U.S. DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

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PUBLIC MEETING

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THURSDAY
AUGUST 29, 2019

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The Hydrographic Services Review Panel met at the Hotel Monteleone, 214 Royal Street, New Orleans, Louisiana, at 8:30 a.m., Ed Saade, Chair, presiding.

HSRP MEMBERS PRESENT

EDWARD J. SAADE, HSRP Chair
JULIE THOMAS, HSRP Vice Chair
CAPTAIN ANUJ CHOPRA
SEAN M. DUFFY, SR.
KIM HALL
DEANNE HARGRAVE
EDWARD J. KELLY
CAPTAIN ANN KINNER
DR. DAVID MAUNE
CAPTAIN ANNE MCINTYRE
CAPTAIN (ret. USCG) ED PAGE
GARY THOMPSON

NON-VOTING HSRP MEMBERS

JULIANA BLACKWELL, Director, National Geodetic Survey, NOS
RICH EDWING, Director, Center for Operational Oceanographic Products and Services, NOS

NOAA LEADERSHIP PRESENT:

NICOLE LEBOEUF, Acting Assistant Secretary, NOS

CAPTAIN ELIZABETH KRETOVIC, Acting Director, Office of Coast Survey, NOS; Alternate HSRP DFO

NOAA STAFF PRESENT:

GLENN BOLEDOVICH, Policy Director, NOS PCAD

CAPTAIN RICK BRENNAN, Chief, Hydrographic Surveys Division, OCS, NOS

VIRGINIA DENTLER, Center for Operational Oceanographic Products and Services

LYNNE MERSFELDER-LEWIS, HSRP Coordinator

GALEN SCOTT, Program Analyst, Geosciences Research Division, NGS

ALSO PRESENT:

RENEE COLLINI, Program Coordinator, Northern Gulf of Mexico Sentinel Site Cooperative, Mississippi-Alabama Sea Grant, Mississippi State University

WINDELL CUROLE, General Manager, South LaFourche Levee District

BRIAN LEZINA, Division Chief, Planning and Research, Louisiana Coastal Protection and Restoration Authority

DR. RICK LUETTICH, Alumni Distinguished Professor and Director, Institute of Marine Sciences and Center for Natural Hazards Resilience, University of North Carolina at Chapel Hill

CLIFFORD MUNGIER, CP, CMS, FASPRS, Senior Instructor, Department of Civil and Environmental Engineering, Louisiana State University; Chief of Geodesy, Louisiana Spatial Reference Center, Center for GeoInformatics

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

8:32 a.m.

CHAIR SAADE: Okay, we'll start the meeting. Thanks, everyone. Thanks again for the local participation and the audience. As always, please make sure you sign in and to drop off your badges when you leave.

Welcome back to the HSRP Meeting, Day 3. We had a great first day and a second day of speakers and discussion. I look forward to the speakers today. We'll do a quick recap of yesterday from the members. Please note the topics, FE.

As we won't have time to do audience introductions, during the breaks, at each break I'd like to ask you to introduce yourselves to someone that you don't know. So with that, Captain Kretovic, could you take the lead?

CAPT KRETOVIC: Thanks, Ed. Welcome back to Day 3, everybody. Today we start off with Mr. Galen Scott from NGS, discussing the National Spatial Reference System, NSRS,

Addressing Subsidence Through Time-Dependent Positioning and Intraframe Velocity Modules. We have great panel addressing NOAA's existing and potential subsidence and sea level rise services for hydrographic services. Also just a reminder, if you have not already signed up to make a comment or signed into the meeting, the sign-in sheets for both are coming around.

Again, there are three emergency exits on that wall, and in the event of emergency we will muster out in front of the hotel on the street if we have to evacuate. The bathrooms are also outside of these doors right across the hall.

CHAIR SAADE: Julie Thomas and Captain Kretovic, will you please lead us off with your comments from yesterday? We'll do a recap around the room as we did yesterday from the members, and what resonated with you. This is largely to capture the recommendations and take advantage of everybody having an evening to think about it. So please go ahead.

CAPT KRETOVIC: Sure. I was really impressed with the partnership in unmanned systems for hydrographic surveying. Everyone gave a great presentation and there was a lot of really robust discussion.

VICE CHAIR THOMAS: There we go. One comment is that these unmanned systems, since we do so much surveying offshore, bathymetric and then topographic lidar right along the beach, and jet skis using push dollies with GPS sonar on them, I'm always looking for these unmanned systems or some way to serve through the -- to survey through the surf zone.

So it was interesting because the technology still hasn't come up with a way to actually bring -- I mean we do do it by jet skis. But that surf zone for us in Southern California is so dynamic. It really drives the shoreline erosion and our bars offshore. So it was interesting. I mean I loved the effects of using the drones because that of course saves us getting an airplane to do some of the areas that

we're doing, and we've already started using drones also.

But I'm always looking for that magic way to survey through the surf zone. Okay, thanks.

MEMBER THOMPSON: And just to follow up on that, the -- Tom's vehicles, I think, just exciting to see what we can -- the future holds with that. But also yesterday, there was discussion about some of the limitations because of current rules and regulations.

So hopefully we can work with other federal agencies to allow the full extent of use of that technology safely in the environment.

MEMBER KINNER: I'll just echo what Gary just said. I think by the time that the IMO, or not -- well yeah, the IMO and other organizations get organized around these unmanned vessels. First of all, the technology seems to be growing, and I see things happening with the actual machines that I wouldn't have imagined.

There's so many different kinds of

unmanned vessels now out there, and it gives us so many opportunities, except for the fact that we've got all these COLREGS to deal with. I'm hoping that they don't get too far ahead of the legal stuff before we get, I don't know, to the point where we've eliminated their usefulness. I don't even know how you approach the IMO on all this stuff.

MEMBER HALL: Just to that point, the IMO is struggling with that, especially with the COLREGS. So I know that that's something that they're addressing. So I've been on the committee for -- the Panel for four years, and I'm always amazed that every time we have a meeting there is some new advance, and it's --

And I knew so little when I first started apparently, and I'm still probably only about a teaspoon's depth of the ocean of any kind of knowledge on what NOAA and the actual technology side. But yesterday, I mean seeing what those drones can do and the pictures that they deliver and getting that information was

really amazing.

So the guy from Texas A&M, that was a really great presentation and some neat products from what they've been able to do.

MEMBER KELLY: Good morning, Ed Kelly, New York/New Jersey. I had a couple of kind of impressive things to me. One was the potential for the autonomous operation, and it brought to mind be careful what you ask for, you just might get it. That is going to give us an opportunity, at a very reduced and efficient cost, to generate enormous amounts of data.

