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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HYDROGRAPHIC SERVICES REVIEW PANEL (HSRP)

SPRING PUBLIC MEETING DAY 2

WEDNESDAY, MARCH 6, 2024

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>> OPERATOR: The broadcast is now starting. All attendees are in listen-only mode.

>> BENJAMIN EVANS: Good morning, everyone, or good afternoon depending on location. Welcome back to day two of the Hydrographic Services Review Panel Meeting Spring 2024. As mentioned yesterday, my name is Ben Evans, aim Director of NOAA's Office of Coast Survey and designated Federal official. I'll be joined by the HSRP Chair, Mr. Sean Duffy. Before we start I want to offer technical updates and then turn over to Miss Amber Butler for administrative reminders before we get into the round robin this morning. Thank you for making the pivot to the virtual environment. One thing we noticed it was challenged the balance having multiple people on screen and engaging in dialogue while at the same time ensuring there was add bandwidth for of the ASL interpreters and court recorders to provide access to the full range of participants.

So in discussions prior to starting this morning what we thought we would try, for the purpose of round robin and round robin only, we like to have the HSRP panel members come on camera, if you're able, and just to provide that -- a little bit more of a face-to-face, as we go around the room to make that more as if we were all in the room together as we wish we could be. If

that doesn't work for the ASL interpreters and court recorders, we'll go back to having one at a time. We're trying to balance access with all attendees and participants with facilitating as robust discussion as we can. We'll try for the round robin. If that doesn't work we'll revert back to single cameras on. I hope that works for everybody.

Before we turn it over to Sean to kick off the round robin, I would like to turn it over to Amber to give a quick administrative reminders.

>> AMBER BUTLER: This meet something being recorded. You can refrain from using the question box or you can close out of the meeting if you do not want recorded.

As meeting agenda we have attached as resource for you. You can use the questions box on the menu to the right side of the screen to submit any public comments or questions. You can contact myself, or Virginia Dentler for any troubleshooting. You can contact us at hydroservices.panel@NOAA.gov for any comments now or later. We'll address all comments or questions during the public comment period later in the agenda today.

And here is some alternate connection info, if you would like to join by phone. And now I'm going to turn it back to Mr. Sean Duffy. Thank you very much.

>> SEAN DUFFY: So, good morning, everyone, welcome to day two of HSRP. Yesterday was a very interesting day, lots of moving pieces. I appreciate everybody's attendance. I am serving as the chair of the HSRP and based in New Orleans Mississippi River Navigation, Big River Coalition. We're going to start off this morning with a round robin to hear from

members, notes from yesterday, thoughts that stayed with you, and we're going to do it alphabetically. I see Anuj, Mary Paige, are you -- there are two As there. Mary Paige, I think you're up first.

>> MARY PAIGE ABBOTT: I had to put my glasses on, Sean, just so I would look similar to you.

>> SEAN DUFFY: That's not a good goal.

[Laughter]

That's not a good goal at all.

>> MARY PAIGE ABBOTT: I got to cut my bangs. Anyway, from the rainy East Coast of the Gulf of Mexico, my -- today, that is. Yesterday was gorgeous, first, the sessions were fabulous yesterday, and I want to thank everyone, and kudos to all of the moderators and the presenters. It was -- as I'm learning, these meetings can be a tad overwhelming, as to the amount of information that's being presented. Yet, what I heard most yesterday, was a focus on safe and efficient, as well as create best practice, and that seemed to ride across the presenters, as well as our Directors. And then a couple of concerns that I had, is that information we may have may be underutilized. So, underutilization of data Websites, everything that we're doing, may unintentionally be underutilized. I'm also concerned that some of our non-NOAA sources -- Jeff Ferguson made a comment about, we must make sure we validate non-NOAA sources. So, that's a concern as to whatever the dynamics that are put in place to do that, as well as the continuity -- concern of continuity. Another was the PPUs that the pilot was using. Seemed like one coast had one system or one port was using a system that suited that pilot association, and then I believe I heard another

one using yet a different. I don't know if there's rationale for having continuity between things, but that was just something that caught my eye, and that's it for me at this moment.

>> SEAN DUFFY: Thank you, Mary Paige. Next, we'll go to Qassim. I don't see him on the screen. Oh, there you are.

>> QASSIM ABDULLAH: Thank you, Sean, good, everyone. I think it was a great day. I agree with Mary Paige, definitely it was a fabulous day. All of the panel, well organized, nice mix of speakers. Really the nice thing, the one I noted, the highlight the importance of NOAA services, for mariner, but also highlight the importance -- I will say describe the more -- the more people rely on NOAA data, you're going to expect more expectation for high resolution data, and currency, that's what I noticed, definitely. There is a highlight of communication, and greater presentation, how much a fast of draft can save us in 40, 50,000, for example. So, provision navigation, there is pressure on us to really to support the -- and the only way to support it, to have high resolution, more data with more frequency. That's a great opportunity for NOAA. Thank you. That's all I have, Sean.

>> SEAN DUFFY: Thank you, Qassim. Next up, Anuj Chopra, I saw you earlier. There you are.

>> ANUJ CHOPRA: Good morning, everyone, this is Anuj Chopra. My apologies I couldn't attend yesterday. I did catch up, I would like to reiterate what Dr. Qassim said. That precision navigation is important for the competitiveness of the ports for economic security and operational security. Second that we utilize every data source there, like other commercial ports

and make our ports more competitive as to what they already have. Whatever information they have, what they have, that's value.

Second point, to what Mary Paige added about pilot PPUs, maybe there's opportunity for the national pilot's association or other organizations to review that, to standardize, as a bare minimum. Maybe that's for another time to delve into it, but that's a good point raised by Mary Paige on that.

Looking forward to today, and thank you, again.

>> SEAN DUFFY: Thank you, Anuj. I am looking -- I see Captain Cruz would be next. I am not sure if he's there. And not seeing -- I'll go down the list, Nicole Elko, are you here?

>> NICOLE ELKO: Yes, good morning.

>> SEAN DUFFY: Hey, good morning, Nicole.

>> NICOLE ELKO: I would like to amplify the applause for yesterday. And great job making a virtual meeting happen so quickly, Julie the panels were really interesting and informative. When I saw the agenda, seeing a lot of ports focus, I am not surprised of course we would do that here. I wondered what the coastal community connection might be. It's very obvious, I think very relatable, the challenges that the ports are having, their data needs, you know, it is very relatable to the coastal communities, which is my lens, my perspective that I bring to this.

As I mentioned yesterday, in my question related to using sediment for resilience, and lots of other challenges are bubbling to the surface that I think are not just port specific, right? They are -- there are things that NOAA can help with, and by helping the ports, they are going to be helping the neighboring and adjacent communities.

So, some of the specific things that I was hearing yesterday, and I was glad to hear, because I came to the meeting wanting to talk about them, was as Qassim just mentioned the high stake level of data. You know the water level is something I'm passionate about and our communities are asking for even louder than they were six months ago, to help with sunny day flooding, their challenges for planning with sea level rise.

The second one, communities have data conversion anxiety, so, I was glad to hear Marian's update as well as updates on MSRS, that's all coming together and I look forward to helping communicate all that you all are doing to the coastal communities through that process.

And then the third one that is of concern to communities right now, is implementation of this unprecedented amount of coastal resilience funding with BIL and IRA, you know, getting the fund object gated and what is involved. And all the permitting NOAA is going to oversee to see it through. Finding the funding data collections to support those projects and expanding the workforce, having enough people at NOAA and everywhere else to do all of this work. That goes along with training the next generation, which is one of our other goals, and I heard almost all of that stuff yesterday, so, admiral Evans, thank you for your expert presentation, collaboration across NOAA, not just with NOS is impressive. I love that Weather Services kind of included in almost everything you all are doing, and stakeholder engagement, you have so many pictures of human on the slide. Great to see that happening. The training the next generation really warms my heart.

Finally I had questions yesterday regarding the data conversion, and just wanted to thank Marion and co-op, the way you all are looking forward,

thinking about incorporating AI into the next conversion, and already starting to get ahead of that is -- so, thank you for the time.

>> SEAN DUFFY: Thank you, Nicole. Excellent insights. Good morning, Deanna Hargrave, you're up next.

>> DEANNE HARGRAVE: Good morning, everyone, nice to see you, echo amazing presentations yesterday, the content, the expertise, the sharing of information is, you know, it is symbolic of the great work that this group does. So, no surprises there. Interesting, Qassim, that you went before me, because I think you are in my head and read my notes. I had resolution, accuracy and frequency, and so you've already prefaced that in -- I'll then move it into data standards for globalization of these datasets to really leverage, you know, the full capability, the more standardization we have, the easier that becomes. And that the models are -- you know, the models are only as good as the information, and as we build more realtime, and more complex models, they need more data to be, not only to build the model but to keep it updated, and to keep -- once you've -- I think you've all experienced, you know, you -- maybe with your iPhone, you get a new phone, all of a sudden it's fantastic and all of these new things, then they stop maintaining the tools that you got used to using on a daily basis. So the maintenance of things we build is equally as important as building them in the first place.

So, yep, also, I was tickled by Larry's presentation, looking into the, you know, how -- how do we best utilize these tools. Tools, of course, are very interesting and we love to just say, oh, here's a new thing, let's go use it, so it is really interesting to see how effective they can be and when are the

optimum times to leverage tools like vessels. Thanks for that looking forward to another great session today. Thank you.

>> SEAN DUFFY: Thank you, Deanne, I know Tuba has an excused absence, Eric Peace, I did catch your comment about beignets. I am sure interpreters touched up on beignets. With that go ahead. Eric.

>> ERIC PEACE: Good morning. I started to think about operational aspects. A couple things I heard yesterday that kind of stemmed through a lot of it, you talked about -- one of our members mentioned the economic impact and making sure ports of resilient and can function. The other issue is safety. Navigation safety is critical. Here in the lakes we have places that have not been surveyed until 1938 and that shoal is in the traffic separation scheme which causes hazard to navigation. Things like that are critical to make sure we have vital precision data to operate our vessels safely. We're talking thousand foot vessels on the Great Lakes as well. Heavy, big ships.

In addition to that, the NOAA port system is crucial, that ports system is absolutely safety of navigation. And, again, I'll say it one more time. I believe it should be funded completely within NOAA, I don't think it should be a cost share agreement. Just like I don't pay for my stop sign, we all pay for it. It's a safety of navigation issue.

But the presentations were fabulous, I enjoy I get exposure to the West Coast as well. So, thank you.

>> SEAN DUFFY: Thank you, Eric. Julie Thomas is up next. I haven't seen her on the screen. Julie, are you with us? Okay --

>> JULIE THOMAS: People here.

>> SEAN DUFFY: Sorry, Julie.

>> JULIE THOMAS: Thank you, Sean. Yes. I tried to make the virtual meeting really interactive is difficult. One thing that I did drive down from Long Beach last night to San Diego, so I'm home now, and I thought, particularly for the four new members that we have, I was feeling kind of sad for you, because when we're in person, we're really much nicer.

[Laughter]

And we're much more interactive and -- not -- I don't mean nicer, but there's a lot of discussions you would be welcomed very warmly, et cetera. So, it's very difficult in this virtual environment, but I do appreciate the four new members sitting through this meeting because it is difficult in your first meeting.

I have to say that I really always enjoy the Directors reports. You heard me say this many times. I like to have them right up front in this meeting because I feel the work that go on within these three divisions is so incredible. Trying to ingest everything that the three -- Brad, Marion and Ben went through yesterday, in their very quick allotted time slot was kind challenging I thought. I need to go back and really check out some of those programs that you mentioned. And I always learn so much. I actually think they kind of set the stage for the meeting, because really what we're here to discuss and advice is to support the three divisions. So, the more we know about their work, I feel it is really crucial and pivot all to this group.

There were a bunch of certain particular comments that I wanted to follow up on. This modernization of NSRS, I have been talking with Dana, Brad. We're going to -- Captain Jacobsen asked if I would arrange a meeting, and Kim, Kim Holtz would be involved with this, too, but Captain Jacobsen would

like to learn a little more about this modernization and particularly how this affects this under keel clearance project, et cetera. And so I will be following up with Dana on that, and Kim, and Captain Jacobsen. I don't know, Admiral if you want included in that conversation, but it is kind of important, as we bring in the deep draft ships, you know, if there's going to be an impact there with this change.

The other thing was, Admiral Evans' comment about F stops, I want to follow up on that, Jim Haussener's conversation was interesting, he crammed a lot of point in that talk. One thing he said, NOAA please do something to protect wetlands and underserved communities. On my drive home, I started thinking about that, and I thought, what can NOAA do to protect some of these very vulnerable places? We have a lot in California, and we have water level measurement, there's inundation models now, but I thought that was really interesting to try to quantify a little bit about what are the components of NOAA that's really going to support these areas.

Okay, I have two more comments. I could go on and on. Qassim, I am sorry we didn't have more discussion. Karsten, I had dinner with him before he's such a wealth of information that is going on that do overlap with the digital twin concept and AI. One thing that's interesting, we're talking about AI in this context. The more data -- like the motion sensor now that they're developing to put on the ship, right now there's a very cumbersome motion sensor that they have, and the pilots really -- the weather is rough, or anything, they can't really deal with setting up this sensor, and they have -- as of to date, they have 150 measurements of the vessels with the motion sensor on, but now they are developing this three-inch cube they will

be able to take on, like a black box set on the deck, they're trying to -- the manufacturer is trying to get it so they don't have to take it out of the box, they have a little antenna, pick up the motion sensor, they put one on the stern and one on the bow, he would really like thousands of measurements, because to really -- as you heard, it's not only the length and width and depth, it's how it is loaded and what type of product they're carrying. There's so many variables in this motion sensor. So, thinking about deep draft and under keel clearance, the discussions to me can go on and on, and I was sorry we didn't have more time to really get into that.

