared 64:8 108:18
		144:12 166:11
		sharing 12:6 17:20
		119:8 135:18 137:1
		sheet 146:18
		shift 37:10 38:13,18
		140:6
		shifting 170:20 171:15
		171:21
		ship 26:2 40:8,12 42:10
		42:13 45:11 181:20
		shipping 67:1 74:14
		83:15 137:7
		ships 21:2 24:14 39:15
		40:6 42:16 43:6 44:1
		55:11 58:18 60:21
		shoal 20:15 167:22
		168:5
		shoaling 171:20
		shoes 28:3
		shore 146:14 159:9
		shoreline 155:12
		shorelines 89:17
		short 97:4 121:14 137:2
		137:3
		short- 74:13
		shortages 74:7
		shot 51:20
		shoving 155:16
		show 8:21 34:6 98:17
		116:19 128:7 144:10
		144:15
		showcase 178:9 179:2
		180:14
		showcases 180:15
		showing 59:15
		shows 94:13
		shut 171:9
		side 7:19 84:14 92:21
		98:18,19,21 122:8
		sidebars 53:10
		sign 21:12
		significant 66:22 89:16
		89:19 101:19 102:12
		103:9 117:22 133:20
		141:15
		significantly 112:7
		166:17
		signify 148:2
		signs 136:11
		silence 143:13
		similar 9:3 46:18 77:12

147:1 176:22 182:13
simple 177:19
simply 61:7 75:3 99:15
 126:3 135:1
simulator 42:11
simultaneously 73:7
sincere 55:1
single 7:2 71:18
single-beam 181:3
sir 28:11 63:11 143:14
 149:2
site 113:9
sitting 22:18 25:3 168:5
situation 30:13 136:16
situations 62:20
six 15:11 58:7 87:21
 151:1 169:16 180:3
size 28:5,6 29:9 55:10
skin 70:8
skip 31:21 32:5 146:8
slide 69:9 70:17 71:6
 72:1 73:8 74:8,19
 75:2 76:21 78:1 80:6
 81:8,17 83:11 85:8,20
 88:21 91:18 97:5
 98:14,15 101:7 103:3
 106:1 109:2,4,22
 111:13 112:14 115:10
 116:18
slides 16:22 99:22
 101:5
Sloan 1:17 34:18
slot 23:7 60:15,17
slow 118:5 145:9
slower 46:2
small 28:5 87:7 88:8
 114:16 117:8 127:16
smaller 37:15 45:12
smart 41:6
smarter 59:9 162:10
snapshot 97:7
sneakers 73:2
software 44:17 138:2
 145:7 175:5 176:13
 177:3 178:18
solutions 110:15
 141:19
solve 71:1
somebody 164:15
 167:5
someplace 168:7
somewhat 96:3 107:10
soon 38:4
sooner 50:20
sophistication 54:19
sorry 22:2 25:15 27:5
 49:13,17,18 51:11
 78:22 109:2 118:10

141:12 157:19 178:6
 184:22
sort 16:5 91:20 94:5,17
 97:17 107:18 119:15
 126:9 130:6 140:3
 172:1
sorts 86:16 90:19 93:8
 167:8
sound 57:17 166:15
soundings 176:15
sounds 80:7 151:21
 169:19 172:2
source 12:20 74:12
 146:7 173:10,14
sources 10:5,7 129:6
 140:21
south 89:11
Southern 58:2 89:2,9
space 61:16 82:6
 107:14 109:21
span 96:6,13 140:3,3
spatial 15:6 29:12
 37:17 52:10
speak 57:8,10,14
 170:22 173:6 176:10
speaker 11:7
speakers 3:3 64:16
 73:1,1 118:12
speaking 65:2 132:5
 148:2
special 174:14
Specialist 3:5 65:22
 82:22 84:11
specialists 117:17
specific 14:18 15:2
 40:5 76:10 93:20
 105:1 106:3 113:5,6
 113:17 122:6 142:1
 173:15
specifically 30:3 68:15
 104:19 122:4 134:3
 135:15,21
spectrum 44:8
speeds 161:9
spend 98:16
spending 58:21,21 59:2
sphere 36:6
split 150:5
spoke 49:20 123:17
sportfishing 134:16
sports 70:20
spread 119:7
spring 5:5 81:21 117:2
squarely 165:18
squat 46:4
Sr 1:12,14
staff 2:14 54:9 63:20
 87:1 94:2 95:19