The question now becomes what are we going to do with that data, how is it formatted, and how can we maximize the use of all the different public and private enterprises that are going to be generating all this data? How can we best, in a safe, secure, et cetera way, pull that data together to create the necessary products that we have to have to move forward?

That tied me into you know again, I'm all about economics. That's my business. I'm in

the commercial maritime business. We're here to make money, you know. So that being the case, as the vessels and the scale of the operations increasingly get bigger, most regrettably, most of the channels and the land bases don't change. We have to find more, better ways to operate within those zones.

And that data, leading toward the concept of precision navigation really means that we need to be able to find the best and the safest way to operate in constrained spaces, to maximize economic impact. I think, you know, there's a lot to be done there with what data do we get and how do we get that data formulated, sifted down to the most relevant portions of the data that can be used by end users?

Not scientists, not researchers, but actual practical operators, so that they can actually operate these vessels, these different channels, all these different things that lead to our blue economy. I think that was kind of what was hitting me. We're going to generate all this

data; how do we best use it for the best purpose?

MEMBER DUFFY: So good morning. You've made it through three days of New Orleans, and that means you're the strongest of the strong, right? So teamwork. I guess there's a lot of, and before this meeting there's been a lot of discussion this year on the historic water levels that we've faced, and it raises a lot of challenges.

When I hear Julie speak of surveying on jet skis, I mean the channel is so different here and it really stresses the survey capability. I will say that a lot of times, it's easy to say that, you know, we know multibeam is the way to go, but how to apply it here is a real challenge.

I know that because I've spoken to the team members who really know that a whole lot better than I do. As we get down to brass tacks on it, the good thing is there is teamwork going on with NOAA and the Corps and the private industry, working on solutions that will

hopefully move forward in the future as we go forward to help with surveying Southwest Pass.

But in an area where you have 30 miles of river that need to be dredged in high water, and there's a 24-hour change where you can see over five feet of sediment in 24 hours. So the survey that you started with doesn't look that way when it's delivered is a real challenge. That's one of the problems. It's not as simple as it might sound.

Yeah, I'm happy to be here talking to the people who will shape that future, and look forward to the new technologies. But that panel really was helpful, and I will be reaching out to some of those folks and hopefully we can help move that forward to bring back a real solution. Thank you.

MEMBER McINTYRE: What I took away from that panel was the importance of having academic partnerships, and it's just really important. There's a lot of technology, everything's changing and it's really good to see

kind of the government, industry, the people that are doing the work and the universities alongside with everything.

MEMBER MAUNE: I enjoyed the technology panel also, and it's pretty much been said. I agree with everybody. I've been so impressed by the differences of New Orleans with other ports we've been to. The first HSRP I went to was in Long Beach/Los Angeles, and their problems were just 100 percent different from the problems here.

When we drove through the port yesterday to see those miles of containers sitting out there, and you wonder might some of those containers have been there for years? The guy assured me, they're there for seven days, maybe some of them 14 days but that's the max.

So they have to have an extremely efficient port to pull that off, and I found that very impressive.

MEMBER CHOPRA: Good morning. I thought yesterday was very informative. I think

it showed us the capabilities for the autonomous vehicles especially adapted to hydrography. On capacity, I think we're building on it as more research goes. I really appreciate NOAA's leadership in that space and its support.

Echoing other comments that, you know, the academic partnership and educational support, taking that to the next level so that it becomes the mainstay for hydrography for us. Thank you.

MEMBER PAGE: Hi. Ed Page from Marine Exchange of Alaska. I'm very impressed with NOAA being so progressive and leaning forward with respect to taking advantage of the emerging technologies, the force multiplier to get the increasingly daunting workload they have ahead of them, make some progress in it.

So my historical thought of NOAA is going along these ships and slowly surveying the bottom, and now they're just stepping on an accelerator pedal going up to max speed. I know there's a lot of concerns about IMO and the Coast Guard approving these operations or unmanned

vessels, if you will. I started my maritime career about 51 years ago now, when I first entered the Coast Guard and spent 30 years with the Coast Guard. But my whole life had been avoiding flotsam and jetsam, not jetsam obviously, flotsam all over the water.

So there's fish nets, there's logs, there's coastal aids to navigation sometimes when you get off station you have to avoid. There's vessels, unmarked vessels. There's all kinds of flotsam out there, and if we have sensors that actually have lights on them and AIS transmitters on them, they're much more visible than all the other things you have to avoid.

So you still have to look out the window and keep your radar on, et cetera. So I'm not -- I don't think that's a very daunting challenge to get these vessels that don't have, you know, not staffed with people to be operating. In fact, they're out there right now as well know. We saw a lot of things and Saildrones, what have you. They're playing

around out on the ocean.

So I think that's not going to be a heavy lift at all. I think that technology could help us. In fact right now, a lot of the fish nets, which I get caught in my scoop periodically because they're not marked very well, a lot of the fish nets are having AIS transponders on them so you can find them. That's an issue the Coast Guard's wrestling with right now.

So you don't just -- the only way you find a fish net is when your engine slows down, you're wrapped up in a net. Now you know where the nets are with the buoys. That's very prevalent throughout the world. If you look on AIS screen, you see these things all over the world now, fish net buoys.

So again, technology's there. It will solve that problem also as far as these vessels not being, having persons on them. Thank you.

MEMBER RASSELLO: Hi, good morning. Sal Rassello, Carnival Cruise Line Miami. The past years, I have seen we are keeping talking

about technology and data collecting. In my small world, in my small work environment, I have used a lot of data you're producing.

What I've seen that nowadays when I do my planning, I can navigate over two, three feet of water with a large vessel, and that is doable due to the fact that I have the data and I know how to find the data.

Therefore, I think we should continue doing surveys. We see how the environment changes due to, you know, hurricane and flooding and inundations. I think that's the right way to do it. I see the future that we will be manned vessel from shore. That's not very far, so but that is based again on how much and how much data the operator can use, and how precise is the data.

So the safety margins are very limited nowadays, as I see two-three feet of water is very challenging situation, and channels are not very wide now. The ships are getting bigger, and that's my main challenge during my small work

environment. That's all I have to say. Thank you very much.

MR. EDWING: Morning, Rich Edwing with CO-OPS. So I really enjoyed the autonomous vehicles panel yesterday. My program doesn't have a lot of application for that technology. We like our observing systems to stay put right where they established them, but that's just --

CHAIR SAADE: They're already autonomous.

MR. EDWING: Yeah, right.

(Laughter.)

MR. EDWING: But clearly that technology is the future, as was said several times. And I will point out right now there are gliders, underwater gliders that were launched by IOOS, by the Navy and perhaps other entities out there doing temperature profiles and other observations, to help people understand what's going to be happening with Dorian.