And, Nicole, this comment about sediment transport is so crucial. In L.A., there isn't as was mentioned yesterday, a lot of sediment transport, but during large storms, those edges can fall off, there's deep canyons there, and we do see it, and as you heard, one foot of change, they now have reduced the draft of the channel from 76 to 75, and they suspect that there will be more reduction as we go on after the large thunderstorms.

So, there's just a multitude of things that go on. I'll stop there. Thank you.

>> SEAN DUFFY: Thank you, Julie, really excellent point. Again I would like to thank you for your leadership as past Chairman. Big shoes to fill. I won't say bigger jersey, because I would neat fat boy side and you need a small lady size.

With that, as we do this, we'll get a little better. I notice, of course, that Nathan is online, and I can see the names. I had to wake up and think about that. Our Vice Chairman, Nathan Wardwell. Good morning, sir.

>> NATHAN WARDWELL: Good morning. All right. I don't know if it is better going first or going last. And those are always my options. Going in the middle might be a nice choice at some point, but, yeah. So, I took a number of -- a ton of notes from the meeting yesterday, and I'll echo what a lot of people have said, but a ton of kudos to the NOAA team for pulling this meeting off with being Vice Chair, I'm starting to see all of the effort behind the scenes that it takes to pull off this meeting, and there's a lot that goes into it. And -- let alone switching, pivoting so fast from in-person to virtual. So, definitely appreciate all of that effort.

One of the main takeaways, or something that I heard quite a bit was about just the increased vessel size, and how that's being challenged for ports and waterways, and crowding the oceans and spatial awareness, right? And so just kind of, for me, for the highlighted comment that either panel members just brought up, but the importance of increased measurements and improved positioning, right? Like these waterways aren't getting bigger, so we need to provide more information to be able to navigate them safely.

I mentioned, or I heard about the value of port, the physical ocean graphic realtime system a number of times. That's no surprise, it's a very valuable system, especially with the panels that we're hearing yesterday. I did hear specifically call-outs to wave data and wind data for those ports from a few panelists. I really enjoyed Larry's presentation, and I was digesting it and trying to figure out the right way to explain my thoughts and Deanne hit it right on the head for me, and it was how to best utilize tools, right? And so, I think about that all of the time, and just the water level

world, there's a lot of different types of sensors to use, but not one works in every situation, so, I look forward to hearing more about that, and learning.

I was really excited about the social maps release that will be coming out in March for better access to operational forecast models that Marian brought up. And then, Julie's comments about Jacobsen's interest in getting an update on NSRS modernization, I think awesome, that's really great. That's something that comes out of this meeting that is great. I hear -- groups under this modernization is happening but I don't think many people understand what it will do to their operations and how it affects their operations. Getting a better grasp of that will be a big task.

And then just one last comment. I'm really surprised Qassim I didn't hear digital twin come up yesterday. Maybe it will come up today. And that's it for me.

>> SEAN DUFFY: Thank you, Nathan. Again, excellent comments, as I adapt a little better I see that Tuba is online. I think I messed up and I think she's going to miss tomorrow. Tuba, I apologize, are you there? I did not mean to skip you. And --

>> TUBA OZKAN-HALLER: Can you hear me?

>> SEAN DUFFY: I apologize.

>> TUBA OZKAN-HALLER: No, you can't skip me. I was able to join a little late. I came online as Julie was talking about her impressions. Yes, so, thank you, apologies that I was late this morning. So, yesterday, as usual, packed meeting. But one thing that I reflected on after the meeting, you all remember, I did miss the fall meeting which means the last time I really engaged with all of this work was a year ago when we met in Puerto Rico I

was impressed when hearing the updates from the NOAA folks, just how much work gets done in a year. I was actually impressed by all of the progress along all of the dimensions that we talked about in our last meeting. So that's just phenomenal to see. Congrats to all of you all who are doing this important work.

And then as far as the other sessions are concerned, I really, really enjoyed the session on port. I really enjoyed seeing just how all of the bits and pieces fit together in order to enable safer passage, safer navigation, this is exactly how it should work. I asked the questions about funding, because I feel the local context matters, but, again, NOAA's willingness to prioritize a particular area, because the engaged work is going on there, maybe we can replicate that kind of collaboration, coordination, for some of these other important port, too.

And then finally, again, I was just really happy, and I feel fortunate that I hear about the progress that Marianne and Ben and Brad reported on, and, again, I, too, really enjoyed Larry's presentation. Even though it was all of the way at the end, it was definitely one worth waiting for. Great first day, look forward to another day and a half here. Thank you.

>> SEAN DUFFY: Thank you very much. I'll let you know your late, tardiness is excused.

I really want to welcome the new members. I was an athlete coach for a long time if it doesn't show, and I appreciate the team concept. It's great to have new members here. I'm going to ask -- it's not in my notes. But I ask you add a little about your background, and where you are, what your expertise is. We will go in order as you see on the screen. It is hard for me

to introduce you, because I really don't think I've ever met -- I have seen some of your names before, but I'm happy to be educated and we'll start off. Sloan Freeman, good morning, welcome.

>> SLOAN FREEMAN: Good morning, it's a pleasure to be here and honor to serve on HSRP. Background, I co-founded hydrographic survey company in the Mid-Atlantic region 20 years ago. We've been contractor for Corps of Engineers and NOAA, and updating nautical charts as well as state Port Authorities over those decades. So, I would say my primary impression from yesterday's meeting is certainly how critical the data that we've collected over the decade, is to the safety and to the commerce sector as a whole. And my primary impression, honestly, I can't help but see it through the lens of how much work goes into collecting high resolution data, especially when it is needed repetitively in areas of concern and across the wider coastal ocean where data might be 60, 70 years old, is how much workforce is going to be required in order to keep that type of data updated in serving the public interest. Whether that data is collected on traditional vessel platforms or autonomous vehicles. There's a tremendous amount of expertise that comes in with requiring good data, processes good data and delivering good data so it can be used in the public sphere. That will be challenging in a flat budget environment to say the least.

So, I look forward to serving on the panel and helping however I can and really look forward to the continued discussion today and tomorrow. Thank you.

>> SEAN DUFFY: Thank you, and welcome aboard.

Next, we'll move on. Kimberley Holtz. I guess you're at home where we were going to be.

>> KIMBERLEY HOLTZ: Yes.

>> SEAN DUFFY: All right. Welcome again, and look forward to learning more about each and every one of you.

>> KIMBERLEY HOLTZ: I'm Director of survey for the Port of Long Beach. I have 30 years of land surveying experience, most has been geodetic surveying, datum changes. I'm a licensed geologist and worked as petroleum geologist for the city for four years. I kind of switched back and forth. But I remember when we switched from NAD-27 to NAD-83 which was the data shift. So, we're getting ready to do that again. And I remember when it was actually put out, the new coordinate system, new elevation, and when agencies switched to it. It was about a ten-year period. Because smaller agencies didn't switch to it. So, I'll be curious to see the new M, national spatial reference system rolls out. How quickly do ports swish to it? There's lots of other agencies that are port related. And I was really interested, too, when they were talking about the new tidal datum coming out. I assume tidal datum will be tidal vertical datum of 38 which we're currently on, and I assume we'll be able to update our tidal datum to NSR-24. I'm curious to see how that works out and how long does it actually take before ports start using this system. Because historically this is only the third datum shift in the history of the United States. It's a big deal. That's how I got in geodetic surveying when the datum shift happened in '88 but most agent significants didn't switch until 1995.

In the last five years I got involved in the telemetry survey at the port. And doing surveys the same way NOAA does theirs. Probably half the port is zoned category zone of confidential A1. The other, we are waiting, we expect the whole port will be category zone of confidence A1. We plan on updating the surveys every two years so we won't have data older than two years. That's because we get the largest ships in the world. Our main channel is very tight. We're getting ready to do a big deep draft project, where I think we're going to 80 feet depth but it is still a very narrow channel. We're going to try to widen it at point, widen some of the turning basins. It is a type fit. Jacobsen Pilots is very much aware. If they have concern of any specific berth. Sometimes we brought in the largest ships. The large ship will go out and do hydrographic survey a day or two before they come in. They go out and double-check to make sure we can take the large ship.

The last five years I learned a lot about telemetry surveying. And looking forward to being on this committee. The talks yesterday were amazing.

>> SEAN DUFFY: Thank you for that update and getting to know more about you. I very much appreciate it. I can't help when people say, I call it the D word, datum, I have to make sure I'm paying attention. It's over my level. I've been told by many that the Mississippi River is the most complicate place in the world for datums, that's why maybe it's above my head. It's good to have smart friend on that list to ask.

With that, I'm going to move on to Captain Carolyn Kurtz, Tampa Bay Pilots. Good morning -- it's actually afternoon in Tampa, assuming you're human. Good morning and welcome aboard.

>> CAROLYN KURTZ: Hello, hi, everyone. I don't have a whole lot to add. I have lots of notes. I have a whole page of acronyms, if anybody needs those I'm happy to share.

A little bit about me, I'm a life-long Mariner, you graduated from the academy in 1986. Was deep sea nine years and became a Tampa Bay Pilot. Last years as Tampa Bay Pilot. During that time I chaired the pilot commission for many, many years and shared NAVSAC, Navigation Safety Advisory Committee, so, I still do that. And I'm also a pilot instructor, so I coach pilots in manned modeling ship handling and other deck officers that go through the school and simulator instruction, it is about ship handling and piloting. Those are some things I'm doing now, even though I'm not working as a pilot climbing up ships in the middle of the night, which was really night, but it was a fantastic profession.

I would like to address something that Mary Paige brought up about the lack of standardizations in PPUs, and there are a few reasons for that. Every pilotage area is different, and pilots are protective about their pilotage areas and fight tooth and nail to avoid standardization in training and policies, in the economic structure of their associations, and, of course, in the equipment that they carry aboard ships. So, there are even groups that are still not using PPUs because they don't feel it's appropriate although the standard of care and piloting profession is to carry a PPU.

One of the most important part of the PPU is to carry an independent GPS so you're not getting that through the IS plug. I don't want to go too far into the weeds. I could probably talk all day about all of that stuff. But high pilot groups feel they have chosen the best equipment for their port, for their use.

One of the really important factors is determine the selection of this equipment is cost. Even though it is something that's become very important and critical in making some of these decisions with huge ships and very little under keel clearance. Some ports are fully funded for this equipment, through their tariff, and through grants and things, and then other ports are paying for this stuff out of their own pocket. So, you know, there's a spectrum of equipment that's available, and that's another thing. There are only about 1200 pilots in the United States, so vendors competing -- it's kind of a fixed market who is going to use them. So, it seems to trend. A lot of people are using CIQ which they're using in Long Beach. Which we were using in Tampa. Great software, highly customized and easily integrated with other things. But, anyway, that's kind of a long answer, but that's the reason why this stuff is not standardized. There is no standardization of the equipment, and the quality of the data that goes into what you're seeing on your screen. So, that -- that's the underlying reason.

I also just wanted to touch on this -- the precision navigation thing is amazing, and it's so impressive. All of that has to be taken with a grain of salt, that pilots were not supposed to really be subject to economic pressure. It's really all about safety, and so, increasing the draft of the ship that can come in, even if you have not dredged, that's your smaller tolerances, you're chipping away at safety margins, so the precise navigation information is critical, if those are the decisions that you're trying to make. And we went through that in Tampa. We increased the draft by a foot, even though nothing else had changed physically in the channel. It really was about the pressure to bring in larger vessels and to accommodate a customer. And so,

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

But I would just remind people that it is the pilot's job to make an inform and supported no decision, that's a very important reason to have this -- all of this data, is it is not the go decision, but the no is the hardest thing that we have to do is to say no to a customer because of particular conditions.

And with that, I will say thank you, and I will look forward to the next day and a half.

[Laughter]

>> SEAN DUFFY: Well, good to have you on the team, some excellent comments. I had very similar thoughts being closely associated with pilots on the Mississippi River. And our -- last of the four new ladies to join the team, Rebecca Quintal. Can you give us comments and update, please the floor is yours.

>> REBECCA QUINTAL: Good morning. We switched. I'm happy to be on the panel yesterday was informative and well managed. We stayed on track for a lot of content. My background, I have a degree in geology and oceanography, and a long history of ocean floor mapping. A large majority of that had to deal with safety of navigation surveys but other types of surveys as well, both for domestic and international safety of navigation. So, I -- I -- that's where my background lie, and where I think I can contribute the most to this. I want to echo Tuba's comments on the -- just how informative the conversations were on the Port of Long Beach and Los Angeles yesterday. I really enjoyed those. I had not seen the port in action,

so, I hope to get back there maybe at a future meeting. We'll be able to attend. There was a lot covered already. A couple of topics of interest, that I am interested in pulling the thread on is, you know, I'm not surprised at all that the pilots are utilizing the S-102 standard to add a level of granularity to their ENCs displays. I know the format is not finalized and there's limited coverage that we have available now, but I'm interested in understanding what other community groups are taking advantage of that ability to customize and hope we're getting the word out on that ability.