137:12 153:15
stage 23:12
staged 155:22
stages 104:12 139:19
staging 87:13
stake 128:21
stakeholder 16:21
 63:20 107:19 108:20
 109:8 111:11 112:8
 112:13 115:12,22
 116:3,15,22 123:18
 123:20 132:21 135:2
stakeholders 86:13
 124:8 126:20 133:2
 133:10
stand 162:14
standard 43:9 48:5 96:3
standardization 18:9
 43:3 44:21 144:22
standardizations 42:20
standardize 13:6 182:7
standardized 44:21
standardizing 181:12
standards 18:7 176:9
standing 119:6
standpoint 132:11
 136:15
start 5:12 8:17 20:2,4
 34:18 38:10 116:2,12
 116:21 153:15 168:13
 169:12 172:20
started 25:3 68:14 92:2
 103:16 116:15,17
starting 6:5 17:11 29:1
 74:11 92:12 128:1
 129:11 183:22
starts 168:14
state 35:6 52:21 95:8
 96:18 103:22 105:18
 112:19 113:17,21
 114:6 123:12 125:14
 125:21 126:5 133:20
 163:16
statement 7:11 133:6
 167:20 180:20
States 38:14 44:11
 73:11 132:13
stations 88:10,10 91:7
status 89:4 160:5
stayed 8:19 47:5
stemmed 20:7
step 54:12 93:12 107:2
 107:2 162:10
steps 110:5,11,16
stern 26:17
Steve 149:5
stink 136:8
STOFS 24:17

stomp 21:3
stop 18:22 21:11 27:19
 56:9 62:3 186:3
store 88:13
storm 85:16 89:8,10,14
 90:13,19 91:6,13,14
 93:5 95:17 113:3,15
 122:20 163:19,19
storms 27:11,17 85:22
 89:1 91:17 155:11,21
STORMTOOLS 114:1
stormwater 93:11
story 135:4 173:8,18
straight 65:4 150:11
strategic 70:15 93:7
strategies 88:2 92:19
 93:3 99:5,11
strategy 93:4 99:16
 111:11 112:8 115:22
 130:13 146:19 147:1
streams 55:17
strength 149:8
strengthen 116:12
stressing 86:5
stressors 96:11
stretch 181:5
strictly 134:12
strong 91:17 149:7
 166:1
structure 43:4
struggle 159:16
stuck 62:2
student 82:21 100:19
studies 86:1 89:3
 103:18 104:16,20
 160:19
study 73:16 103:16
 104:16 105:3,6,10
 106:5 112:16
stuff 16:15 43:16 44:6
 44:20 149:13 155:20
subject 45:8
submit 7:19 179:19
submitted 146:18
 148:16
submitting 172:16
subsided 98:10
subsidence 62:16 70:2
 76:1
substantially 66:14
successful 172:15,19
suck 61:18
sucking 156:2
sudden 18:20
suddenly 54:10
sufficient 69:4
suggestion 152:21
 180:10