And that's, you know that's, can't have a more important application than that I

think. So anyways, I really don't have much more to add than other people have said about the partnerships and the future for the -- for that panel, so thank you.

MEMBER HARGRAVE: Good morning. Deanne Hargrave with Shell. So yesterday technology, that's my area of passion and it was a great, great panel. I loved to hear what NOAA's doing, also what academia is doing and I'm most familiar with what industry is doing.

When I -- the first, the first sonar I was working with, I was looking at paper records. So you know, 20 years ago it was paper records. Ten years ago it was the big analog to digital change. Now we're looking at unmanned vehicles and we're looking at a plethora of options, what they can do.

It's like it's a technology explosion, and I think that I'm completely impressed that NOAA is using already a lot of these technologies, because that takes a lot of investment and these things are changing so fast.

It's like, you know, it's like buying your iPhone. You don't want to buy Version Number 1, because you know that in six months it's going to change and that there's a huge learning curve.

So I did appreciate the comment that I heard yesterday about don't -- buy one. Learn how to do the whole process, figure out all the problems, the details of how to actually manage that, and then make a bigger investment. I think that was really valuable.

MS. BLACKWELL: Good morning, Juliana Blackwell of NGS. I had two takeaways from yesterday, again following on what others have said about the unmanned systems. For me, it was the importance of working together within NOAA, within our offices and other offices within NOAA that are all important in making sure that we are doing unmanned systems safely, securely and efficiently, and continuing to work with the emerging technologies because things are going to continue to change.

But it's taking, you know, it is a

team effort to make sure that we are doing this well and coordinating with each other internally, as well as with our partners who are doing exciting things from their respective organizations. So hearing from the partners yesterday on that I think was also very engaging.

The second takeaway I had was related to the tour that we had of the City of New Orleans, and for me I look at things more so from the land side, as you all have heard me say over and over again. But you know, while we're talking about commerce on the water, the fact is we're building the shoreside infrastructure to support that. In this challenging area and we'll hear more about today with subsidence and sea level rise panel that's coming up here shortly, is I heard we're going to build another container facility.

I'm thinking where, first of all, and how high? So those are the kinds of things that were going through my mind is okay, I can see the need for it, but I'm really interested in trying

to understand who all's working on making sure that when that does get built it's sustainable and it connects to the other areas where the cargo is going to have to be transported to.

So I think that was really eye-opening, to be able to visualize that yesterday and appreciate the tour and all the interactions that we had last evening. Thank you.

CHAIR SAADE: Okay, thanks, everyone. I just want to say those are great points. It's really energizing and great to see everyone's thinking about all this and getting stimulated by it all. The comment about how remarkable all the ports are, how different the ports are. You know, it all leads to the adaptability of NOAA, because NOAA's the common element certainly for us.

But NOAA's the common element in being able to do it right in Long Beach and do it right here and do it right in Juneau, and that's a lot of credit to the whole NOAA organization I think, and Sal's comments about trusting the data? I

mean that's what it's really all about. His captains trust the data.

I can tell you as a contractor, NOAA's really, really demanding on the accuracy, improving the accuracy of it and it pays off, you know. The reason that Sal's captains trust the data wherever they go, certainly in the United States in the areas that NOAA has control of is because of these rigorous requirements.

And then the other aspect of it is visualization, and that goes back to the whole discussion in my mind relative to what you said, Ed, in terms of the tremendous amount of data, and the end users being -- it doesn't have to be an engineer or a hydrographer or a geophysicist or whatever. It can be -- anybody can look at that data and understand where the dangers are, what's good, what needs to be done.

Those are really important points, and again it's all because of the demands everybody puts on themselves. The other thing was talking about the private industry/academia/government

partnerships. I agree. That's the key to all this.

It was really nice to see the diversity of that panel yesterday, all these different organizations with different backgrounds sharing ideas, really pushing this technology forward, and then having the insight of Thomas Chance.

Let's face it, it was great, which allows me to say multibeam, multibeam, multibeam. So he said it best, but that was the best part of it. I think I had one another point. Anyway, that's enough talking I guess for now. But again, it's really nice to see that we can stimulate these ideas, and I'm hoping that the public and the other folks that were listening in get energized by all this as well.

Okay. So we are a little bit early. Just one second. Okay, Julie.

VICE CHAIR THOMAS: Maybe I'll take a minute just to -- I want to wrap up just a couple of things. Our prioritization list I feel is in

really good shape. Rich, we kind of died on the last bullet in the prioritization and it really has to do with the Ocean Forecast System, and I wrote a description which I pulled from the Web. But I don't really know the status of that, and then one more comment on there, would it be appropriate.

I guess this is really Rich and Juliana. No, it's Rich and OCS, I think, because you're the ones that are actually rolling it out to the NWS offices. Who's -- I'm a little confused about OFS. It's done in CO-OPS, right? Could you just give us a brief survey of that one?

MR. EDWING: Sure. So CO-OPS is I'll say the operators of the operational forecast system models, hydrodynamic models, which are forecasting most of the same observations that we provide in real-time, you know, water levels, currents, air temperature, water temperature, things of -- salinity, things of that nature.

VICE CHAIR THOMAS: Right.

MR. EDWING: They're developed in a number of places. Coast Survey Development Lab develops most of our models but not all. For example, the Great Lakes Environmental Research Laboratory develops the models that we operate up in the Great Lakes. There's also an IOOS role through the COMT, which is a modeling testbed. You're aware of that, I think, Julie.

But the models themselves actually operate at the high performance computers in College Park at the National Centers for Environmental Prediction. We have a partnership, if you will, with the Weather Service where, as the different developers develop their models and make the transitions to the high performance computers that are, you know, take advantage of the computing power and the robust, you know, availability, operational infrastructure.

It's there to ensure the data's always there, and then that output comes to CO-OPS, you know, to then put out the products, if you will.

VICE CHAIR THOMAS: Okay. So are they

never -- how does that interface with the local NWS offices?

MR. EDWING: Well, they are users of the models. They look at the output.

(Simultaneous speaking.)

VICE CHAIR THOMAS: Right, okay.

MR. EDWING: So but there's not really a direct I'll say link to them --

VICE CHAIR THOMAS: There's not a direct, okay.

MR. EDWING: -- as part of our process, you know.

VICE CHAIR THOMAS: So I guess the question is how do we want to handle this on the priority matrix? Is this something that we should have on there that folks are interested in and --

MEMBER HALL: It was something that somebody was interested at some point.

VICE CHAIR THOMAS: Right, right.

MEMBER HALL: So I don't recall exactly who it was. So if nobody in here, and we haven't

figured out if Lindsay Gee wants it, then I'm not sure it needs to -- it was something that like it popped up when we did the very first priority matrix, that somebody put it into the Survey Monkey survey that they did, and I don't know who it was.