Another area I'm interested in learning more on, the talk on the wave height, and -- the magnitude of the wave heights has been increasing, and I'm interested in how well our predictive models are performing at predicting those extreme events, because particularly in a place, like Long Beach, they can be very impactful. And a lot of that has been covered. I'm happy to be a part and looking forward to the next two days.

>> SEAN DUFFY: That's good to have you on board. We have given out some new jerseys, and with that, we'll move over to our government non-voting members. I'm not sure if Nicole is available. I didn't see her on the list.

>> We're going to go to the Directors.

>> SEAN DUFFY: I'm sorry, I must have the wrong list.

>> I think Andy is up next.

>> SEAN DUFFY: I'm sorry, good morning, Andy, or afternoon, Andy, sorry.

>> ANDREW ARMSTRONG: Good afternoon, all. Folks spoke about going last. We're really last on this list. There's nothing much left to say. I want

to add how impressed I was with the panels yesterday and how they are -- folks are working together and using NOAA's data. I think it's important for us, and NOAA, to pay attention, as to how folks use our data, so, that was very informative. But I think the main thing I would like to say is how impressed I am with HSRP panel members who have been so closely paying attention, and absorbing material from this meeting. I just think the comments that we have just heard are impressive, and I'm -- I'm really pleased to be a part of a panel that pays so much attention, and takes so much care in what they're doing. Thanks.

>> SEAN DUFFY: Thank you, Andy. So, I see Dr. Marian Westley in front of me, if you are ready to go, good afternoon. I'll catch one sooner or later. Different with everybody across different places in the country.

>> MARIAN WESTLEY: Great. Can everyone hear me okay? So, thank you, again, I just find these meetings extremely energizing. It's always terrific to brag about the great things your people do, but it's even more -- it's more exciting that you're really listening, and you're giving that real feedback and kind of real input, so, I really appreciate the time here.

I'm very sorry we're not in L.A. Long Beach, I'm very interested in seeing that port up close. As you know, we have a great port partnership in L.A. Long Beach. We have three partners. I'm very excited to see how you're using all of the ports data you have, and interest in possibly additional data would be great. So, just, again, exciting to be here, it's a real shot in the arm to kind of keep doing the great work you're doing, so, thank you, all, much.

>> SEAN DUFFY: Thank you. Moving on to Brad Kearse as the next Director.

>> BRAD KEARSE: Thank you. Glad to be here. I'm not usually involved here. Juliana is, it was delightful just listening to the feedback you're giving. Where we go as an organization and helping us out as the parts of this NavOp positioning. I always love when I hear about the National Spatial Reference System. We have a lot of work to do to make sure the word is getting out there, where it might impact folks. So, I hope that conversation continues. We've got folks on the panel that do really understand that, and we need you as advocates to keep quizzing us, and get the right folks connected up. Julie, I'm glad to hear that Dana is going to get connected with the port. I know he's very active in the state of California, and those things are really nice to hear, and where we have our other advisers that are out there across the country, to get them engaged with everything from the ports to all pieces of transportation and how they connect. So, great to hear the discussion. Really appreciate your feedback. I took copious notes from each one of you all as you were giving the feedback. I look forward to, you know, catching up in person. You know, those sidebars and all of those are so important, but really appreciate everybody that pulled this together in the virtual environment. Thanks.

>> SEAN DUFFY: Thank you, I really appreciate the comments about pulling this together, and I don't have everybody's title. I'm doing the best I can. I appreciate you putting up with not maybe a proper introduction. I can go to Larry Mayer and just say it's Larry Mayer. Good afternoon, Larry.

[Laughter]

>> LARRY MAYER: Thank you, Sean, wonderful to be last again.

[Laughter]

It is my place, I guess. So, as Andy said, you come at the end, and notice everything has been said already, I do have to reiterate the compliments that have been given by others to the great sessions yesterday. They were really great panels. And to the staff, because this switch suddenly to a virtual meeting is a non-trivial thing, and I think they pulled that off amazingly.

What I can do is take a step back and offer a very long-term view. I think with the exception of Andy, I've probably been at more HSRP meeting over the year than anybody else attending here. I think that's true. And I have to say that -- the quality of the panel but sophistication of the panelists this time was tremendous, and what I heard from them, and it's actually it's sincere praise. We usually hear lip service, a lot of whining and complaint. But there's no question. I've seen this again, over the last years this real convergence, coming away from a meeting like yesterday feeling like NOAA is really providing a tremendous service to this amazing part of our economy. I mean, the numbers and size of these ships are just tremendous. And I really came away feeling very good about that, I think you're really on the mark here in terms of providing what they need, particularly with precision navigation, it's wonderful to see NOAA models and data streams being used in models that are providing real very helpful real time information. I think that's great.

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

the years, and I remember the days of Sal, the carnival chief Captain, a lot of what he wanted was different. NOAA just wasn't doing things right. But I think we really are seeing a real convergence here, and it just made me feel real good. It was nice to hear all of that. I'll stop there.

>> SEAN DUFFY: Very good. I appreciate your comments, too. I will say it is very good for navigation to be able to reach out to you and Andy. Some of the work at UNH is being embraced and desired by pilots on the Mississippi River, as we talk about advancing things like air gaps. So, with that, thank you, everybody, Director, hopefully I didn't blow anything too bad. It is interesting to Rear Admiral Ben Evans to see if he has anything to say.

>> BENJAMIN EVANS: Thank you, our Deputy Assistant Administrator, Rachael Dempsey, is on the line. If you are listening, feel free to speak away, I'll pause my comments, our understanding is that she's not currently in a place where she can easily speak. So, just -- I want to acknowledge -- everything I said has probably been said. I want to echo comments, frankly it's gratifying to hear comments about the products and services that our offices are providing, that are making a difference. I think, for me, the discussion of the local requirements yesterday, and the Southern California region, and in particular the under keel clearance project, that's something that's been in the works. We've been working that problem for seven, six, maybe eight years now, dating back to when I was at specific hydrographic branch in Seattle when this really kicked off in mid 2010s. So, it is really great to see that coming to fruition in the S102 format and being utilized. Of course now the challenge is, how do we exports that? How do we expand that effort to other port. Other water ways. . I think it is noted

the ships are getting bigger but the water ways aren't. That's very true. We're spending -- as a country, we're spending billions or physical infrastructure to support marine transportation systems, to support our port and that's absolutely justified spending. The challenge we have is commensurate level of investment in the geo spatial structure, because in many respects, I think of that as virtual dredging, in some respects. It allows us to make smarter risk assessments, to utilize all of the water that's there at a fraction of a cost of building out the physical infrastructure further. So, it is very gratifying, again, to hear that that public-private partnership in Long Beach is showing so much

To a couple comments made by some other panelists. I want to note, Julie to your comment about the datum changes and Captain Jacob send's interest. OCS would like to be part of that conversation, NGS probably has a more central role. As that comes together, please keep Jeff in the loop. I'll also note the comments on Larry's presentation, which I also thoroughly enjoyed and learned a lot from. We'll note as we think -- Larry hit the nail on the head there. Where we are right now with utilizing uncrewed systems, and trying to figure out, okay, where does this make the most sense. Yes, this is very cool technology, and where can we insert that, and where can we plan to insert that in the future as technology improves even further, where can we stop that in now in a way that makes sense. Where can we slot it in in the future. You hear us talk about utilization of uncrewed systems and as we plan for future utilization of the new class B ship, you hear a lot about building in flexibility now to utilize systems now to make sense where to do so, and ensure we have ability to do so in the future.

And then the last comment I'll make is that, again, I think this was Julie's comments about the Director's presentations. I'll simply note this is largely your meeting to the panelist, and so if you feel that you would like to see additional time for Director updates, and having given one of those, feeling like I was racing through my presentation, if that's something the panel would like to hear more of, that's certainly a conversation we can have to adjusting the agenda to make sure there's more space. Certainly the Directors don't want to suck all of the air out of the room. It is not about us, we want you to have time to hear from the local panels and panels of experts that we're putting together to meet your interests. But the agenda can be adjusted. We're not stuck with that format.

So, I think I'll stop there and pass it back to Sean for any final comments, as we wrap up this session, and I have some administrative reminders before we move on to the next session.

>> SEAN DUFFY: Thank you. Admiral, I'm going to be quick and figure out, as Chair to have some place to talk. There are were a lot of comments that were relevant. I think I could lead the intro into the next panel. Mississippi River change, challenge, relative sea level rise, salt water encroachment. Subsidence, beneficial use of dredge material, active crevices. We're in a very challenging place here. That's part of the reason I enjoy this so much as I can look at real world situations, what's impacting navigation on the river, and hit a group of experts that can provide some insight, help come up with some ideas. And with that, I'll again probably have some longer-winded comments at some point, but we'll try to keep us on time, and let preparation for the next panel go. I know Admiral, you have

some comment that our Vice Chair, Nathan Wardwell, is going to moderate the next panel.

I'll be close in case there's anything I can help with, but I'll turn that over to Nathan when you're ready, sir.

>> BENJAMIN EVANS: Thanks, Sean. Thank you. I'll be very quick here, because I think we covered some of this, but, again, I want to make a note about public comments, we have a public comment period at the end of the session. Thank you again to the participants who provided comments in the advance, to stakeholder staff and others joining the webinar. I encourage your public comments and input. If you have a comment please type if t in the webinar under the questions box. It will be read into the public record and/or put on the screen if time permits all topics will be included in the official meeting minutes. When received in advance they will be shared and welcome part of the record. I welcome and encourage comments directly or during the public comment period.

And, again, a reminder about privacy and disclaimer, these sessions are being recorded, transcribed and posted to the NOAA HSRP Website. The speakers provided their written permission to do so. Your individual permission is required for use of photo, video and voice on audio. The meeting webinar will be retained and disseminated on the meeting Website and accessible to the public. You can decline by abstaining from speaking or dropping off the webinar.

So, with that, Sean I'll go straight to Nathan who is leading the next session, Adaptive and Resilient Ports: Managing climate change impacts to port infrastructure and operations. You have the floor, Nathan.

>> NATHAN WARDWELL: Thank you, I'll be moderating the next session, Adaptive and Resilient Ports: Managing climate change impacts to port infrastructure and operations. And we have Nicole LeBeouf, and two presentations, Justin Luedy, and Rosemarie Fusco, and I apologize if I got your names incorrectly, I have not met either of you or confirmed proper pronunciation. After those presentations there will be a discussion. We will have about 30 minutes or so for a discussion, and I look forward to it. The only thing I'll add, ports are not necessarily my expertise. And ports in Alaska are substantially different, I think, than some of the major port in Long Beach. We do deal with sea ice and deal with large tides. There was an article in the local paper here recently about potentially in the next decade, the arctic being ice-free for period of time throughout the year. So, that is -- that would be a significant change. And would affect shipping. So, I look forward to there conversation.

Nicole, the floor is yours.

>> NICOLE LeBOEUF: I'm thrilled to talk with HSRP with the work we're doing. It is emerging, collaborative and unchartered waters for us. I want to say I was on for the last few minutes and heard the comments from the previous session regarding infrastructure investments and Admiral Evans comments about geo spatial infrastructure needed for those investments and I couldn't have teed this up any better.

With that, I wanted to note -- and I mentioned this to you all yesterday, I'm going to be wearing two hats today, one as head of the National Ocean Service, and the other as the chair of the U.S. committee on the marine transportation systems coordinating board, as we like to say, the CMTS. And

I'm really here a little about both hats, but I'm here on behalf of NOAA asking you all for your expert input and consideration how we might work together to accelerate port resilience. And, first, I'll be a little cheeky and say I have to blame HSRP, for that is a very keen interest of mine in this topic, it's all your fault that you taught me how much to love and respect our port and I've been following that ever since I started coming to these meetings.

Specifically, I want to say that this work centers around what we want to do at NOAA, which is to make sure our ports are fully applying the authoritative guidance, and NOAA's trusted environmental data when they plan their infrastructure investments. This include planning for sea level rise, but also extreme weather events and other coastal hazards that are changing over time.

From you all, I hope to -- and our panelists -- I hope to learn more about whether you believe port have stuff authoritative data for detecting the coast over time and to make sure the infrastructure lasts for decades to come.

Next slide, as HSRP is well aware. NOS has many products and services to provide safe maritime transportation, nautical chart, and of course human capital expertise in NOS's regional navigation managers who work with pilots, mariners, and recreation boaters on a daily basis. In addition NOS leads coastal planning and management in this country, including working with coastal communities and industries to create resilience and to promote adaptation to climate change.

NOS, also, as you know, measures our elevation, and subsidence, and oversees much of our nation's coastal and ocean observations, measuring

tides, currents and sea level rise. A percentage this touches on what else NOAA does like at the National Weather Service. But right now focused on NOS. And I also want to note we have skin in the game when it comes to coastal adaptation and preparations for climate change, because most of NOS's people and facilities are located in the coastal zone, planning for resilient future for NOS is so important it cults across all programs in the recently released NOS treatment plan. It means that much to us.

Next slide. If you're not familiar with CMTS coordinating board it is the Federal body for agencies whose missions support maritime operations. At CMTS table, agencies like NOAA, via Department of Commercial, talk about their MTS concerns or solve complex issues or combine expertise as men fit of CMTS. I addressed port resilience in this year's work plan. Next slide, please.

I know you know this. I want to say it out loud. Port are important. They provide $1.5 trillion to the U.S. economy and support over 13 million jobs. Our coastal and ocean related economies contribute disproportionately to the nation's GDP with 90 percent of good and products relying upon ports and related maritime industries. As I would like to say when anyone let's be up on a podium. Most Americans cannot go a single day without eating, wearing or using something that come through the port. Ports fundamentally support our way of life and are too big to fail.