suite 93:2 95:2 175:7
suites 10:13
suites 95:14
summarize 144:9,16
summary 79:12
summer 117:2
summit 80:17,21
sunny 15:12
super 95:18
supplies 73:2
supply 72:22 74:7
support 12:2,3 16:9
 23:14 25:12 58:22
 59:1 70:20 71:10,20
 74:21 76:20 78:8,12
 79:9 88:6 103:10
 105:17 110:11 146:10
 165:10 175:10 185:16
supported 46:9 108:10
supportive 105:22
supposed 45:8
sure 10:6 13:13 19:20
 20:10,19 21:3 41:1
 49:6 52:12 68:17 69:8
 72:1 91:10,16 93:13
 103:2 124:21 129:13
 130:19 135:19 136:1
 137:2,14 138:17
 144:17 154:10 164:18
 173:3 175:21 178:12
 182:17 184:19 186:3
surface 14:17 167:7
surge 89:10,14
surges 85:17
surprise 29:22
surprised 14:5 31:12
 48:4 172:11
surprises 18:1
surprisingly 73:20
 80:15
surround 96:9
surrounding 74:6
survey 2:4,13,15,19,19
 2:20,20 5:10 35:1
 38:22 40:10 74:15
 76:2,6 145:16 171:11
 173:17 177:18 181:8
 181:19
surveyed 20:14 181:17
 181:17
surveying 37:2,4 38:17
 40:14 146:2,13
 166:15
surveyors 179:9
surveys 5:6 36:22 39:3
 39:11 47:10,11
 157:12 172:16,21
 179:16 181:14

survive 143:8
suspect 27:15 175:12
sustenance 136:1
switch 37:7,15,18 38:19
 54:9
switched 37:8,13 47:3
 172:11
switching 29:5
symbolic 17:21
system 10:13,13 21:4,6
 29:21 30:1 37:12,17
 38:4,11 52:11 59:1
 89:20 91:13 95:10
 177:16 179:20
systems 37:4 60:9,19
 60:20 61:1 67:22 86:6
 88:11

T

T 98:3
table 70:21 101:20
 131:3
tablets 175:1
tackle 174:16
tad 9:15 132:22
take 26:11,14 38:10
 40:12 54:12 98:20
 111:22 117:1 119:22
 136:17 145:14 149:1
 150:10 151:20 159:19
 169:8 171:2
takeaways 29:8
taken 45:6 135:13
takes 29:2 50:15
talk 15:4 20:8 24:21
 43:15 48:14 56:17
 62:11 67:6 70:22
 84:16 85:21 91:19
 100:21 101:7 102:10
 107:5 113:9 120:15
 124:8 134:3 153:10
 158:5,11 161:8 164:5
 169:2 170:11 172:19
 173:13 174:4 182:4
talked 32:20 108:6
 125:5 152:15 163:8
talking 20:22 23:22
 25:22 32:7 37:21
 60:18 73:1 84:9
 100:15 101:15 130:7
 153:8 160:12 169:22
 172:10 174:9
talks 40:15 158:1,7
 183:5
Tampa 41:8,11 42:1,2
 44:16 45:18
tangentially 154:6
tangible 103:11

taper 15:8
tardiness 34:4
target 107:15 144:2
tariff 44:4
task 31:10
tasks 106:5
taught 68:11
team 28:22 34:8 46:17
 46:21 86:10 88:19
 91:1,8 95:20 99:4
 101:10,14 125:10
 133:14 149:7 183:1
 186:4
team's 185:15
teamwork 185:9
technical 5:14 69:7
 173:21
technically 147:13
techniques 162:2,6
 167:16
technologies 164:1
technology 60:12,14
 152:22 178:9 180:13
 180:15
ted 67:16 119:11
tell 76:5 127:2 161:18
 173:18 182:7
tells 75:3
temporary 91:8 94:13
ten-year 37:14
tenant 94:3
tenants 86:12,15 87:2
 90:9 91:13 95:1
term 74:14 161:7
Terminal 102:1,5 127:4
terminals 88:7 137:5
terms 55:14 84:18
 137:9 167:10
terrific 51:6
test 179:10
testing 103:14
thank 5:18 7:10 8:9
 9:12 10:20 11:1 12:6
 12:7 13:10,11 16:16
 17:8,13,14 19:14,16
 21:16,18 22:3 27:19
 27:20,22 28:2 31:16
 32:8 34:2,3 36:12,13
 40:18 46:14 49:11
 50:17 51:4,21 52:1
 53:14 54:1 56:19 57:2
 62:9 63:12,18 65:8,10
 65:17 67:3,5 82:20
 83:7,9 84:2,2 100:1,2
 100:8,10 109:3
 117:21 118:20 122:15
 122:16 123:3 129:13
 129:17,18,18 130:21