VICE CHAIR THOMAS: It actually could have been me, because I remember that Shep brought it up at the Miami meeting and I said oh, I want to hear more about that or learn more about it, and it probably made it into the matrix. So --

MR. EDWING: So a suggestion might be we could put on a webinar and kind of do an overview of the whole modeling program for -- you know for everyone, and then you can kind of take that in and see what you'd like, you know, where you'd like to go next. You know, we're still building it out around the country. We don't have model coverage everywhere. We actually just formalized our --

We've had kind of a five-year plan, an

informal five year plan for a number of years. But we just kind of made it formal, being signed by the different directors, and it's kind of almost a public-facing document which we can share that as well, you know, kind of where we're going next with the modeling program.

VICE CHAIR THOMAS: So Dave, maybe on one of our Planning and Engagement calls, we could plan to have a webinar talking about the modeling and OFS. Would that be appropriate? And then we could kind of table it until San Francisco if we want -- what we want to do in San Francisco, if we want to have a 20-minute briefing, half an hour update on it or what we want to do with it there.

MR. EDWING: Yeah, and certainly I know one thing that you guys could help us with. It's a new capability and well, like I said, some places we don't have any capability and we're kind of building it out in others. We do everything we can to make people aware and educate them, but I think there's a lot of places

where people aren't even aware that the model's there --

VICE CHAIR THOMAS: Right. So the outreach --

MR. EDWING: I think the outreach and engagement, and kind of just how to make people aware that it's there and start building that confidence in the forecast data, the way that people have, you know, confidence in the real-time data and other things we do right now would be helpful.

VICE CHAIR THOMAS: Okay. So why don't I leave it on our priority list. Well I'll put -- under Status, I'll put webinar to be planned for future P&E call, and we can arrange that. Then I'll put San Francisco down as a possible place to dig into it a little bit deeper, because it might be more mature by that time?

MR. EDWING: Yeah, and that's a good place because we do have a model there.

VICE CHAIR THOMAS: Right.

MR. EDWING: And I think that's one that's kind of coming up for a refresh, a modernization. But yeah, that'd be a good place.

VICE CHAIR THOMAS: Okay. So I think that finishes -- so I'll go ahead and make those notes to the priority matrix, and then try to mail that out within the next couple of hours, or maybe I'll do it over lunchtime.

Then if you on the panel could just look at the matrix and see if there's anything that I didn't capture correctly or stands out, because that way we can kind of sign off on it to include it with the letter to the Administrator, okay. That was one thing to wrap up that.

I have been feeling -- I updated the letter to the Administrator. Yeah, yeah?

MEMBER KELLY: So just, I think, to call it a list of priorities, we have to actually prioritize it. I think it might be a list of topics of interest or, you know, to say it's a prioritization list means it should be numbered 1-2-3-4, not just all of this stuff.

VICE CHAIR THOMAS: Do you know what's funny? I took the numbering out last night. I took that whole column out.

MEMBER KELLY: So I think we just have to be careful what we call it, and/or it's a valid discussion to prioritize, maybe knock down to the top one or two anyway, the one or two and the others to be of continued interest. But we have a fairly ambitious agenda for something that's not really prioritized, and internally we as a Panel should have some feeling as to what the one or two most important of these several items are.

So I think we still need to change the title and/or have a continued discussion as far as, you know, what is our priority.

VICE CHAIR THOMAS: All right. We can go either way. I'm happy to change the title. Right now as you know, it's divided -- there's two topics on there for Hawaii. There will be two for San Francisco. There's a few ongoing.

There's a few issue papers and then

the archive that we set up on Ken's suggestion, which was good. So what -- do you have a feeling on that? Should we change the title or do you want to number them?

CHAIR SAADE: Before I forget what was on my mind, relative to the ASV we've agreed we're going to look at it again in San Francisco, because of the local capabilities, right?

VICE CHAIR THOMAS: Oh, with Saildrone and ASV.

CHAIR SAADE: Right. So one of the things I'd like to add to that list was -- I wanted to mention relative to Sean's needs is challenging whoever's developing ASVs to get near real-time data collection processing and to the end user, because it's obvious that it's really critical and it's a trend that's going on in the offshore industry anyway.

I think we need to challenge the ASV developers on that, because there's such a need in places like the Mississippi River.

MEMBER DUFFY: Thank you for that, Ed.

Mr. Chairman, I couldn't have said it any better, and on the title, I'll hit you with a little of my humor, but remember words are important.

MEMBER MAUNE: Could it be the HSRP Issues Matrix rather than Priorities Matrix?

VICE CHAIR THOMAS: Issue Matrix?

MEMBER MAUNE: Issues Matrix.

VICE CHAIR THOMAS: Okay, I will do that, and I will add that one in for San Francisco.

MEMBER KELLY: Yeah, Ed Kelly again. I hate to be a pest, but you know prioritization is something that we do need to look at, and I think we need a combination of prioritization based on where we're going to be that are relevant, localized specific issues. Like I hope we get Google in here, you know, in San Francisco to come visit us and talk about not necessarily shipping but the Internet of Things and AI and challenging issues. So that's very germane to the location, but there are other issues here that we ought to prioritize based on just because

it needs to be done.

So you know, I'm all about prioritization, trying to get stuff done not just talked about, and I don't want to create a list of things that we talk about but something that we can actually try to channel the Panel's interest and energy into a little bit to get some stuff done. But I know it's challenging. We all have real jobs and what-not but --

VICE CHAIR THOMAS: No, I think we actually --

MEMBER KELLY: We have a list. Let's use it. Let's make the list work.

VICE CHAIR THOMAS: We do. We based the panels on our New Orleans list, and I think we got them all. So I think that we are -- look. I mean I certainly look at Hawaii-San Francisco. When we're developing the agendas, we certainly look at those. But of course you're welcome to any feedback or additional. You can be on the planning committee, Ed. Better watch out.

MEMBER KELLY: Volunteers get what

they deserve.

VICE CHAIR THOMAS: I know, okay. All right. Well let me try to update that issues list a little bit over the lunch and then we'll send it back out so you can take a quick look at it or a longer look at it. You'll have a few days. But we do want to try to get it out with the Administrator, so I wanted to get it cleared up. Okay.

Thanks Rich on that, and I guess what I'll do also is send my updated letter to the Administrator, to Lynne and Virginia, and they can email it out to everyone, and if at the end of the day we have some time, I'd like to go through the bullets on that. I've been putting them right into the format of the letter to make sure that we capture everything that people feel is important. That's all I have to say on that.

As far as the issue papers, the sea level one, Audra and Mike are actually updating -- there were a couple of things that we wanted to get in there. Okay great, and Audra, maybe

you could send it to Virginia and Lynne. Okay.