These efforts are being under taken in an effort to make sure they do not. Next slide, please.

So, I grew up coastal. Coastal -- change in the coastal zone is not new. What is new is the pace of change and what we know about it, including the

degree to which coastal hazards are impacting our ability to plan for the future. Coastal change is impacting more people in industries than ever before because, more than ever, humans are living along the coast. 40 percent of the U.S. population live in coastal counties and that number continues to grow. We know that the rates of change in the social, and along our costs are occurring faster than anywhere else on the planet and that those rates of change are accelerating.

Many ports are located in low lying coastal areas which makes them especially vulnerable to inundation and coastal change therefore threatens our national security, U.S. competitiveness, and our U.S. supply chain, whether we're talking about bananas, speakers -- speakers or sneakers, medical supplies or fuel.

At the same time, port, themselves are facing rapid change within their own industry putting pressure on to transform daily operations or infrastructure while simultaneously planning for climate change.

Next slide, please. Planning for the future is essential but extreme weather and climate change are here now, impacting the United States and ports around the world. Globally, a total of $81 billion in trade, and $122 billion in economic activities is estimated to be at risk annually due to climate related impacts. Oxford University published a study last year estimating that the annual cost of physical damage and resulting trade losses for more than a thousand ports around the world. They found, not surprisingly, that large ports in high income nations face the largest financial losses, including the Port of Houston, which faces the potential loss of $169 million per natural hazards each year. It's the highest in the world. These economic impacts, of

course expend well beyond the Port of Houston and into the surrounding economies and communities creating supply chain obstructions and shortages of all manner of things.

Next slide, please. How do we keep track what is going on with climate change? We have a good starting point. NOAA and NOS is a trusted source of environmental information particularly for short-term operational port and shipping activities. NOS's office of coastal survey and center for operational ocean graphic products and services deliver products like Pacific navigation and new monthly high tide flooding Outlook among many years.

Next slide, please. In addition to data and services that support daily, weekly and monthly port operations, authoritative NOAA climate data exists.

What do I mean by climate data? Next slide, please. Climate data is simply data that tells us about climate conditions at longer intervals such as years or decades. NOAA collects observations and disseminates warnings at multiple time scales. Seven-day forecast, and monthly Outlook, NOAA uses these predictions at climate time scales like those depicted here. By the way in the right hand bottom only there's a specific cull-out in the scientific paper about climate change for port resilience and port infrastructure planning. I do apologize for the graininess of the image. I found this yesterday and decided to pop it in and didn't have a chance to reach out to the authors who are NOAA scientists also.

Anyway, NOAA uses our ocean and coastal observations that you're well familiar with, but other foundational data as well like measurements of elevation and subsidence from the National Geodetic Survey to feet our predictive models to under the what, wear, how and who of climate impacts.

Tell me more, you say? National Geodetic Survey. For example the NCS data is used to measure elevation change-overs time. And we can add that to projections for ocean heat to better provide predictions for sea level rise at specific locations. Knowing this, we can build a more holistic picture of what port could face, and therefore should be planning their infrastructure for.

What we're doing in our work and what we're asking today is if we think that port, we being HSRP as well, if we all think port are using these climate data and prediction or whether there's something we can do differently to support port planning needs. Next slide, please.

Of course planning for for the infrastructure is inherently complex requiring authoritative data and approaches to ensure reliable adaptation and resilience. In recent years, guidance documents for port planning resilience have been developed. Last year the cybersecurity and infrastructure security agency, or CISA, and marine Army Corps of Engineers replaced resilience assessment guide. NOAA and the alliance, created port management self assessment document before that. This was guidance made with industry and Federal agency input including those agencies on the CMTS. So, some ports are already using these resources but many are not, and for those that are not, we like to understand more about why. Next slide, please.

So, resilience experts at Federal agencies and at academic institutions are working with port to directly to under how best to design and plan coastal resilient port infrastructure. NOS works with communities, including port to support local decision making. We have visualization tools online such as digital coast, which is a Website that has a deep collections of data visualization, training and resilience decision support tools. Also, NOAA sea

grant affiliated institutions are becoming expects in port resilience like the universities of Rhode Island and Wisconsin featured here and others as well. There's also a Department of Defense land working group that has built a database, including with help from NOAA, to assess and project sea level and coastal risks for installations, DoD installations and facilities worldwide, of course some of you know that major port are sometimes located right next door to some of these DOD installations.

So, we have all of this authoritative expertise. It should be informing port resilience planning. And on top of that, at the present time, we have a lot of Federal funding going in to support climate resilience infrastructure including port. American association of Port Authorities has done a great summary of all of the funding out there, and they estimate over $6.5 billion is intended exclusive lib for port in the infrastructure investments and job act, with another $27 billion that ports of eligible to apply for. One example included the port infrastructure development program, but also under the Inflation Reduction Act there's the EPA clean port's program, creating financial incentive report to make resilient infrastructure plans. This is free money, right? But we're trying to figure out if there's barriers to ports applying for those funds and if they apply for funds are they using authoritative guidance an data at the core.

Next slide, please. August of that sound very Washington, D.C. focused. Outside of DC. In the real world, port are going about their business. They have busy daily operations and all kind of expertise how to plan for futures. Knowing this we engaged with the APA to address this issue. Not surprisingly, APA gets it. I was invited to give a keynote remarks at recent

power summit which is a new initiative that AAPA launched to build a resilient port planning for the future and I will be participating in upcoming legislative summit in D.C. in a couple of weeks.

I believe that NOAA, working with CMTS, AAPA, sea grant institution, HSRP and others can really represent to narrow any uncertainty ports may have when it comes to planning for climate change, but that does include identifying any barriers and closing any gaps that ports may have for use of authoritative information and guidance.

Next slide. So the good news is there are folks who want to enhance U.S. ports authoritative information. NOAA seems yes, University of Rhode island and others at AAPA. Trying to build a cross sectoral collaborative approach with Federal, private sector and other actors to keep port ahead of the climate curve.

Next slide, please. One of our first action side-by-side being led by CMTS. CMTS is in the process of developing request for information which they hope to publish in the Federal Register this spring. In RFI we seek information from others who play a role in port planning such as engineers hired by ports to assist them as well as academic institutions working in the space and becoming experts in ports resilience planning.

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

Though the CMTS is lead for RFI, of course NOAA has a big role to play and that's why I wanted to see input from HSRP and why I'm really looking

forward to hearing from our invited guests. And we like to thank Rosemarie Fusco, graduate student at URI. And Justin Luedy from Port of Long Beach here to share experience for planning at climate resilience port. Welcome, Rosemarie and Justin. It's wonderful to meet you and thrilled to you have here. With that, I'm going to turn the mic back over to Nathan. Thank you so much for your attention.

>> NATHAN WARDWELL: Thank you for that great introduction, Nicole. I did notice on your slide about climate data and infrastructure planning where you had the red circle, it really looked like it mentioned planning for arctic commercial shipping in there. So, very timely with the article I read this morning about continued loss of sea ice in the arctic. So, really looking forward to the rest of this session. I believe Mr. Justin Luedy, you're up with the first presentation and the floor is yours.

>> JUSTIN LUEDY: All right. Good morning, thank you, Nathan and administrator LeBeouf that's great information and really good information for attendees on the scale of sea ports here especially on the West Coast. That's a great introduction to my own presentation. I'll be talking -- this is Justin Luedy senior environmental special for the port. I'm an ecologist but focus on the infrastructure side of adaptation for the Port of Long Beach. We'll talk about the difference between adaptation and some mitigation efforts. But, in terms of scale, just some basic highlights for the group is Port of Long Beach is the third busiest container seaport in the U.S. just after Port of L.A., then New York, New Jersey. We're a major gateway for U.S.-Asia trade and economic engine for the nation and region as a whole. You can see why the topic of resilience is important for us. And we move

about $200 billion in cargo each year. That's a bit of context for the through put here at the port.

Next slide, please. So, why is resiliency important? As you can imagine there's quite a potential for impact on the port complex, when I say port complex, that's the Long Beach and Los Angeles ports together as our San Pedro Bay ports. We're already seeing impacts from climate change here. Our primary concerns at this point are sea level rise and storm surge, that's where we've seen impacts and that's where we're looking into the future, but actually on the next slide I'll talk about the greater frequency and magnitude of storms. I got a couple case studies to share on what we already experienced here. Go back, please.

So, we're also seeing certainly a greater number of hot weather days here in the harbor stressing our electrical systems. Resiliency is really becoming a key topic of concern when it comes to decisionmaking. That's for our port and executive team. Border harbor Commissioner, we work under a board of five Commissioners as well as tenants and stakeholders. Long Beach is landlord port. We have married tenants doing all sort of industrial activities here in the harbor and how -- the question is how do we prioritize resources especially in the face of rapidly changing climates. This is a ongoing discussion we have internally with harbor department staff and tenants and other folks in the region. It really drives this investment in maritime infrastructure. We have a really robust large capital improvement program, so, we have -- you know, everything from small to large development and redevelopment projects fall within that improvement project program. Notably our pier wind, some folks in California are familiar with the newest

push to produce a rather -- rather build a facility for staging and development of offshore wind turbines for placement offshore and central California as well as expansion of rail. Rail is a big topic in the port right now, expanding rail for better efficiency of cargo.

Energy resilience also has become a really hot topic within the last five or six years. We've had more of a push for energy resilience programs and really coming up with strategies to address energy concerns, both within the harbor district but within the larger city context.

We are working on a variety of power systems resilience programs to support our terminal, and lots of project, large and small under way for critical port facilities. Those are things like fire stations, fire boat stations our very robust security systems, as well as our command center. So, we're looking at, you know, how to generate renewal energy, store that energy and figure out the best way to convey power to our own facilities as well as everything that we lease and operate. That is really a big push especially here in our environmental team is energy resilience as it pertains to climate change.

Next slide, please. Okay. So, as mentioned we're seeing that greater frequency and magnitude of storms here in Southern California. A couple case studies that have really highlighted the need for resiliency planning. Going beyond status quo and really becoming leaders in this field are two past hurricane, so, back in August of 2014 we experienced hurricane Marie. This is a storm over 300 miles off the coast of Southern California but the storm of that storm -- we're a south-facing beach and city, so that puts at a certain position geographically that can be troublesome for storm surge.

Hurricane Marie came at that right angle and cautioned significant damage to Naval Mole and shorelines, $7 million there. Significant damage to the breakwater, the breakwater is a total of nine miles long, at three different sections, two gates for access. We saw three large holes and over 80 breaches of the breakwater. Well in over $20 million in repairs. That number is have larger after that. And repairs to rail operations and facilities and tenants. That was a human wake-up call for us and our board. Most recently, last August, 2023 we saw Hurricane Hilary, which made landfall as a tropical storm. We got lucky. Minimal impact to the port and city, but this was absolutely a wake-up call as well, certainly highlighted the need for a greater, more centralized response, when these sort of storm event come our way and probably more frequently in the future. This incident management team was really a -- pulling representatives from various departments, rather divisions within the harbor departmentally is our port to coordinate on all potential concerns and issues that could come from a storm like this. We checked our pump stations, installed temporary pumps, our maintenance team, the on-the-ground folks who did all of our equipment checks make sure everything is up and operating and a really robust notification system to the tenants about stormwater concerns. The Tropical Storm Hillary was a great way to prepare and advance to make sure we had something centralized and strong for future storms.

Next slide, please. So, all of this talk of resiliency planning, began quite a while ago and it was sort of framed in the context of how will the port large international seaport, like Long Beach, evolve and adapt over time, so it really started with the production of climate adaptation and coastal resiliency

plan for CRP. This is a living document that has grown over time with various updates but really centralizes our approach to adaptation planning and ensures resilience and business continuity in the face of climb. So, this is a really robust process that took over three years starting with a really overarming inventory of our port assets, is everything that we lease, own, operate, even our private facilities were included in that. Then, on to risk and vulnerability assessments of those assets and then the development of -- excuse me, of adaptation strategies and those ranged from governance side of things, so, port plans and policies, considering climate impacts all of the way to infrastructure enhancements. So, certainly a wide suite of adaptation strategies came of that.

The first strategy really looked at incorporating sea level rise, extreme heat and storm surge considerations into some really large port documents, our strategic plan, design and electrical guidelines, all sort of risk assessments that we do, and our -- actually what's now under way, under development is a stormwater infrastructure master plan. Step one updating plans and policies, accounting for climate considerations, and what was existing as well as what was coming.

We also -- we are charged by the California coastal commission on issuing harbor development permits. And within the very specific geographic boundaries of our harbor district. So, we enhanced our harbor development permit application, that's used by both port staff for port projects as well as tenant programs, so they all use the same application form. We really wanted to capture, cast the net wide, at the beginning of the process to

ensure that development and redevelopment projects were considering climate vulnerability, sea level rise impacts and extreme heat.