131:7,8,12,21 134:6,7
 135:18 136:20 137:13
 137:16 139:11 143:2
 143:9,15,17 148:16
 149:2 152:3 161:12
 164:16 178:7 183:6
 183:14,15,19 185:18
 186:4
thanks 13:20 19:13
 50:16 53:13 100:9
 117:19 120:3,14
 129:14,15 140:16
 144:19 159:4 161:15
 179:3 184:11
theirs 39:4
themes 159:8
thing 5:20 11:8 19:9
 22:5 24:16,22 25:21
 32:11 44:9 45:4 46:12
 50:7 54:11 66:12
 106:7 108:5 114:12
 143:5 159:6 167:6
 169:6
things 10:17 12:13
 14:20 15:2 18:21 19:2
 20:6,18 27:19 42:14
 44:5,18 51:7 52:22
 55:3 56:5,17 74:8
 88:9 92:21 99:10
 106:4 107:1,20 108:2
 108:14 109:8 110:12
 110:13 111:12,18,21
 113:11 114:8 118:6
 119:18 121:10 123:19
 128:2,5,10 142:18
 153:8 154:21 157:1
 164:8 167:17 171:13
 175:1 181:13
think 8:22 11:5 14:9,18
 18:2,18 20:4 21:9
 23:12 28:10 30:10,21
 31:6,12,18,19 34:15
 38:6 39:18 41:10 45:6
 47:14 49:15 50:4,7,12
 54:11,12,14,16,21
 55:4,13,19 56:5,6
 58:1,17 59:7,19,22
 60:6 61:5 62:3,13
 63:14 65:3 66:15
 76:16,17 85:5 115:16
 116:9 117:10 118:7
 119:1,6 120:12,18
 123:1 128:21 133:14
 134:1,2 141:22 142:3
 142:9 143:12 144:21
 146:8 147:8,11
 148:15 151:8,9 154:3
 154:9,14 155:2 156:5

156:6,9,10,11,20
 157:10 158:16 159:7
 159:18 160:10,17
 162:22 163:1,5
 164:21,22 166:4,8,11
 167:8 169:15 170:6
 170:13,21 173:9,12
 173:17,20 174:7
 176:6 178:22 179:4
 180:9,13,21 181:10
 181:21 182:3,6,9
 183:20 184:8,10,15
 185:20
thinking 17:10 25:4
 27:2 94:18 118:11
 121:3 130:16,20
 153:3,10 157:13,22
 159:6 166:8
thinks 112:12
third 15:22 38:13 84:20
 180:21
Thomas 1:20 21:19,22
 22:3 28:2 122:18
 125:3 126:18 127:2
 129:13 151:8 157:22
 159:18 169:5,22
 174:4 175:15
THOMAS 122:22
thoroughly 60:4
thought 6:6 22:8 23:8
 25:4,9 123:5,9 149:11
 159:2 160:2 178:8
thoughts 8:18 30:7
 46:18 48:22 118:17
 153:21 155:3 183:12
thousand 20:22 73:19
thousands 26:19
thread 48:3
threat 149:9
threatens 72:21
three 23:3,6,14 51:15
 89:22 90:2 92:12
 95:13 104:16 139:10
three- 26:10
thrilled 67:5 83:6
throw 160:16
throwing 124:18
thrown 101:11
tickled 19:5
tidal 37:22 38:1,6
tide 95:17
tides 66:17 70:4
tie 158:20
tied 38:2
ties 103:21 116:5 147:5
 156:11 164:7,7
tight 39:16 40:1,2
tighter 162:18