So that one was -- that one should go out to the Panel, to the subcommittee on sea level. I mean you can send it to everybody. It's easier to just send it to everybody. But really it's those that were in that -- because we're going to meet again. When do we meet again, right after lunch in our -- to discuss the issue papers?

Right. Working group at one o'clock. So right after lunch, we'll get back into our working groups and thanks Audra and Mike for doing that. And then we'll get back into our working groups and see where we get with these. Everybody good with that? Any questions? Okay. That's all I have, Ed.

CHAIR SAADE: Okay, yeah. Anyone have any additional comments or topics they want to bring up? Go ahead, Ann.

MEMBER KINNER: This is something in my notes yesterday and particularly listening to the panel and noting how many people are in this

whole new world of unmanned, whether you call them autonomous or whatever, and what I wrote down was, distribution of effort across academic and commercial programs: does anybody coordinate? Is there any kind of you might call a central clearinghouse to know Company A is doing this, Company B is doing exactly the same thing, a little different coastline and allowing for the competitive issues? Is there some position that NOAA could take to become kind of a central coordination/distribution point for some of the basic research on some of these resources?

CHAIR SAADE: I can -- the few of us can probably answer that in different ways. I can use -- personally I can use University of New Hampshire's, the folks we deal with there that do exactly that. A lot of that is because people are more than willing to let them know what we're working on, whether you're a private company or you're another research outfit.

So that one kind of happens naturally. Dave, you probably have a lot of experience on

people in various research developments.

MEMBER MAUNE: You know, I think we need to allow the competitive marketplace to -- each guy's back there trying to develop a better mousetrap than his competitor, and they don't like to tell the other people what they're working on. I know that happened with lidar, that we had three or four major lidar developers and they were all doing things, keeping it secret.

I published a book one time in 2007 that said that you can only have one lidar pulse in the air at a time, and the day that book was being introduced, OP/TECH introduced multiple pulse in the air or maybe it was a different one. But these guys hide what they're doing to gain a competitive advantage over the others, and it does bring out the best of our industry by not having a central control.

They deliberately try not to share what they're working on, for fear that their competitors might gain an advantage from knowing

what the other guy's working on.

CHAIR SAADE: I mean that's a good point. That's exactly what we did on recent developments as well. But you have to do it to protect yourself and protect the IPs.

MEMBER KELLY: If the IOOS groups and the regional associations have helped in academia in particular, to let's say ameliorate that issue. It still hasn't gone completely away, but by working through IOOS, where money and funding is directed through the regional association instead of the direct competition for grants for institutions, I've seen over the past years a better cooperation among the academic groups.

I think that's also become a little bit of a clearinghouse because there's a little less proprietary information that goes on there. So I think that's helped, but it still hasn't solved that issue. Everybody wants to know what the neighbor is doing, and nobody wants your neighbor to know what you're doing, and that's you know, free enterprise. So I think there's

only so much we can do with that.

CHAIR SAADE: I was going to add relative to Hawaii, I was thinking that maybe Ann's interest in terms of the recreational vessel representative. We haven't really done much on that. Hawaii might be a great time to have a little bit of focus on that. I'll throw that in there.

MEMBER KINNER: Total agreement on that, because one of the things that I find is that the small boat fleet, which in my brain is anything up to 300 feet frankly because even the skippers on large yachts don't know of a lot of the resources that are out there. But particularly the smaller boats, oh what's the magic cut off, the 65 foot, 20 meter break, which is a lot of what I talked to all the time.

They have no clue about what we're doing, about what's available to them. I spend a lot of time introducing them, and one of the things I've thought about is maybe some, don't know if you want to call it a newsletter or what

to call it, but some way to get the word out to that level. There's something like ten million registered boats in the United States. God knows what there are worldwide.

But that's a lot of potential users of what we are talking about, that don't even know it exists. It's an outreach thing. It's an education and outreach thing and trying to figure out a way to push that out. You know, BoatUS can do some. I get Maritime Commons. I get little dribbles here and there that apply to my fleet.

But I don't, I'm not aware of any strong way to push this kind of information out. I was talking to, I think I was talking to Rich in March about the change to the tide tables, and my commercial fleet doesn't even know that's coming. How am I going to introduce them to the idea that they have to download those tide tables that the Coast Guard just tells them every year they need to have on board? Does the Coast Guard even know that the books aren't going to be printed like they've been printed for however

many years?

There's this gap of information between the big guys, which is a lot of what you guys are, and the little guys, which is mostly what I'm talking to.

MEMBER CHOPRA: Ed, can I make a comment on that? So in Houston-Galveston, we've seen this issue also, and the Lone Star Harbor Safety Committee has been very active in that. We've had NOAA reps on that committee. We also have the president of the associations both the fishing and the leisure craft on those committees, and there's a very good outreach program there.

So there is a mechanism which is there. Maybe we can just redirect to focus the existing Harbor Safety Committee mechanism for that outreach, rather than do an independent. Because that -- we've seen that to be very successful and working, that the Harbor Safety Committee mechanism works. Lone Star's a classic example.

MEMBER PAGE: If I could just add to that, I know through my time down in California, I used the Latitude 38 magazine, the Latitude, you know. I think there was the marine log down in your area or whatever.

But the magazines or the papers that the recreational boaters use, I used to post a lot of articles on search and rescue cases and lessons learned from marine casualties, real short articles, what we can learn from someone else's mistakes, but also any other changes as far as regulations or new procedures or tide tables, et cetera, new technologies.

I mean that's the form they use. When I was Captain of the Port, I used that when I wanted to talk to the recreational community. Down in LA I used that form or in San Francisco and Latitude 38 or down there in Marine Log, and then but also had a different form for the Professional Maritime and for Pacific Maritime magazine, when you're talking with the commercial industry.

So there's a whole suite of -- there's not one solution. There's a whole, you know, suite of options you have to use --

MEMBER KINNER: And I see all of them and I try to contribute to the Sea Magazine, Passagemaker, Cruising World, Cruising Outpost, you name it, and each one has its own little niche and that's part of the problem. The Passagemaker people don't talk to the Latitude 38 people. They're not even on the same planet frankly, and that's an issue.

There's -- what I'm trying to figure out is if there's some way, I don't want to call it a press release, but some way to push this out. It kind of goes back to the discussion we had at some point about AIS distributing safety information and ten million little boats out there and a lot of them don't have AIS.

So it's a nice idea, but it's not going to fly in certain fleets. I don't know whether -- because even BoatUS doesn't reach -- it doesn't even reach a significant number of the

people in that fleet, and whether it's Coast Guard Auxiliary, Power Squadron, whatever. But some way to reach out and begin to educate that level of floaters to the fact that this information is changing, that it's out there. Most of it's free.