So, with this HGP application we use coastal zone maps allows them to locate themselves on the map, and guides them through a process by which they can say, you know, is my project vulnerable, what sort of options do I have for adaptation, and we get them thinking about that and of course we work with them on that as we issue permits. So, the -- and then once we went through all that process and provided a -- both of our board of engineers as well as tenants with a large suite of sea level rise inundation maps to help with planning and design, early maps were based on an old model, so September 2022 we updated inundation maps based on best available science and latest guidance in the state of California. Those are in our GIS system and are user friendly, those look at 2030, 2050, 2080 and 2100 with different risk aversion send scenarios and we have a look at the 100-year storm tide. These maps have really proved super helpful especially to our own internal staff at the port as our design team, you know, really assesses primarily larger scale, longer life span port projects, looking outward. So, we typically focus port assets at the 2080 horizon at this point and that's somewhat standard here at least in my experience on the West Coast as other sea ports are looking out that far to -- with the, what we consider life span or design life of a port asset. And that's very different than the city that surround us. They adapt and evolve differently. Obviously a very different set stressors, and assets, and so port infrastructure, it really requires that roughly 50-year life span, look at approximately 4.3 feet of prize by 2080 for the Los Angeles region. And folks on the line working in

California and doing climate considerations in the state, you are probably aware of newest draft guidance from ocean protection council released in late January proposed for finalization in early June and port looking for what is that new guidance saying, how does that compare back to the 2018 guidance and what might that change for short and long-range planning.

Next slide, please. So, this just givens an idea, I wanted to provide one snapshot what our maps look like. Right now what you're looking in darker gray area is harbor district, the geographic scope of our port and what you're seeing here is inundation, blue shade represent inundation in feet and shades of yellow to orange-brown, represent the overtopping potential, where we're seeing access points in the harbor for potential uninundation and areas in the hatch marks represent large scale, proposed recently completed or proposed development from year 2018 on ward. You can see potential impacts on new port projects, you notes also, tier G, J, those are recent. And what we see in older part of the old harbor, pier S, A and B, those are older areas of the harder they resided as a result of oil extraction.

These are areas that have vulnerability and we'll prioritize assets.

Okay. This is actually my last slide. I don't want to spend a lot of time here, I wanted to show that this is the mitigation slide. So, while I work on adaptation side, the port has to take a two-pronged approach to climate. We have adaptation side, how we evolve. We understand this issue is upon us and our infrastructure needs to be resilient and we have air quality team working on mitigation strategies most fall within the greenhouse action plans, cargo handling equipment and trucks, we have new robust zero policy which is, you know, all things zero emissions, greenhouse gas reduction

strategies. This is a huge point of -- huge part of the decarbonization efforts in the harbor. I didn't want to leave that out simply because it is really part of our climate strategy overall. And lastly, we contribute to the City of Long Beach's climate action plan. So, we are one adaptation plan as part of a much larger approach here in the City of Long Beach for reducing local impacts and addressing climate change together with other city department. And that wraps up my slide. Thank you.

>> NATHAN WARDWELL: Thank you for that great presentation, Justin. We're just about right on time. Rosemarie, you got the floor, so go right ahead.

>> ROSEMARIE FUSCO: Can you hear me clearly?

>> NATHAN WARDWELL: I can hear you great.

>> ROSEMARIE FUSCO: Okay. Great. Thanks. So, thank you to Nicole and Justin. That was very motivating. This presentation should fit well into the examination of how Federal tools fit into port resilience on the ground and in this case, my presentation will be talking about how we're using academia as a conduit for that implementation, so, my name is Rosemarie Fusco, I'm a professional urban planner and fourth year Ph.D. student in the Department of Marine affairs at the University of Rhode Island. I'm going to talk about incorporating CISA's infrastructure resilience planning framework into a port master plan process in the Port of Providence, Rhode Island, and the infrastructure resilience planning framework is the IRPF, something you Saul briefly in Nicole's slide. So, it is out of Department of Homeland Security, and I'll talk a little bit more about that.

Next slide, please. I want to go over the project team for this because it is public private partnership and then you have academia thrown in as well. This is a great look how a team would be made to implement port resilience in a wider scope. This project I'm talking about through Department of Homeland Security through CISA, cyber structure resilience agency. And the master plan is funded through bond attained by the port operator, Waterson Terminal Services and through partnership with City of Providence because the land is primarily leased through the City of Providence.

In this project, the Waterson Terminal Services, WTS, will be hiring a private consultant as part of the project, to run the master planning process. But, they will be collaborating and running the process alongside URI who will contribute a few come components. I'll talk about that more but I want to say there's these very significant pieces to the puzzle here. While port resilience is a major component what we do in my department in URA, in the marine affairs coastal resilience lab, where resilience is a key component of our work, most of our programs have been funded by the U.S. Army Corps of Engineers, Department of Homeland Security, National Science Foundation, DOT, Rhode Island Sea Grant. This is kind of a new component. I want to make sure that landscape is put out there.

Next slide, please. So, the infrastructure resilience planning framework was released by CISA in November of 2022, end of November. The IRPF is a Federal framing -- framework for port planning processes that is mostly traditional but has very significant resources and components that support port resilience in a very tangible way. So, CISA collaborated with the Department of Homeland Security center of excellence for testing and

implementing this Federal planning tool. They started with a case study in Kentucky in 2019, and they released a request to find other possible case studies after that, and the marine affairs department reviewed the planning landscape that we're a part of. Because robust ties to the port and maritime resilience in the state of Rhode Island, we were able to find out that the port was looking to do their master plan, the first -- by the way the first master plan for the Port of Providence in history, and we were able to bring them on board as project champion and allow us to implement this IRPF process through the master plan right off the bat. URI was able to collaborate with the city on releasing their RFP to hire a consultant and that is still under way. This he are if the final stages now of releasing notifications to the contestants and choosing consultant next week, I believe.

So we should just say the case study is one of three case studies right now, along with Norfolk and Galveston, but I believe Providence is the only one that is specifically in a designated port area. The other planning case studies in a wider community, more wider coastal community, Providence is, of course, port specific.

So, here's just a quick look at the study area. The purple parcels are parcels looked for ProvPort and the orange and area within the dotted line are study area. One of the initial benefits off the bat of incorporating a Federal planning process into the master plan is that it expands the study area and brings the components of risk assessment and components of vulnerabilities assessments to a wider area than if it was just contained to private port parcels.

And I should mention that ProvPort has been a petroleum port historically and undergoing a major transformation to support the offshore wind industry which is very influence in the state of Rhode Island right now ProvPort has a need to expand and produce supportive mechanisms for that market.

Next slide, please. So, the overall goal of the IRF -- IRPF portion of the project are these specific five things. So, they -- the IRPF means to incorporate the following tasks into this case study, right? So, it -- but the thing about it is that it is expanding what woo would traditionally be are the port master planning process for ProvPort and adding new components for that plan process. The inclusion of Federal framework is growing beyond what it would traditionally be, and what our patrol is, URI's role is to see how that planning process is working and how it is being incorporated that this live action master plan for the Port of Providence, and then report back to CISA on what is working what's not working and what resources are being used, what is valuable, what is maybe not valuable, what the gaps are and other things that pop up as we walk through the planning process step by step, and I'm going to go through some IRPF process for you now. First I want to talk about the goals, of ProvPort's master plan for the Port of Providence, because those are very important. The application of the IRPF process, its goals overlap with these goals somewhat, but it is important to note that the master plan should already be evaluating the land, and land use and other components that are already present in this space, that it would ideally target properties for expansion for areas for improvement, ways to grow the market that the port need and also have some sort of stakeholder engagement component that would identify ways to benefit the

community, things like job creation, but other potentially more environmentally related issues like environmental justice issues or aesthetic things, or public access to the water is important for this project.

One thing I should add,ly is very important the last two presenters talked about, a big goal of master plan, inherently in the City of Providence is to identify, or create material so they can be supported to apply for new and large Federal funding opportunity. That is something that has already been discussed in the master plan, and that's one of the very useful things that will come out of this master plan. So, that's a big one.

So, the goals of the IRPF and ProvPort overlap. There's major components that underpin resilience and shared goals. These are some of them. The stakeholder engagement process will be enhanced and grown because of the inclusion of the Federal framework into this port master plan. Are you behind me? Can you go forward one slide?

Thank you. I jumped ahead. So, this is a slide that explains the overlap of the goals between the CISA project and ProvPort's master plan. The major components include things like stakeholder engagement, how risk affects the business's within the port, and how key infrastructure and dependencies influence the master plan and vulnerability for the port and addition of risks assessment to the master plan, and this is a big piece of the value of implementing a Federal planning process into the port master plan, is the edition of risk assessment at the level that you URI can provide and also a more detailed examination of business-to-business risk and interdependencies within the space.

So, next slide, please. So, I want to get into the nut and bolts a little bit about the IRPF and how we're going to implement that, and just leave you with that. So the IRPF outlines five key steps as they are seconds to incorporate into the planning process, existing planning processes he in this case a live one that enhance resilience by addressing critical infrastructure dependencies and support these five steps. They provide tools, guidances, things that are very basic like a meeting facilitation guide, things that are more advanced like mechanisms to fund resilience and solutions. So, within these five steps are we are taking some and implementing them through URI and some are going to be done through the consultant and ProvPort's portion of the master plan. URI is contributing the identification of critical infrastructure, and of highly detailed risk assessment, beyond what would traditionally be done in the master plan and consultant's role or private sector's role in this is help develop actions and implementation and evaluation that comes later in the planning process. But we're going to work together on the lay having the foundation which is identifying project champions and designing stakeholder engagement strategy. Those are things very collaborative.

Next slide, please. And here's a little more of the nut and bolts. So, you can see this is what is going to be a very basic outline of the master plan components. The orange item, community engagement and infrastructure dependencies are things added because of the IRPF's role in the port master plan, and the blue items are things that URI will take the lead on because of their inclusion in the process and grow beyond what would traditionally be in

the port master plan because of funding limitations and other capacity limitations.

So, the community engagement plan is very -- is going to be something that's significantly influenced by the IRPF. We already know because the stakeholder engagement strategy due to other Federal resources like Metropolitan Transportation Guide are going to have big roles to play and already influencing the way ProvPort thinks of the stakeholder engagement plan. And so just a little bit about the value of including academia in this type of case study, URI will be using two major platforms that are developed through the University and used at the state level to further -- to grow the risk assessment component of this master plan. So, RI-CHAMP is the Rhode Island Coastal Hazards Analysis Modeling Prediction platform and that's a deterministic platform that uses storm scenarios with a very high resolution mesh, coastal mesh so you can have very specific idea whatever impacts from natural hazards will be at a very specific point and that coupled with data that we select when we visit the site and talk to business owners, we get very detailed information about like where a doorway is, the things that are very important on the ground, where a generator is, and that information, coupled with the scenario, storm modeling from the deterministic models gives businesses, organization, or state level very specific idea of what they can expect in a given scenario and how to prepare for that.

So, this RI-CHAMP is used by the emergency management organizations in the state of Rhode Island and the other component that URI uses is called STORMTOOLS. That's a problemistic model used in long-term planning and

that is used by the state of Rhode Island when examining land use changes and other permitting aspects. So, the combination of those two things really gives an idea of the type of risk and vulnerability in different area, and different parcels and change over time.

One thing that we learned from doing this already is that sensitive information and security is really important to some of the port components that we deal with, particularly small businesses. So, we are in this project with IRPF, we are going to provide individualized risk assessments to the businesses that participate with us, and that will contain sensitive and confidential data that they do not agree to have us share with anybody, but they will get that information so they can increase their resilience and their capacity, but the public access information, and information that we are allowed to share, will be the component that goes into the publicly available master plan, and that is part of a larger picture that will -- that goes into the two models that will also be providing to the master plan.

And next slide, please. A little about stakeholder engagement, because it is so important, right? So, the port master plan would have a baseline engagement dictated by the city, and I think -- for community meetings and awards and public engagement -- public hearing, rather, at the end of it, because the IRPF process is involved and URI is helping to design the stakeholder engagement strategy there will be more expansive involvement and that will start early on. There's a stakeholder mapping exercise and because of URI's robust ties to community groups already in the area, and people's Port Authority and other active groups, they will be brought in earlier in the process. It is kind of like a double bond. It is more like a

connective tissue that is able to be added to this process, and just strengthen the process from the start to the end.

And so with that said, the stakeholder engagement is not started yet. The consultant is about to be selected and we're really excited to get started on this. So, next slide. I'll show you where we are, we are just in the second phase of the project where we start our risk assessment and we design our stakeholder engagement, and the data collections should take place over the late spring, and into the summer, with the report out at the end of the year, so, hopefully, we'll be back in front of you with more findings from this research and a really good look how to live action, Federal planning process into a local master plan and port, and this is a small examination of it, but I think we'll have some really important information to report back to CISA, so we're very excited. If you want some more information about this project, you can contact our principle investigator. Dr. Austin Becker and a chair of the Department of Marine affair, myself, or one of our coastal resilience specialists. Hopefully we'll be back with you at the end of this year. So, thanks for having me.

>> NATHAN WARDWELL: Thank you very much for that, Rosemarie, that's a significant effort that you're under taking. Let's see, so, now we have 20 -- less than 20 minutes or so for discussion. I don't know if the panel members can turn their camera on, or if that's going to slow things down for the interpreters. But --

>> Nathan, I think if the panel members who want to make a comment just turn their cameras on so we know.

>> NATHAN WARDWELL: Sorry, I was thinking about the speakers, not necessarily the HSRP panel members.

I guess as you have -- if you have a question, just turn your camera on, and I would also offer the opportunity to Nicole, also, if she has questions, or input, while we're -- people are gathering their thoughts from the great presentations we just had.