time 6:1,16 13:7 17:13
 18:13 21:4,8 23:7
 25:16 27:6 29:21
 30:10 32:13 34:7 42:3
 51:11 54:20 61:10,20
 63:4 64:4 66:21 69:1
 69:6 73:3 75:8 76:7
 79:8 92:1,6 98:16
 100:4 114:11 118:20
 120:6 131:18 132:9
 134:3 137:21 138:7
 138:10 140:7 142:6
 142:20 143:2,17
 147:9 149:15 156:17
 156:20,22 157:1
 163:20 167:21 169:2
 170:2 177:16 178:9
 178:22 181:7 182:1
 182:14,21 184:8,21
timeline 11:9,12
timely 83:16
times 19:12 23:1 29:22
timescales 75:11
tissue 116:11
title 53:16
today 7:12,12 8:5 9:9
 12:14 13:9 19:14 26:8
 31:14 36:11 67:19
 76:16 84:5 125:2
 148:7 158:2 184:4
told 41:2 173:8
Toledo 156:3
tolerances 45:13
tomorrow 31:19 36:12
 148:8 182:14 184:1,9
 185:19 186:5
tomorrow's 148:6,14
ton 28:18,21
tonight 186:5
tool 103:15 120:18
 157:8,14,15,17
tools 19:1,7,7,12,13
 30:9 78:9,12 100:12
 110:12 157:4,5 162:2
tooth 43:2
top 71:5 79:7 138:10
 139:4 151:1 168:5
topic 64:6 68:11 85:4
 86:8 87:17,20 133:15
 141:13 156:6,21
 162:11,21 163:5
topics 48:2 152:18
 160:9 172:9
topo 160:2
topping 97:14
total 73:12 89:21
touch 45:3 142:18
touches 70:5

track 47:5 74:9 155:17
 176:18
tracking 162:3 165:16
 165:16 167:11
trade 73:13,18 85:2
traditional 36:2 103:9
traditionally 106:8,13
 111:2 112:2
traffic 20:16 133:19
 137:7 168:4,15
training 16:13 17:4 43:3
 78:11
transcribed 64:15
transform 73:5
transformation 105:16
 129:2
transiting 134:18
transition 99:7 154:12
 154:17
transport 27:7,10
 160:14,22 165:13
transportation 53:4
 59:1 67:22 69:12 77:9
 112:10 119:19 140:12
tread 57:17
tremendous 36:3 54:20
 55:9,11
trend 44:13
tributaries 155:14
trillion 71:9
tropical 90:13 91:14
troubleshooting 7:22
troublesome 89:13
troupe 85:7
trucks 99:8
true 54:17 58:20
Truly 14:2
trusted 68:19 74:12
try 6:6,22 22:4 25:10
 39:21 63:4 81:15
 131:19 134:12,14
 137:22 140:17 143:1
 164:18 181:12 182:21
trying 6:18,18 23:5
 26:13,14 30:6 45:17
 60:10 80:2 81:12
 159:15 179:21 182:6
 182:7 183:2
Tuba 19:17 31:18,20
 159:20
Tuba's 47:16 159:15
 167:15
Tulane 160:18
tunnel 130:10
turbines 87:14
turn 5:15 7:5,7 8:8
 63:10 83:7 118:5,9,14
 143:12 144:8 148:4

148:21 149:21 170:22
 182:12 183:11
turning 39:22
twin 25:20 31:13 130:1
 130:4,6,16,21 131:13
 150:19 151:5,17
 152:4,9,12,13 153:14
 183:9
two 5:5 8:22 25:13
 39:11,12 40:10 49:2
 65:19 67:19 71:21
 89:6 90:1,7 95:14
 108:6 112:17 114:8
 115:8 125:21 130:3,4
 137:16 178:12
two-pronged 98:20
two-way 170:7
type 26:22 35:21 64:1
 112:16 114:9
types 30:12 47:11
 105:22 128:6
typically 96:1 140:11
 155:6 168:1 177:6