I hate to tell you how many different weather sites I have on my phone and my computer, and I'm adept and I'm still finding new places. I'm tuned in to know where to look. A lot of these people don't even know that there is anything for them to go look for. I don't know how you get beyond that. I don't know if it's a PR thing or what it is.

But it's definitely an educational push, and I wish I could figure out an easy way to do it. We're dealing with the same thing frankly in some of our Harbor Safety Committee issues. How do you get the information out to the people who need to know?

CHAIR SAADE: Rick. Do you need to get a microphone?

CAPT BRENNAN: I think you're absolutely correct, and I think as we know, the pyramid of maritime users has a base of, you know, recreational users. I think the precision navigation project, even though I think we talk about that it's focused on low under keel clearance and commercial navigation, I think the intent is, is that that is made available across the board, and it's packaging everything that we NOAA do in an easily consumable way.

I think that when we talk about those users, I think the amazing thing is is 20 years ago, you know, you would go out and I remember going on a friend's boat and him pulling out a 1960's paper chart that he had stuffed under the seat of his sailboat and complained about how this particular wreck wasn't on the chart and, you know.

So you're like well sure. Maybe you should get a new chart, you know, because it's 2000 now. So but I think today when you go out, I mean even a jet skier has their iPhone in front

of them with some sort of navigational app up, and those apps in my mind are the way to that community, right, because everybody has an iPhone and we can debate the efficacy of it.

But that has been a huge advance for, you know, having people navigate in a way and getting them information in a way. I think that is the grand hope for precision navigation as a program, is that it democratizes the delivery of that data and harmonizes it in a way that it can be consumed by as many people as possible, and particularly these app developers.

So a lot of the time that we're spending in doing this development is really about making sure that it is absolutely readily consumable by a whole host of these developers. So not just portable pilot unit manufacturers, not just ECDIS producers but, you know, the base, the most base level of people.

I think those app developers that all these folks are using, and there's a whole plethora of them, I think that's a unique place

where we have an opportunity to penetrate that recreation market and the floaters as you put it. So anyway, so I just had to say that. Thank you for letting me --

MEMBER KINNER: And that makes perfect sense, and it occurs to me that if we had an opportunity at some point to bring in, for instance, somebody from Sea Map, somebody from Navionics, somebody from Nobletech, somebody from Raymarine, somebody from whoever, that are developing the hardware too, because these plotter systems pull in a lot of the so-called free information.

The users have them, I've got it on my phone. That might be a way if we could bring them into a situation like this and talk to them about what do they need in order to be able to push this kind of information out, because I think everybody I talked to these days has some sort of electronic chart system.

CAPT BRENNAN: No, absolutely, and I think the HSRP that we had in Seattle, we did

have a couple of those vendors there. I know Rose Point was there and the one refrain that we've heard from them over and over again is great, we love that idea. We need it everywhere. We need it reliably and we need it delivered in a way that we can consume.

So that again has been the thing that has been informing the whole precision navigation, you know, initiative that we have is how do we get it? So that's the thing. We don't have operational forecast systems everywhere. We're working on that, but it's really about trying to get the data that we do have everywhere.

Just for example, I mean Rose Point was paying to take, you know, the Weather Service grid models, convert them into something that they could transmit and deliver just so they could share wind fields. So it was this, you know, this guy who was on his motor trawler created a software package that would do that conversion just to show it.

So it was a matter of us going the 99 miles, but that one last mile, you know, that we needed to deliver it so that that data was consumable by the small guy, was not getting done. So I think that's the thing that we're trying to bridge that gap right now, is that one last mile that you've got to go to make sure that it's there.

So we've got it out in all sorts of other ways, but anyways.

CHAIR SAADE: Thanks, Rick.

VICE CHAIR THOMAS: Okay, all right. I have to just say for CDIP at Scripps, we get 250,000 hits a day from surfers and it's amazing how many coastal planners, military, small boaters are actually interested in the waves in Southern California.

So we found -- our big thing has been to get out the word to boaters that we have buoys, because our buoys are not as big as the NDBC three-meter discus buoys, where a meter across and round and low to the water, but they

give this high resolution wave data.

And so you know, we've started on our website actually posting things, but we have an app and I was telling Ann this. I went to Silver Gate Yacht Club two weeks ago. I loaded apps on every one of their phones because a lot of them were non-familiar, they weren't familiar with how to get an app, how to save it to your home page, right, or whatever.

And but I went around for like 40 people and I loaded these apps onto their phone. So there is this whole thing, Ann, and I know in San Diego. I mean I think we have a few ways in San Diego to get out to the small boater and the small user.

MEMBER KINNER: It's the rest of them.

VICE CHAIR THOMAS: It's the rest of them, I know. But you're not going to get everybody. But we do, you know, I've walked the docks. I hand out flyers. I go to the fishing associations, I go to the yacht clubs. We have lists, and of course through the Marine Exchange

at Southern California, Kip has a list a mile long of recreational boaters, because they're part of the Harbor Safety Committee meeting there.

So then that way we get all of the Channel Islands boats, and I've sent things out. He's very generous with that list, and so he's actually emailed things out.

MEMBER KINNER: It's a big issue.

VICE CHAIR THOMAS: It is. It's a big issue.

MEMBER KINNER: It's a very big ocean, because I'm talking to people from all over the world literally, and if there is some way to pull in the software people. The other note I made was techies versus mariners, because frankly some of the people who develop the software have no clue what the environment is like when you're out on a boat that's moving in three dimensions at once, and getting them to understand that you need to be able to dim the screen at night, which literally came up.

If we could get directly into, whether it's Rose Point or Nobletech or whoever, and bring them in. Because I've had this discussion with the Nobletech people. The question of how do you dim the screen came up. Why would you want to dim the screen? Well most of us understand that. The techie knew how to play the game on his computer, but he didn't know the circumstances under which we were going to use his product.

I see an awful lot of that in the technology world. So bringing them into the picture in more than a, hey, this is here for you way, but letting them understand what we are looking for. When I turn the key and take my boat out of the slip, I need to know that the toys are going to work, and the toys are going to give me the information I need, and that I can make the screen do what I need it to do.

I'm afraid a lot of them don't, and I don't know -- other than bringing them into the forum, I don't know how else you make sure that

as they're developing new technologies, as they're implementing new information, whether it's G Captain or -- not G Captain, what's the other one, ActiveCaptain, all these other things that are out there.

It's nice but how do we use it and how do -- they need to understand how we use it. Other than having them sit down in a session like I did one day and have somebody ask the question how do you dim the screen, they're not going to get those -- they're not going to understand what our absolute needs are.

So I'd love to see them brought into more direct contact with what is available.