>> NICOLE LeBOEUF: Yeah, Nathan, I'll buy a little time. I want to thank our invited guests. Those were really amazing and impressive conversations, and I would love to think that our port around the country are all as well as off and as far advanced and moving out as much as Long Beach and Rhode Island, and maybe if they are, if they are not, we're also standing by to help under some of that, and how we can spread those best practices through port-to-port sharing and other means.

Anyway, so excited to have this conversation teed up and would love to hear more from HSRP about what they see as some needs there, and just for our invited guests, a quick, I guess, sort of point of clarification, the Hydrographic Services Review Panel advises the NOAA administrator on a range of issues associated with, you know, this, and other things, in the marine transportation and navigation sector. So, this -- anything we hear from them that we can take to heart and build back into our partnership with you also. Anyway --

>> NATHAN WARDWELL: Thanks, Nicole. You broke the ice for us, now I love this. We have a new panel member that looks like she has a question. So, Rebecca, why don't you go ahead. I think you're on mute, Rebecca. I can't hear you.

>> REBECCA QUINTAL: Thanks, Rosemarie. I enjoyed your talk. I'm a fellow Rhode Islander. I was interested in the RI-CHAMPS, I think that's the right tool you're using for coastal hazards for the port. You mentioned in the database where doors, where generators are, he et cetera. I'm wondering if it also includes dwellings that are below ground floor, I'm thinking about Hurricane Sandy and walls of water coming into people's apartments and how dangerous that was, is that kind of information included in the model?

>> ROSEMARIE FUSCO: The answer is -- there's a couple parameters, our data is only collected in areas that are designated under our project. That doesn't often include residential, so, in short, we don't often -- like I have not collected any data on underground dwellings so far, however, the data collections model and process that we use and platform, collects all information about the facility that would make it vulnerable, or have inundation point or have a component that would result in cascading consequences for the property and for the area. So if we collect data on a building that has an underground residence, we will collect information on that, and specifically on what point to -- to the exact location, what point would be vulnerable for that specific place. For example, if it flooded on one side of the building and not on another. We would know if an inundation point is affected by the water and which point were vulnerable. That's the essence of it.

So, not many residential point so far, but we're always growing the database.

>> Thank you.

>> NATHAN WARDWELL: Julie, go ahead.

>> JULIE THOMAS: Do you include the storm drain, Rosemarie?

>> ROSEMARIE FUSCO: Yeah.

>> JULIE THOMAS: That does a lot to predict underground or flooding that might happen. Thank you, all for the comment. It was really interesting. Nicole, I kind of laughed because I thought, oh, my gosh, I knew she was going to like hearing Houston has the highest -- what was it, natural disasters or something? That's very appropriate for this panel to know.

Justin, I also -- well, I'm from San Diego, but it was interesting your climate guidance from state agencies. I kind of have followed CoSMoS, Teledapt. Scripps has done some work. This goes to what you spoke about the stakeholder engagement. One of the things that I get pushback a little bit is when I attend a stakeholder meeting or even I'll say my local City Council sometimes, they have asked me to come, and it's like, you know, we -- climate change is so unpredictable. It is unpredictability. How do we deal with it? Which model do we follow? Which IPPC graph do we follow, and I'm wondering if we found in dealing -- I find it is very hard to talk with stakeholders, because they have -- many of them are already very educated on a lot of facets and have already said, yes, we have a problem here, and almost many different agencies, people have gone to them and said what can bee do to help, but them when it comes right down to it there could be a dearth of information, or they have model that is sometimes don't agree.

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

>> JUSTIN LUEDY: This is Justin. I don't have camera access to the go to webinar platform. Just phone for me. I should mention we use AECOM for

production of inundation mapping and they are a fantastic team in the Bay Area. They certainly deceive that credit. For us the OPC model -- here in California, we're such a different animal in so many different ways in the state, and when it comes to coastal resiliency planning, OPC, ocean protection council guidance is the best for seaport planning. We're privy to the California coastal commission and state land commission. Those agencies really do sanction the OPC models so it made the most sense for us to use that model for inundation mapping of our harbor district simply because we knew we would have the congruency with the state agencies. They are -- they approve our coastal development permits and they have quite a purview of sea ports, so, to me that was sort of a no-brainer in the sense we use OPC model but we have looked in the past at CoSMoS. City of Long Beach used CoSMoS model as part of their action plan. We are aware of other model notification place but OPC was the more appropriate choice for our port.

>> JULIE THOMAS: Great. Rosemarie, what was your interaction with the stakeholders? Did you have enough interaction to have feedback?

>> ROSEMARIE FUSCO: Yeah. So the water terminal service and URI have robust connections to the neighboring communities and communities around Rhode Island as well in regard to like port planning and interactions with the port and its neighbors and impact of the environmental outcomes the port on neighbors. I feel like this is a good moment, because you get to hear from Justin, in a very large port community, and then from me, where Port of Providence port community is very small compared to California and for us, the neighboring communities for ProvPort are low income or multi

lingual, and they are organized and already have a lot of information and have vision for what they would like to see from the port over the next 10 to 20 years. So, we have a really good starting point but one of the things that is problematic, the information everybody uses is different as you say. So one of the things that helps us, we use these different types of modeling platforms to show the audience, the end users, that there are varying degrees of information, but even though there's uncertainty, what is certain is that things are going to change, right? So, what is certain, that there is going to be a level of impact even if we don't know what level of impact that is yet, there's going to be impact. So, just saying that for everybody is like this unifying force, and it kind of just -- it adds a sense of cohesion. We're all working toward the same goal. So, we've seen that over past interactions. We'll see how this port master plan works out. I think there's more at stake now. The conversation is changing a little bit because the port is undergoing transformation and engaging with emerging markets. We'll see how the conversation hashes out now. We've found despite effort of uncertainty and myriad of sources that can be used to contribute to this conversation, saying there is the need for adaptation or need for resilience is a starting point. I hope that answers your question.

>> JULIE THOMAS: Sure. Thank you. Thanks, Nathan.

>> NATHAN WARDWELL: Yeah, thanks, Julie. Qassim, why don't you go ahead.

>> QASSIM ABDULLAH: Thank you, Justin, Nicole and Rosemarie. I have a comment and question, please don't feel obligated if you don't know the answer because probably you not involved in the concept of digital twin,

looking at the two seaports, the digital twin will come as a big help in case of climate change, planning, master plan and digital twin, I'm talking about don't have physical, digital twin -- digital replica for physical environment of the boat, everything in it, navigation, and that will help a lot in cases like this. It will help in assessing the risk, and putting mitigation, strategy for it, so, I'm wondering, especially for Rosemarie, the master plan for Rhode Island, are they thinking of building this digital twin, and Justin, same way, do you know if there are -- I'm pretty sure there isn't -- didn't exist, but are they going that way? Are they thinking that way to build a digital twin for their ports? Thank you.

>> ROSEMARIE FUSCO: I'll answer for me. I actually don't know. I haven't heard any -- that has not been brought to the table when I've been there, I have not heard of that, of them doing that. That's a great, great question, maybe I'll bring it up.

>> QASSIM ABDULLAH: Thank you.

>> ROSEMARIE FUSCO: Thank you.

>> JUSTIN LUEDY: I agree here, this is Justin. I'm not aware of that either. A great question.

>> NATHAN WARDWELL: All right. Thank you, Qassim. I am glad you got your digital twin in there. I've been waiting for it.

[Laughter]

Mary Paige, why don't you go ahead. And we might have a little bit of extra time here, so, if there are questions, go ahead and try to get them in.

All right. Mary Paige?

>> MARY PAIGE ABBOTT: Great. Thank you. I enjoyed listening to both of the preparation, especially because they -- both east and West Coast being represented, and my area of -- my focus is that of the recreational boater, and when I listened to the presentations, speaking about ports, I don't want anyone to forget about the public and private Marinas that are used by the boaters in the area, and a lot of times, the access is exact same physical water base, it is just non-commercial. It is a recreational standpoint. The economic impact of a recreational boater in the United States is about $230 billion annual impact -- excuse me, 12 million registered recreational boats in the U.S., and Rhode Island, for instance, it's a $1.7 billion economic impact with over 7,000 jobs that are impacted, as well as 381 direct businesses. So, as a stakeholder, in Rhode Island, and then the numbers in California are a tad larger, by additional zero, but, regardless, the point is, hopefully the stakeholders are including this in huge, huge group to the data collections, as well as the impact on that, so I just wanted to make that statement and hear an affirmative from both of you that you are including us.

>> ROSEMARIE FUSCO: That's a great, great point for the ProvPort master plan. There, so far, is no plan to include those stakeholders in an active way outside of community meetings. So, I'm glad you brought that up. Because I am going to bring it up for the next team meeting. I think -- are you in Rhode Island? This is a hot topic in Rhode island, because Rhode Island's economy greatly depends on the recreational boaters and fisheries. So, the impact of the increase in port traffic through the Narraganset Bay has potential impact for the state of Rhode Island, it's a part of the master

planning process, but I think that -- I am glad you said this, I think it needs to be brought up more specifically next time we talk about, particularly once the consultant is collected.

>> MARY PAIGE ABBOTT: Perfect, perfect. Thank you.

>> JUSTIN LUEDY: For us in Long Beach the Port of Long Beach discourages recreational boating. It is something harbor patrol -- I wouldn't say strictly forbid it. We really try to avoid that.

We only have one like a sport fishing organization, they are located outside of our harbor but use the port for transiting and navigation, it occurs further off the coast outside of breakwaters, but we didn't account for recreational boating in our adaptation plan, specifically because we don't see it as a stakeholder.

Now, the Port of Los Angeles is a different story. The port complex has commercial fishing and boating and certainly had to account for that. Here in Long Beach, it's not something that we do. City of Long Beach in the own action plan account for that. We're a large coastal city in California, that's taken into account. In the harbor district specifically our plan does not address it.

>> MARY PAIGE ABBOTT: Interesting. I appreciate that information. Thank you for sharing.

>> JUSTIN LUEDY: Sure. We have fun fishing pier we consider to be public. We put on fishing platforms so the angler -- we have to shake sure because there's sustenance fishing, we wanted to account for that. Again that's the fishing community.

>> MARY PAIGE ABBOTT: I have a question and please don't forme flip on this. So, I'm a boater, I was a sailor and sting Potter, but the point is, I'm lighting big signs in the port, in the channel, recreational boaters not wanted. That concerns me from the standpoint that not everybody has the choice, especially if there's a dangerous situation occurring -- being occurred, but I'll have to take a look at my ENCs and other data available to me as recreational boater as to what is keeping me out of that, out of that harbor. But thank you very much for sharing that.

>> JUSTIN LUEDY: Sure. Response to that in short is based on the industrial nature of the port. We're huge marine terminals with public and private facilities and intense shipping traffic. It's not the appropriate environment in terms of recreational boating. That's the reason you would probably get from others on our staff, yeah.

>> MARY PAIGE ABBOTT: Thank you.

>> JUSTIN LUEDY: Sure.

>> NATHAN WARDWELL: Thank you for that.

We have two more minutes I believe. I see Nicole and Julie up here and I have a question, too. I don't know if I can fit it in there. But, Nicole, why don't you go ahead and we'll see how much time we have left.

>> NICOLE ELKO: I'll try to be quick, I was -- I had glitching issues when you are presenting. If you said this I apologize. I understand you did inundation modeling. But are you looking ahead to a certain time, 2050, some year in the future and are you adding an amount of inundation on top, and planning toward that time? I ask because NOAA has a fantastic report

published with the interagency panel that a lot of coastal communities using with the one foot by 2050 guidance?

>> ROSEMARIE FUSCO: Justin, I'll go quickly. So far in this master plan, the planning horizon is not set yet. It is likely 75 years. With that plating horizon, we'll zero in on what exact scenarios we're going to use in deterministic modeling and how that hashes out and which curbs we're going to use, but we will do inundation on top of sea level rise, absolutely. So, that's absolutely a part of all of the models we'll use. So, for us, we just don't know yet, what it is going to be because the plan horizon isn't secured. As we move through the next three months, we'll know in the plan.

>> JUSTIN LUEDY: That's the same for us in Long Beach. Over the last few years, we're in this large phase of -- large redevelopment projects and most of them has been designated a 50-year life span, for that reason when it comes to the early stages of program management, engineering, the design and development of engineering drawings and plans right now, we really look total 2080 horizon per the ocean protection council guidance and that help us to understand sort of based on life span, average life span of port infrastructure and redevelopment project, we'd be looking out to 2080 and then obviously that will shift and change over time, as we move toward forward on projects. That's really where we look right now, unless it is a critical facility, something that the coastal submission has designated as critical which is water and transportation assets then we might look beyond to 2100, but that's pretty uncommon force at this point.

>> NATHAN WARDWELL: Thanks for that question, Nicole. Since I'm moderator, I'm going to finish the last question. I see you hop in there but I

figure I should get an opportunity. So, there's a lot of data sources out there a-e, and a lot of place where's data can be accessed and be provided by NOAA, as this panel, you know, our role is to advice the administrator on what other need are out there, and I don't know, I just want to ask the question and provide you the opportunity, if there are any gaps in the information you need for doing your assessment, and it -- yeah, if you have identified any gaps in data or products to do your assessment, and if there's a way that NOAA can help with that.

>> ROSEMARIE FUSCO: I'm sorry to say that's the hot topic and goal of the project that I presented to you really is. So, we hope to identify some of what those significant and impactful gaps in the resilience world of port planning, and see if the Federal planning process of IRPF contributes solutions to those gaps and if there are barriers to implementing IRPF, and what those barriers are. I don't have a specific answer for that, because that's a question we're working on, and I think probably one of the most impactful for port resilience right now.