U

U.S 1:1 67:21 70:20
 71:3,10 72:11,21,22
 77:8 81:10 84:21
 102:20 132:17 165:8
U.S.-Asia 85:1
ultimately 139:12
uncertainty 81:3 128:9
 129:6
unchartered 67:9
uncommon 140:14
uncrewed 19:12 60:9
 60:19,20
undergoing 105:16
 129:1
underground 121:15
 122:3 123:2
underlying 45:2
underpin 108:18
underserved 25:2
 146:21 147:5
understand 31:4,7
 52:16 76:3 77:22 78:4
 98:22 119:7 138:5
 140:2 169:21
understanding 48:10
 57:7,12 82:11 165:20
 166:6 170:8
understood 167:12
undertaken 71:22
undertaking 118:1
underutilization 10:1
underutilized 10:1,3
underway 93:10 104:12

unfortunately 32:5
UNH 56:15
unifying 128:16
unintentionally 10:3
unique 145:11 154:3
United 38:14 44:11
 73:10 132:13
units 181:13
Universities 78:15
University 3:5 66:2
 73:16 81:11 100:20
 112:18
unmapped 147:2
unpack 183:21
unprecedented 16:2
unpredictability 124:3
unpredictable 124:2
upcoming 80:21
update 15:16 30:20
 38:6 40:19 46:22
 179:14 182:1
updated 18:16 35:22
 95:5 146:17 180:3
updates 5:14 15:17
 32:17 61:11 92:7
 146:4
updating 35:5 39:10
 93:13
urban 100:18
URI 82:21 104:9 114:1
 115:21 127:5
URI's 116:4
usability 157:16
usable 95:11
use 7:18 19:9 30:12
 43:18 44:13 50:5
 62:16 64:19 81:7 94:4
 94:11 107:12 114:6
 121:18 125:7 126:2
 126:10 128:6 134:18
 138:22 139:4,6 148:2
 156:19 167:17 174:22
 176:10 177:22
useful 108:14 177:8
user 95:11 177:5
users 128:7
uses 75:10,20 113:3
 114:1 128:3 165:11
USGS 153:6 165:19
usual 32:10
usually 52:4
utilities 130:11
utilization 60:19,20
utilize 12:19 19:7 30:9
 59:10 60:22 175:6
utilized 58:13 162:2,7
utilizing 48:5 60:9

V

valid 157:3
validate 10:7
valuable 30:1 106:21
 106:22
value 13:2 29:20 58:17
 59:15 109:14 112:15
variables 27:1
varied 183:2
varies 163:9
varieties 174:10
variety 88:5
various 91:2 92:6 162:1
varying 128:8
vehicles 36:3
vendor 177:2
vendors 44:11
Venice 181:5
verbal 147:14
version 151:15
versions 183:9
vertical 38:2
vessel 29:9 36:2
vessels 20:20 21:1 26:9
 45:22
Vice 1:14 3:2 28:10,12
 29:1 63:7 65:9 66:5
 83:9 100:2,7 117:21
 118:10 120:3,7,10
 122:17 129:15 131:12
 131:16 137:15 140:15
 142:14,21
video 64:19
view 54:13 164:11
Virginia 2:17 7:21 145:1
 171:3
virtual 5:19 13:22 22:4
 22:16 29:6 53:12
 54:10 182:10
virtually 59:7
vision 127:20
visit 113:9
visualization 78:9,11
vital 20:19
voice 64:19 125:2
vote 151:17,20
vulnerability 92:17 94:8
 94:11 98:13 105:11
 109:11 114:9
vulnerable 25:6 72:20
 94:17 121:20 122:6
 122:11