CHAIR SAADE: Okay, thanks. We've got just a couple of minutes before we move onto the next segment of the program. Is there anything else to talk about?

However, I do think -- I was just sitting here thinking we might want to have a recreational users session in Hawaii, because I agree with Julie. The amount of interest and

focus that the surfing community has in California really drives a lot of what goes on for coastal applications.

VICE CHAIR THOMAS: We're getting pushback from Lynne for Hawaii.

CHAIR SAADE: Lynne doesn't understand. We're going to be there for two weeks.

(Laughter.)

MEMBER DUFFY: That sounded like a field trip you were speaking of, Mr. Chairman.

CHAIR SAADE: We're just brainstorming.

VICE CHAIR THOMAS: We're going to announce the dates of the following meeting so everybody has them in their pockets, including the two weeks in Hawaii.

MS. MERSFELDER-LEWIS: Right. There's going to be an extended HSRP meeting for a lot of extra sessions. The dates that seems best for everybody were the week of April 27th for Oahu, and the week of September 21st for San Francisco. So we'll reconfirm those and I'll put that all in

writing for you guys, but please save the date.

We have such a long list of topics for Oahu. We will take everything under consideration, but I'm telling you you have about a third more than what you could possibly fit on the agenda and have time for discussion.

So just FYI on that, and I hope we'll have some time this afternoon to talk about that or this morning or whenever that's going to be this afternoon. We can talk about what we've already -- the team that's met, some of the stuff we've already talked about, the new ideas we have here and for San Francisco too. We can just run through those.

CHAIR SAADE: Okay, thanks, Lynne. Can we go ahead and have Galen get set up?

MEMBER MAUNE: Lynne, has a venue been established for Hawaii?

MS. MERSFELDER-LEWIS: We can't even contract it until October.

MEMBER MAUNE: We can't even contract until October. Okay. Lynne, being the

mathematician that I am, when you say we have one-third more material than we can cover in three days, that to me sounds like you need a four-day HSRP.

CHAIR SAADE: Okay. We're all set for the next segment with Galen Scott. He's program analyst with Geosciences Research Division of NGS and NOS. Take it way, Galen.

MR. SCOTT: Thank you.

CHAIR SAADE: Thank you.

MR. SCOTT: Good morning, everybody. I'm Galen Scott. I'm currently the NGS acting constituent resource manager, which means I'm supposed to be talking to stakeholders and bringing information back to NGS to help us make decisions about how we move forward.

I also happen to be the co-chair of the NOAA Sentinel Site Program, which is all about taking NOAA products and services and delivering them on the ground to people to help make decisions about responding to sea level rise. So I'm very pleased to be here to kind of

set the stage for the next upcoming panel that's going to have a really interesting discussion.

So the topic that I'm talking about here is the National Spatial Reference System modernization, which is going to set the stage for helping to deal with places that are moving. So I've got a terrible subtitle here addressing subsidence through time-dependent positioning and intraframe velocity models. However, really what that means is the Earth is moving, so where are we now?

The National Spatial Reference System is the system that has latitude, longitude, elevation, gravity, shoreline and particularly their changes over time. National Geodetic Survey's mission is to define the National Spatial Reference System and to maintain it and to provide access to it. Currently, this consists of two datums, the North American Datum of 1983, NAD 83 and the North American Vertical Datum of 1988 or NAVD 88.

This is the underpinning of all

geospatial data. It helps you align different data layers and currently -- well, first of all, I'm going to be speaking to the elevation portion of the NSRS because that's really about which way water flows, which is what we're all concerned about. Currently that system, the NAVD 88 is referenced through what we call passive controls, or those little benchmarks in the ground that is where surveyors start their work.

In the future, we are going to be going to active control, meaning continuously operating GPS stations. So when we move to the new datums, tomorrow's National Spatial Reference System is going to be active, and we're going to have, as Juliana mentioned the other day, four terrestrial reference frames that are based on the tectonic plates.

So I'm not going to go through all of those, but particularly what we're going to focus on is the fact that we're going to be creating, replacing NAVD 88 with the North American and Pacific Geopotential Datum or NAPGD 2022. The

idea here is that we're going to be able to account for how things move through time.

So just to kind of give you a sense of how the National Spatial Reference System works, it's the, as I said, the underpinning of all geospatial data layers. So if we want to talk about creating flood insurance rate maps, we start with something like airborne or mobile lidar data sets that's collected by one person at one time. We then need to connect that to a stream hydrograph that's collected probably in a different place by different people maybe at a different time.

Then we create the elevation certificates, which you know, are used to show where the particular places are. Put all of that information together to create the FIRMs. So if everything is consistently aligned, all those different data sources are consistently aligned, they'll work well together to show you where the water's going to go over the land.

So the current NSRS, the North

American Geodetic -- North American Vertical Datum of 1988, sorry for those folks in the back that may not be able to see those tiny little lines, but the lines on this map are the geodetic leveling networks that were created by roving bands of surveyors that literally walked across the country, east to west, north to south, bringing their families with them in tow and doing these observations, leapfrogging one observation after another all the way across the country and back over decades and decades, right. Seventy or 80 years of data that was collected by these roving bands of surveyors were all matched together, put together to create NAVD 88.

800,000 of those little benchmarks connected by 2.2 million kilometers of geodetic leveling, right. So that's what was used to create NAVD 88. It was the best technology at the time. Leveling is extremely precise, to the submillimeter level, but errors build up over time and over distances. And so now that's the elevation portion.

Imagine there's a whole other set of roving bands of surveyors that are building towers and taking angles and distances to create the horizontal component of the spatial reference system. So that's NAVD 88, and we realized here after Katrina that that wasn't really sufficient, to provide the level of survey control that was needed in a dynamic place, right?

Eighty years of leveling data put together in a place that's moving considerably year after year really didn't give us the kind of consistent and accurate information that we needed. So back in 2004 and for several years after that, we started working with Louisiana to create GPS surveys, to do GPS surveys that would get us more accurate positions now. Where is the land now, so that that could be referenced?

The problem is, is that that was -- we did it several different times, but that left some survey control marks in specific places, but it was not necessarily that accessible to the surveyors. They sometimes had to travel pretty

far to find the marks. We did these different surveys over time, didn't always hit the same marks.

So we had four different surveys, but only 55 of those surveys were tied in to all four surveys, to give us an idea of how things were changing over time. So we started to do this here because of the need of this dynamic place, and that really kind of pushed the idea that we needed to do this in general, because the Earth is a dynamic place and things are moving.

So are we modernizing the National Spatial Reference System? To better serve communities in regions experiencing land motion and uplift and subsidence, but also because we want to be consistent with the main driver, GNSS or Global Navigation Satellite Systems. That includes GPS we as well as GLONASS and the other satellite systems, the positioning systems up there that we can -- that we can use.