>> JUSTIN LUEDY: In the interest of time for me, I'll point to heat. I'll say we have a lot of great guidance on sea level rise, but extreme heat would be something interesting to be more reliable information and modeling that helps us plan especially for energy resilience efforts and initiatives here.

>> NATHAN WARDWELL: Thank you for that. I'll hand it back over to you, Sean. I believe you're on mute.

>> SEAN DUFFY: Thank you. You were right. So, one of the things we really didn't get to touch on yesterday, I'm going to hit real quick, is this is both Nathan's first time moderating, and first HSRP as Vice Chair, and my

first role as Chair, so, there's a lot of moving pieces. I'm going to keep on time and be quick. I wanted to thank Miss LeBeouf, Nicole, excellent idea, panel. As a Louisiana Mississippi River person, port resilience is one thing that I also have a concern related to waterway resilience. The most resilience port here may not survive some of the changes that we see. With that, excellent panel, thank you, Nathan. You did a great job.

I'm going to turn over t over to Admiral Evans. I think we have a public comment period but I will silence myself, sir. The floor is yours.

>> BENJAMIN EVANS: Thank you, Sean. I want to -- before our panelists jump off, I want to thank them for input and time, for really outstanding discussion and I'm glad we were able to extend it a bit.

At this point we're at another public comment period. This is a request for public comments, and attendees encouraged to enter their comments in the question box. Please target comments to HSRP members and focus on what NOAA can improve for navigation products and positions data services. This is not an opportunity to turn the panelists questions.

We will show the comments on screen and they will be collated into a document shared with HSRP members and NOAA. After the meeting the comments will be hosted to the HSRP included in the public record.

Ashley, can you please show us and summarize the comments?

>> ASHLEY CHAPPELL: Sure, you should see the comments, thanks, Amanda for posting them. Captain's comments caused a lot of questions. Frank Rabena from Virginia Pilots know you cannot generalize expertise across local areas.

Jon Dasler has a comment that the post guard purposely does not regulate PPU software in order to provide flexibility, noting that regulation can impede and slow progress with customized displays and the like. So, noting how unique each port area is.

Guy Noll building off Captain Kurtz's comments, poses a question on the HSRP, you might want to take a look at this to pre qualify ports for their survey data, incentivizing port communities toward ownership of the port approach, their information assets and encouraging funding for maintaining under keel clearance and air gaps. This is information infrastructure not just physical infrastructure.

Lindsay Gee also comments on PPUs and he makes a leap in this comment from acquisition of survey data to certifying a port who come pies their own ENC or updates, ENC data within their area. So, that is a big jump from our external source data process now but something to think about.

I'm going to skip ahead. Bob Moshiri, Johnson Outdoors appreciated the comments from Mary Paige in support of recreational boaters and reiterates the comment from yesterday about more emphasis surveying near shore areas in the Great Lakes. I did see -- this is a little more ragged because this came in after we updated our sheet. But Lindsay submitted another comment about the Alaska coastal mapping strategy and imbalance of services delivered to underserved communities. Has there been any discussion or progress on establishing the similar strategy for the remote Pacific that has the largest unmapped area in the EEZ, so, this brings us back to the bathymetric gap analysis and ties in underserved communities as well.

So, we will get that comment posted into this document during the break.

And if we -- Admiral, what do you think? Do we have time to open the line?

>> BENJAMIN EVANS: I think we should. We I have a couple minutes. I assume it's technically feasible, if there are any attendees who like to make a verbal comment, addressing NOAA or HSRP panel members we can open the line at this point for them to do so I believe there's a hand raise function for attendees that they can use to signify their interest.

>> ASHLEY CHAPPELL: There's a hand raise function and we can turn your microphone on. You could also keep that in mind for tomorrow's public comment, too, if you're not prepared today, but want to say something tomorrow.

I'm scrolling through and don't see any raised hands. Why don't we wrap up this public comment period and look forward to tomorrow's all right?

>> BENJAMIN EVANS: Yep. I think that makes sense. Thank you to everyone who submitted public comments. There's a lot of really good questions embedded in there, which we'd be happy to dig into further, and some outstanding ideas.

The -- at this point, I believe we have a break coming up so I'll turn it back to Sean briefly for any closing comments before the break, and to take us out.

>> SEAN DUFFY: Thank you, sir, so, we do have a 15-minute break, I would like to hit some quote now and then, I'm going to read one of my favorite from Steve Jobs: To build a strong team you must see someone else's strength as a complement to your weakness and not a threat to your

position or authority. I thought that was very fitting, counting on a lot of you to help explain the hard stuff to me.

But with that, look forward to reconvening in 15 minutes, and we officially have a time-out.

[Brief break]

>> We're returning in one minute.

We are ready for the priorities matrix.

>> SEAN DUFFY: All right. Welcome back from break, everybody. I see Nathan was noted on here, but I'll just go to -- turn it over to capable hands of Eric and Mary Paige on the working group discussion, on issue papers. The floor is yours.

>> MARY PAIGE ABBOTT: Well, good afternoon, and, first, Eric and I have just a quickly review. We have decided to split the responsibilities here, and he will be championing the issue paper focus, and I will be helping maintaining matrix and such. And, as such, we are not going to take a look at matrix at this moment, we were going to go straight into the issue papers, as those which have been presented to the group, and, Eric, you may have the floor.

>> ERIC PEACE: Food afternoon. We got to the point where the geodesy paper was complete and posted. The second one that is currently awaiting approval is the digital twin. So, in your documents you'll see the digital twin paper which has been drafted and put in there. It is like the top part, like six, seven down on the actual Google Drive. Has everybody had a chance to look at it? I guess a better way to phrase it, has anybody not have a chance

to review the final draft of the digital twin paper? It is dated February 25th of this year.

>> JULIE THOMAS: I think I'm good. This is Julie, Eric, I think my changes or edits were included in that, so, it's fine with me.

>> SEAN DUFFY: This is Sean,, we made a bunch of changes, it's been edited but I'm fine with the version as discussed.

>> ERIC PEACE: So far, is anybody not ready to note on the digital twin paper as to whether to move forward with it? Great, great. I guess we take the vote at this point. Sound like it has been first and second by Julie and Sean. All those in favor say aye?

[Chorus of ayes]

>> ERIC PEACE: Any opposed? Thank you. Great, so the digital twin paper will go forward from here. With that said, I won't belabor the point. I know Qassim has been looking forward to this day with the digital twin.

[Overlapping speakers]

[Laughter]

>> ERIC PEACE: Moving on is there any other digital twin papers -- not digital twin, any additional papers we want to put forward or propose working on? I know Deanne talked a little about the sand waves. I don't know if that's still in her consideration, if anybody else wants to get on that, or if there is any other topics that we want to bring up for an issue paper?

>> QASSIM ABDULLAH: Eric, I have suggestion, we're probably going to -- we are planning to discuss it next in technology, but since you ask, I can bring it up as a place for --

We are thinking about the importance of interoperable land and sea, which is connecting all of our coastal bathe data, to the inline, USGS, for all of the things we're talking about. Modeling, we really need that connection. I'm thinking about drafting -- after I talked to the individual, Admiral Evans I didn't have a chance, I was focusing on digital twin, but after this meeting, I brainstorm with NOAA staff on it and see what we can do. That's all I can say now.

>> ERIC PEACE: Okay. Deanne, are you still with us?

>> DEANNE HARGRAVE: Yes, I'm here.

>> ERIC PEACE: Any further thoughts on the sand wave?

>> DEANNE HARGRAVE: Well, they are still out there and they are still moving around.

[Laughter]

And I think about them a lot. But I may be unique in that. Although, you know, I did hear -- you hear about it, tangentially, in a lot of the other conversations, coastal resilience, the presentation that is we've had in the last day and a half. I think it is still relevant. I'm not quite sure if it is quite ready for a paper just yet. I really liked the idea that Qassim just floated about the transition between on shore and offshore. It is related to the mobile sea as well. That could be a component of the issue paper, or transition issue paper could kind of have some bits that come out testify in one of those more focused areas, and one of those could be the seabed mobility or other things of interest. That's just kind of where my head is at at this moment. I don't know if others of you have had a chance to think about that as well or have thoughts about this seabed mobility?

>> ERIC PEACE: I do, the reason I say that in the great lake, we're typically shallow essentially. Yes, we do have depths. But we've seen -- I hate to say this, because I look like a crazy man talking about ice breaker but the ice and intensity of the storms driven more sediment from the open water and moved it into the open harbor, we're actually getting more movement on the bottom which is shoving sediment into the harbor entrances and also moving in track lines out in open water where essentially sand waves pushing up because of the heavy winds and stuff we're getting in the storms. And like lake Erie, sucking sediment between Buffalo and Toledo and pushing it into the harbor as well. I think it is an interesting topic. I think it is something we can predict or look at those closer. Maybe it is something we look at in the future. But I think it is something important.

>> DEANNE HARGRAVE: I think it ties to really the conversation we've been having here, about -- to be able to predict sand wave, you need to have data. You need to have the exact data that NOAA produces fantastic, right? But not just at one point in time, right? Not the data from 1948. You need to have sequential data that you can use to analyze that fourth dimension of time. And so, I think it links to kind of a broader topic of -- you can build a model at a point in time, and it's a great model for that point in time, but things change, and so the model is only as good as it was when the inputs were valid. So, the more and more that we build tools that are great tools and we're using those, and we become dependent on those, the more important it is that we're able to add more data and continue to keep the tool or the model relevant. Otherwise, you -- it loses its effect, and the key bit there, where I think maybe we can help explain the importance of that

sequential data, or repeat surveys. Is where it comes not budget in thinking about, okay, if you want to build a tool, you have to plan for not only building the tool, but maintaining it for the lifetime of the usability of that tool, right? So, I don't know my brain just went on a little bit. Sorry from that.

>> ERIC PEACE: Julie, do you have something?

>> JULIE THOMAS: I do. I was thinking about the seabed mobility, and that paper. And Nicole Elko should join in. There's talk of sediment movement channel of Long Beach, some of the coastal resilience talks, and what Eric just commented on, on the Great Lakes. I'm wondering if we don't want to make it a little bit broader than just, you know, wind farm seabed mobility, but talk about the influence or challenge of sediment movement. Sea bed movement. Seabed mobility, sediment management, whatever. And we could wrap it -- I think there's people on this panel that have expertise in a certain area that they could trip a paragraph, as another example or something like that. And so, we kind of tie it into a larger picture of sediment management, and how do we monitor -- how do we observe that, how do we monitor that, effect, whatever. That was my thought for an issue paper.

Nicole, do you have a comment on that?

>> NICOLE ELKO: I would second Julie's remarks. I was thinking the same thing. I think in my mind, the goal of this paper should be to motivate the cause of Qassim's comment. And when it comes to sediment for me, this is like my world, and Tuba's world and trying to narrow it down is a big challenge. We struggle with that.

>> MARY PAIGE ABBOTT: But I think we should take advantage of your expertise, and Tuba, and some of these challenges that other people on the panel are seeing, and I could see an issue paper coming together that was kind of this larger picture, and whether or not we do the topo hydro, I haven't really thought of merging that as an issue paper, because, to me, that might be such a big challenge. I don't know enough about the actual status of that, or what efforts have been done, so I guess that would leave it up to Admiral Evans and see if it would be merged in. All of these topics, I think are good is what I'm saying.

>> SEAN DUFFY: I would like to jump in real quick and say, when talking about offshore, I didn't have much to say, but sediment transport on the Mississippi River is a huge issue. Not a great deal of information. I will throw out that I mentioned I think the last meeting that I co-authored a paper with scientists from Tulane coastal studies. We are -- they invited me back for a second goal, and that is related to sediment transport on the Mississippi River. I would say I like to see it. Of course, I'm not the scientist on this, but I would be happy to share that information that came from other scientists, just to help improve but I'll seen say, we call sand waves sediment moving on the bottom of the river, probably not the most accurate scientific term, but it is what a lot of the Corps and navigation members talk about where we'll see some change in draft, or change in water depth of over five feet in a 24-hour period. So, very relevant. I would like to see this happen, and contribute. Thank you.

>> ERIC PEACE: Do you have something?

>> BENJAMIN EVANS: Thanks, Eric. I'm sensitive to these discussions and don't intend to tell the panel its business. I would offer, we could if the panel is interested work to put together a discussion at a meeting for future working group meeting focused on seabed mobility, where it matters, where it doesn't, but various tools and techniques, utilized or available to tracking it, because not in all cases do you need to perform a full resurvey. There are remote sensing ten necks and others that can be utilized to help with recon sense to identify the areas where the sea bed is moving, and I would offer that. That could be a first step to get us all a little bit smarter on the topic before going ahead to an issue paper. That said, if the panel feels they need to know what they need to know. And they want to move ahead. It is not my place to stand in the way of that, I certainly wouldn't want to, I would half through the meeting process, we might be able to pull this together a little height tighter.

>> QASSIM ABDULLAH: Eric, if I can add to this, maybe it is a good idea to plan a panel on the topic in the next meeting would be a good -- I think that's what is alluded to.