W

wait 169:14 180:3
waiting 34:1 39:7
 131:14
wake 28:9

wake-up 90:17
wakeup 90:10
walk 107:1
walls 121:4
want 7:14 9:12 24:11,18
 34:5 41:14 43:14
 47:16 50:1 55:20,21
 57:3,14,17 59:17
 61:17,18,19 63:15
 67:10 68:15,16 70:8
 71:7 81:10 98:16
 99:14 101:9 102:11
 107:4 110:1 117:12
 118:8,20 130:2 132:6
 135:22 136:3 141:5
 143:16,17 148:7
 152:14,19 157:14
 158:9 162:13,15
 169:1 170:22 173:6
 175:20 179:14,17
 180:2,6 182:16,18,21
 186:2,3
wanted 5:13 17:8 23:19
 45:3 56:4 67:17 82:17
 94:5 98:17 103:2
 133:5 136:13 143:2
 173:12 180:7,8
 184:11
wanting 15:4
wants 152:17 169:3
Wardwell 1:14 3:2 4:5
 28:11,12 63:7 65:9
 66:5 83:9 100:2,7
 117:21 118:10 120:3
 120:7,10 122:17
 129:15 131:12,16
 137:15 140:15 142:14
warmly 22:15
warms 17:4
warnings 75:7
washed 171:16 186:5
Washington 80:8
wasn't 14:5 56:5 173:3
watches 75:6
water 15:8 25:7 30:11
 46:5 59:10 89:19,20
 90:3 91:13 95:15
 108:3 121:4 122:10
 132:10 140:11 155:13
 155:18 161:10 165:9
waters 67:9 127:4
 134:21 165:8
Waterson 102:1,5
waterway 143:7
waterways 29:11,17
 58:16,19
wave 30:3 48:15,16
 166:21,22
waves 152:16 153:22
 155:19 156:13 161:5
 165:13,16,21 166:14
way 12:3 17:9 30:7
 33:21 60:15 71:20
 75:12 88:8,15 89:12
 90:20 91:15 93:1
 103:11 104:3 112:12
 125:6 130:17,20,20
 133:11 141:11 151:3
 162:14
ways 107:16,20 125:14
 164:2
we'll 6:15,17,22 7:2
 10:21 28:6 34:17
 36:14 38:5 40:5,9
 47:22 49:5 53:17 60:6
 63:4 65:21 66:10
 84:16 98:14 115:9
 117:4,10,18 128:20
 129:4 137:20 139:6
 168:22 182:5,13
 184:8
we're 6:18 8:16,19 10:2
 20:22 22:10,11,12
 24:1,13 30:2 37:10
 38:3 39:7,17,18,19
 48:12 49:8,21 51:11
 51:21 58:20,21 61:21
 62:2,18 65:19 67:7
 73:1 76:15,16 80:2
 82:10 85:19 86:3
 88:12,22 89:11 93:13
 94:8 97:15 100:3,15
 110:2 116:16,19
 117:12 118:17 119:6
 122:13 125:13 126:15
 128:17,22 135:12
 138:22 139:3 142:2
 144:9 155:6,15 157:5
 157:7 169:13 171:12
 171:19 172:9,15
 176:18 177:16 179:16
 179:21 184:5
we've 35:4,10 39:2 47:3
 50:12 52:11,15 58:6
 63:14 85:18 86:2
 87:22 128:19 132:15
 142:7 150:15 154:8
 155:7,20 156:12
 167:21 172:14 175:11
 176:12 177:16 179:22
weakness 149:9
wealth 25:18
wearing 67:19 71:18
weather 16:19 26:5
 68:22 70:7 73:9 86:4
webinar 1:11 63:21

64:2,20 65:2
website 64:15,21 78:10
 144:14 176:20
websites 10:2
WEDNESDAY 1:8
weeds 43:15
week 104:14
weekly 74:21
weeks 80:22 90:7
weird 138:1
welcome 5:5 8:11 34:5
 34:19 36:13,18 41:12
 64:10 83:4 149:19
 185:12
welcomed 22:14
went 18:2 23:6 45:18
 94:21 149:17 157:18
 182:19 186:8
west 21:16 84:7 96:4
 132:1
Westley 2:6 50:18 51:2
wetlands 25:1
WG 4:12
wheel 165:18
whining 55:4
wide 93:2 94:6 165:10
widening 39:21,22
wider 35:19 101:15
 104:21,21 105:12
width 6:1 26:21
willingness 33:11
wind 30:4 87:10,14
 105:17 158:10 164:8
 167:14
window 177:13
winds 155:20
wing 53:18
Wisconsin 78:16
wish 6:13
wonder 164:10
wondered 14:7
wonderful 54:2 55:16
 83:5
wondering 121:1 124:6
 130:14 158:3,9
 166:18 172:14 175:16
word 40:22 48:12 52:12
wordsmithing 183:8
work 6:3,14 7:1 16:12
 17:21 23:2,17 32:14
 32:18 33:2,8,13 35:15
 37:5 38:9 40:2 51:21
 52:11 56:15 67:6 68:6
 68:15 69:15 71:1,6
 76:15 86:11 90:6
 94:19 98:18 102:18
 111:8 123:16 139:14
 161:20 173:17,21

176:16 178:13 179:21
worked 179:10 183:7
workforce 16:10 35:20
working 4:12 39:2
 42:15 50:3 58:6 69:20
 78:3,19 80:22 82:5
 88:5 96:17 99:4
 106:16,20,20 128:17
 142:2 150:1 152:14
 161:22 169:1,8
works 7:3 30:13 58:5
 78:7 128:21 177:15
world 30:11 39:15 41:4
 62:20 73:11,19 74:3
 80:9 141:16 159:14
 159:15
worries 125:3 185:1,2
worry 164:12
worth 33:22 169:22
wouldn't 134:12 162:15
 168:20
wrap 62:4 148:12
 158:15
wraps 99:22
wrestle 167:9
write 178:10
written 64:16
wrong 49:13
WTS 102:5

X

Y

yards 163:14
year 20:3 32:14,18
 57:15 66:21 73:17
 74:2 77:6 85:6 95:17
 97:20 100:19 114:2
 117:3,19 138:8 151:7
 163:15,16 168:6
 179:17
year's 71:6
years 35:2,20 37:1,6
 38:21 39:11,12 40:13
 41:22 42:2,4 54:16,22
 55:6 56:1 58:7 75:5
 77:4,14 87:21 92:12
 127:22 138:20 139:14
 166:16 176:11 181:22
yellow 97:13
yesterday 5:8,20 8:11
 8:18 9:9,12,17 12:12
 13:21 14:15 15:3,16
 16:16 17:5,19 19:19
 20:7 23:7 27:10 28:19
 30:2 31:13 32:10
 40:16 41:16 47:4,18
 50:2 54:7 55:7 58:2

67:18 75:17 142:19
 146:13 163:6,11
yesterday's 35:9
York-New 84:22

Z

ZEERO 99:9
zero 99:7,10 138:21
zeros 133:1
zone 2:10 39:6,8 70:12
 72:3 94:11
zoned 39:6

0

1

1 4:2 93:12
1,200 44:10
1.5 71:9
1.7 132:18
10 114:2 127:22
100 4:9
100- 95:16
102 177:1
11:00 149:17
11:18 149:18
11:30 184:1,21
118 4:10
12 132:15,15
12:00 186:8
122 73:13
13 71:10
143 4:11
15 149:14
15-minute 149:3
150 4:13 26:9 181:15
169 74:1
1948 20:14 156:17
1986 41:21
1995 38:19

2

2 8:11
20 35:2 114:2 118:2,2
 127:22 166:16
20/30 95:12
20/50 95:12
20/80 95:12 96:2,13
 98:5
200 85:6
2014 89:7
2018 97:3,20
2019 103:17 181:21
2022 95:5 103:5
2023 90:12
2024 1:9 5:6
2050 138:7,14
2080 139:22 140:5

21 90:4
2100 95:12 140:13
2120 95:12
230 132:13
24 38:7,7
24- 161:10
24-hour 181:7
25th 151:6
27 37:9 79:16
28 4:5 42:2

3

30 11:21 37:1 66:10
 114:2 167:6
30-mile 181:5
300 89:9
381 132:19
3DEP 153:6

4

4.3 96:14
40 72:11

5

5 4:2
50-year 96:12 139:16
50,000 11:21

6

6 1:9
6.5 79:14
60 35:20
67 4:6

7

7 89:17
7,000 132:18
70 35:20
75 27:15 138:20
76 27:15

8

8:30 1:11 183:22 184:21
8:31 5:2
80 39:19 90:3
81 73:12
83 37:9
84 4:7
88 38:3,18

9

90 71:13

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: DOC NOAA

Date: 03-06-24

Place: webinar

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate complete record of the proceedings.



Court Reporter

NEAL R. GROSS

COURT REPORTERS AND TRANSCRIBERS

1716 14TH ST., N.W., STE. 200

WASHINGTON, D.C. 20009-7831