>> TUBA OZKAN-HALLER: Can I jump in? I think this topic is like what we talked yesterday. Enjoying telemetry that varies little, like these other places, the Mississippi River and mouth of the Columbia River. The mouth of Columbia River, 4 million cubic yard of sediment dreamed every year. That fills multiple empire state buildings every year, that's all sand that fills in. We don't know if that happens during the first storm or last storm or equal amounts over the course of time, so there's a lot there. Admiral Evans, I like your comment about, there are technologies that are ways of observing the

bottom changing once we have a baseline, and so it would be really good to have a session where we can talk about some of those innovative new ideas, and sand waves, certainly ties in with offshore wind development and things like that, too. I wonder, though, how much does NOAA view sediment as its, you know, as its main worry, or issue? Is there -- am I reading -- is there an issue there at all? Is that something that NOAA is like, oh, no, that's somebody else's purview and not ours? Thank you, Ben, for coming online for that one?

>> BENJAMIN EVANS: Sure. I'll try to address that, and I would ask any of the other NOAA experts or office direct have any have an opinion here to offer it. I think the answer to that is, it depend. Certainly from a -- from the Hydrographic Services Review Panel perspective and purely navigational perspective to where is the sea bed, we care about that, base that's our job, our job is ensure fundamentally safety of service navigation within U.S. waters, more generally provide accurate sea bed model, water level, geodesy, that support a wide range of navigation and non-navigation uses and certainly seabed mobility, sand waves, sediment transport is part of that, because it affects the answer.

Now, as a practical matter, do we regard, you know, the -- the science of tracking those -- of tracking sand wave, for instance? That is less squarely in our wheelhouse. That's probably more, say, USGS mission, understanding the physics of how and why sand waves move. There may be other pieces of NOAA that have a strong interest in that, potentially in the fishery service or the other components of the agency. But I think it's -- we, again, you having an interest and responsibility for understanding the shape and character of

the sea bed. This does fit. I think, for us, thinking about limited resource, part of that would be, all right. Where does it matter most? And I'm drawn back to, and I think, Deanne, I shared this example with you when you brought it up the last meeting. Huge sand waves on Long Island Sound. They had moved significantly and kind of wondering to myself, does this really matter? The controlling depth is the same. Yes, that sand wave moved a quarter of the mile. A peak of the sand wave. But the controlling death is the same. Is this an endangered navigation, is it not? Clearly needed portrayed on the chart but was it a crisis that somebody was going to hit this thing that was 30 feet below the sea floor or surface, those are the sort of questions we wrestle with a little bit in terms of whether we dead kit resources to tracking these on a regular basis. Now, again, if we understood the requirements better, for instance, in offshore wind that might influence our decision making, and to Tuba's point, maybe there are remote sensing or recon sense techniques we could use to identify where things are moving so we can react appropriately.

>> ERIC PEACE: To put in context of the Admiral's statement. We actually had encroachment of a shoal in the open lake for the first time ever. The open lake is not controlled by the Army Corps. There's no dredging but we have one of other recommended route sitting atop of a shoal that moved a year and a half or so. That's someplace NOAA might be interested in because I got nowhere else to do because the Corps won't do anything with it. Even if the Coast Guard start laying out paths, traffic separation, or I forget what they call it now, port access between different area, those are going to be planned route. So, if we know there's something moving in that

area that could impact navigation, you wouldn't put that planned route on that location.

Good discussion. I guess we'll open it up. Is there any other issues, working group? I know we want to save time for Nathan to talk about the arctic. Anything else we want to discuss? Do I see a finger?

>> JULIE THOMAS: Can I say one thing? I put it in the chat. I would propose taking advantage of working group meet toss take Ben up on his offer here to see if we could get a little bit more educated about what NOAA is doing in this sediment realm. And to kind of get a head start, particularly if we're going to do an issue paper. Rather than wait for a panel at the next meeting, I think this could be a good discussion over the next six months is what I'm saying.

>> ERIC PEACE: I agree.

>> DEANNE HARGRAVE: Mary Paige that sounds like a nice approach, Julie, definitely helpful to understand what is already being upon. And also to frame up the potential issues and where it does align with NOAA or NOS core mission. I think that makes a lot of sense.

Maybe that is a bit of a two-way conversation of understanding what NOAA is already doing but also having some, you know, some of the -- Eric, your example, having a few industry experts, or whoever come in and talk about how this is relevant to what they're doing, I think, like you said, Julie, we have a lot of expertise on the panel to have some of those conversations.

>> ERIC PEACE: I have one quick question, Admiral. When we have hurricane response after a hurricane moves through the area, is NOAA doing

anything, are they looking for anything, or doing anything on the shifting bottom?

>> BENJAMIN EVANS: Absolutely. I think -- I don't want to speak out of turn. It really depend on nature of the impacted area. So, often the -- well, let's take Port of Virginia, for example, the approaches at the Chesapeake. Depending on what the Coast Guard identifies as impacted area, the portion, draft restrictions they may have implemented, the portion of the channel if any they have shut down, that would be our first priority to survey, to give them confidential to reopen. As part of that, we're looking for any change in the character of the sea bed or things on the sea bed, whether that's, you know, seabed mobility, shifting sand, or, you know, debris that may have watched into a dredged channel or into a navigation channel. It is really any or all of the above. So, we're not exclusively looking, for instance, for a lot of container and ignoring shoal way or shifting sand. It's looking for change detection of any sort in the assigned area.

>> ERIC PEACE: Definitely sound like a climate resilience area to me. Okay. As I muddle through this, anything else with issue papers, anybody else would like to bring out?

>> KIMBERLEY HOLTZER: This is time, obviously being new. I was surprised the Port of L.A. hadn't switched to that completely in their report where the Port of Long Beach has. I've wondering, we've been so successful, we're doing our own survey, submitting them to NOAA for CATZOC rating. Is that a issue paper talking about how port can provide services to NOAA for navigational purposes? Obviously probably the larger port, commerce. I wasn't sure. That was more a question.

>> ERIC PEACE: Anyone?

>> BENJAMIN EVANS: I'll just say -- I don't want to speak for the panel, but I would say from a NOAA perspective, having that story told, and -- would be very powerful for us. And I think we could also incorporate into that discussion of our external source data pipeline, and improvements that we -- depending how we want to approach this, we can talk about, the panel could address the source data pipeline in general, or specific to particular large ports, that may be conducting their own survey work. I think there's in some respects there's a good story to tell there. For us that's good to have to be able to point to. I think there's also some technical work, and some connecting that we could get at through a paper like that as well.

>> MARY PAIGE ABBOTT: I have a question about these products. It came up this morning about -- I think it was Captain Kurtz who mentioned about the different PPUs and I've seen many varieties that are out there. But does it have to -- do the PPUs have to be of a certain quality, power? It's not a highly -- to run the S products you don't need anything special as far as operation of PPU goes?

>> BENJAMIN EVANS: I'll tackle that and Karen other others who are more knowledgeable. As has been noted there's no regulatory -- no regulations on PPUs, different pilot associations free to use whatever they like and call it a PPU. Some have things on tablets, some have laptops it really runs the gamut. There is definitely -- probably a performance limit of hardware and software below which you're not able to realistically file, suite of files or cut customized contours from that data as that product is intended to support. I

don't know if we explored that limit. But I suspect there is a floor below which you're not going to get the kind of performance you need.

>> JULIE THOMAS: I was wondering how many PPUs are out there. And if we're doing a paper on this, we want to have some ideas -- we want to make sure we have the full gamut of the pilots and what there are -- if there are restrictions and I don't know enough about this. We see Captain Kurtz has more to offer than me.

>> BENJAMIN EVANS: Go ahead. Carolyn.

>> CAROLYN KURTZ: There are no standards of this, I can only speak to my use of devices over the years. We've had several different evolutions of the equipment the CIQ software, seems to be very accommodating. Many of us were downloading the Army Corps soundings, because we work on dredge channels with center lines, so that's a primary piece of information they're using as cross track error from the center line. We were able to go to the Army Corps Website and get those files and load them up on CIQ. So, I imagine that would be similar for using the -- the S100, 102, whatever those products are. And the vendor, CIQ, they will make any kind of software adjustments. They are very accommodating to customize the product for the user. So, typically, if pilots needed equipment, they are going to get the best equipment they can get so that it is useful. So, the idea is that you're doing this in fog or rain, or whatever your circumstance -- your enhanced circumstances are where you need more help than maybe just looking out the window. Anyway, that's just a little bit of how that works. But it has been my experience, any time we've gotten a different system we're able to customize it for the port. You can certainly do a survey of pilot associations,

as simple ascending out a questionnaire to every group. There's like a master list, and what equipment do you use, and are you able to, you know, expand what you're doing with what you have. So --

>> ERIC PEACE: Next, Qassim, Kim and Sean looks like he's ready. Go ahead, Qassim.

>> QASSIM ABDULLAH: I'm sorry, I was muted. Thank you. That's a great discussion, and Gus give me a thought about maybe it is time we do kind of technology showcase where we write a few of these PPU manuals, because I just got inform Garmin has two, I'm not sure somehow good this is. I can work with Carolyn or anybody. Can a panel -- because it is hits directly to precision navigation efforts, so we know software accommodate or open flood data or Corps of Engineers data or something like that. With capability, with accuracy. I think it is a great time in the next meeting we can organize manufacturer showcase, if that's okay with you guys?

>> ERIC PEACE: Kim, did you have a comment?

>> KIM HOLTZ: In Long Beach, Jeff Ferguson from NOAA, John from DEA, and Jake as pilot. We were test navigation files. Once we got it set up, seems it is pretty seamless from them when they want to update files. Up with comment we just got back there their Jacobsen pilot. We do our surveys and go every year and do half the port. They want that data the next day. We have to submit to NOAA to be -- to get into the system. So, we're trying to work out that mechanism with them now because we've given them more precise data and every pilot in the Port of log beach is using it. They don't want to wait six months to get an updated S102 file. That's an

issue that could come up. As you give them better data, they want it quicker and quicker. I just want to make that comment.

>> SEAN DUFFY: I wanted to chime in. I think that was a good point there. I think a technology showcase is a little out of our bounds. There are technology showcases that exist. I can recommend them, where a lot of the pilot PPU manufacturers attend one of the more famous ones is NAVTEC, but there are others. And I'll say that for -- and make a statement, I think close to a third of the pilots in the country reside along the Mississippi River, and we don't have -- even going back to CATZOC. We can't do that on the river, we rely on single beam data because the bottom changes so much. There's a 30-mile stretch from Venice to the sea buoy, that you can see five to seven foot changes in the 24-hour period. By the time the multi beam survey would be ready, it would be irrelevant.

So, kind of -- I think part of our efforts should be to know more about what's out there, not try to look at standardizing the pilot units, but here, one of the big lacking things is the amount of surveys and sensors, there's probably about 150 miles or more of the Mississippi River that are not surveyed more routinely surveyed, and, you know, although Jon Dasler is mentioned, David Evans did a hydrographic channel of the whole ship channel completed in 2018. It's five years old. It's a great effort and update but actual realtime data is missing. I would be careful about that, and although I think it is good to talk in some of the groups and discusses to familiarize ourself with what is out there, what's available, and I think trying to standardize PPU, that's trying to tell Microsoft and Apple how to do their programming. And I think that's beyond our effort.

>> ERIC PEACE: We're on the virtual hook here. We have five minutes now -- with that I'll turn it back over to Sean. We will have another session tomorrow. So we can expand on some other issues, then.

Sean, you want to close us out?

>> SEAN DUFFY: Sure. I didn't want to cut anybody off. Of course went back on mute for about a second there. So, a lot of great discussion. I want to try to keep us on time and give the Admiral a chance to comment as well. Again, you know, this team is amazing, there's a lot of experts in varied field and trying to keep us pointed in the right direction is a challenge. It's great to hear talks. Eric and Mary, thank you. I have worked on a bunch of sessions, the work, going back and forth and the digital twin paper give a lot of experience to see that. With that, I'm going to turn it over to Admiral for any final thought before we close out for the day.

>> BENJAMIN EVANS: Thank you, Sean, and Eric and Mary Paige for marshaling that last conversation, I was getting excited and into it and realized we only have five minutes left. Eric, thank you for bringing that to a close. Although, I think, as you said, there's a lot more to unpack there. I'll just note that we have your starting at 8:30 eastern, 11:30 Pacific tomorrow morning. First all up will be another hour as we have this morning for round robin and reflection on today. So, be ready for that. I realize it feels like we're drawing a hard line here at the end of what has been a very productive day, we'll have time to think on it and reflect tomorrow morning when we reconvene.

So, with that, I think that's everything I wanted to share. Thanks, again, to the panelists. And to our attendee, any of whom are still on with us.

Sean, if there's nothing further, I think we can adjourn for the evening, or afternoon.

>> ASHLEY: Can I interrupt for a second? To be clear, it is 8:30 a.m. Pacific time. 11:30 eastern.

>> BENJAMIN EVANS: Sorry.

>> ASHLEY CHAPPELL: It got flipped around.

>> SEAN DUFFY: That's the part of knowing weather temperature is morning or afternoon. We appreciate the effort, a lot of great team work here. I'm happy with the progress and process and everybody's contributions. Welcome the new member, remember some of the old members, and I would be remiss if I haven't mentioned, the team as been great. A lot of support. There's a lot going on that nobody else will know. Well done, thank you. I'm ready to close this meeting out and see you tomorrow. Qassim. Are you here to say good-bye?

>> QASSIM ABDULLAH: No, I agree with you.

>> SEAN DUFFY: I don't want to stop brilliant minds. Thank you, team. Let your jerseys get washed tonight and freshen them up for tomorrow. Look forward to seeing you in the morning.

>> ASHLEY CHAPPELL: Thank you, everyone.

* * *