The big things here are access, accuracy and consistency, right? Access, GPS is

much faster, cheaper and more reliable than -- and it's getting better over time. GPS reduces our reliance on those -- on finding that passive control to start your surveys. The accuracy component here is that GPS is insensitive to that buildup of air as you walk across the country, and it's immune to benchmark stability issues, right.

You know, if we're observing it now, we're not relying on a mark that may have been observed last -- decades ago, and then consistency. This is eliminating some of the systematic errors that are in our current datums. We're aligning this to the international terrestrial reference frames, to the global frames and it integrated both the horizontal and the elevation components of the National Spatial Reference System.

So the NSRS modernization is going to have a whole lot of benefits, and in particular two centimeter heights pretty much anywhere. So in today's NSRS, the way that we work now and the

way that we have for the past several decades is that the height that we publish, that is the authoritative height, is held fixed until it's replaced by another set of observations.

So plotting those observations over time would look like this, right. You take an observation in 1990 and that's what we publish until it gets observed again and so on. Imagine in a place like this if you were using only -- we only had one observation here, right, and it was at 1990 height. But now we're in 2015, and we're still using that 1990 height. That can be a real problem. That's the danger of passive control, survey control that's there and only -- and is only good until the last time you observed it.

Moving forward, the modernized spatial reference system, we're going to have estimates of crustal motion from what we call the IFVM 2022 or the intra-frame velocity model of 2022. Not only do we have these GPS observations over time, we have error bars on them to give you a sense of the accuracy of them.

We also have a model that will project into the future, based on information that we have and based on those observations where we're going to be in the future. We're setting specific what we call reference epochs. These are epochs in time where all of these observations can be moved to so that everything is comparable within a specific timeframe.

So it provides that consistent time to compare surveys that are done at different times, right, and those are the red dots there. We can use the observations that we have, we can use our models, and then we can in 2020.0, this is where all of these -- this information is going to be referenced to.

As we move through time, if we don't have new observations, then the error estimates will grow larger. We'll stay we're pretty sure it's here, but we're this confident instead of that confident.

The intra-frame velocity model we're developing now. We've got several different

ideas of how it can be done. Right now we're taking our CORS, our Continuously Operating GPS Reference Stations and we are gridding those velocities and creating a velocity model that way. But we're also considering adding geophysical modeling to it and InSAR.

That's Intraferometric Synthetic Aperture Radar that can get you very small changes in elevations over time, putting that all together to give you a model of not only, you know, of how the crust is moving and where your positions are going to be at those specific reference epochs.

So we have a whole bunch of tools that are going to be going along with this modernization. We have web pages to get our information out there in machine-readable formats. Our online positioning users service is one of the core products that we have that allows you to process GPS data.

That's going to be -- created, expanded to include a lot of different survey

observations that you can adjust together, and then our transformation tools. You heard from Stephen White the other day about VDatum. We also have NCAT or the NGS Coordinate Conversion and Transformation Tool. These are tools that allow you to go back and forth between the old datums and the new datums and to tidal datums with new data.

So there's a lot of new tools that are coming with this, and we have a big citizen science crowdsource campaign to collect GPS data on those survey control benchmarks. It's called GPS on Benchmarks, so that we get the data that we need to create these transformation tools.

So there's a lot of new products that are going to be out there with the new reference system, and we really hope to make that an easier transition for folks, because there are a whole lot of benefits to be derived by moving to it.

That's it. That's my contact information, and I'm going to leave that up because this is a deep topic and if you want to

learn more you can.

(Applause.)

CHAIR SAADE: Great stuff, Galen. So, I get to start with the questions?

Great. So, the SAR measurement accuracy. When you talk about fairly accurate, how accurate is it? Plus or minus what?

MR. SCOTT: So, the accuracy of SAR, the absolute accuracy can really depend in terms of exactly where. But the power of SAR is measuring changes over time, right? You get repeat passes of the satellite and you can get millimeter scale changes, even sub-millimeter scale changes over time, depending on how much data you have.

CHAIR SAADE: So, over time is a year? Over time is a day?

MR. SCOTT: Over time is over years. It really depends on the number of satellite passes that you have. There's only a handful of SAR satellites up there and there's kinds of operate in different ways. So my understanding

is that there are monthly passes, that you can go from month to month.

CHAIR SAADE: So the way we're going to update going forward to '20 in the future, you're not going to be sending out these teams that walk the continent for a decade or two? It's all going to be satellite updates.

MR. SCOTT: No sir. We don't have the resources to do that anymore. Well, that's a really good point here, and that is we are creating the system here to be able to process this data and to align it all together. But the observations that are required to be submitted to us need to come from partners, from states, from other agencies.

You know, that's what OPUS is all about. You know, people collect GPS data and they submit it to us and use our tools to process it, and then we can publish it. We don't have these roving bands of surveyors anymore, so we need to rely on the data that's being given to us. And that's a really big issue. If folks are

not giving us new data, what we're publishing is what we got last.

CHAIR SAADE: Is that working? Do you need advocates for that?

MR. SCOTT: We definitely need advocates for that. That's part of the change here in the paradigm, is saying that we've got the system, but we need people to actively be participating, doing these observations, and submitting them to us.

CHAIR SAADE: Thanks. Any other questions?

MR. SCOTT: Juliana, if you want to respond to that, too.

VICE CHAIR THOMAS: Oh, yeah, go ahead.

MS. BLACKWELL: This is Juliana Blackwell. If I can just add on to what Galen said. You did a great job Galen, by the way, so thank you very much for that.

So, we are working with the National Society of Professional Surveyors. We meet with

them regularly. They are advocates for a lot of the campaigns that we're doing, a lot of the information, the tools, and using professional surveyors to give us feedback. We also have 14 Regional Geodetic Advisors who are reaching out to partners, current partners and new partners in all the states, and so we are represented that way, too. But we're certainly looking for other ways to reach out to other communities to get data, feedback, et cetera.

The other thing I want to mention briefly is regarding the SAR technology. This is a great thing that we're looking into doing. We're partnering with USGS and NASA to be able to utilize SAR technology to help us with those relative changes over time.

One of the key things that we need to do is be able to make the relative absolute by connecting that to the National Spatial Reference System through most likely our CORS network, and particularly our Foundation CORS. So, in other words, we can model and, you know, use that

technology in the future for relative changes and it will help us with the motions between the places in particular. But we need to be able to bring that down to earth, so to speak, and make sure that we are referencing that to geodetic -- highly accurate geodetic points, particular Foundation CORS and other CORS locations. Thank you.

MEMBER MAUNE: Ed, Dave Maune. That differential InSAR process which you used on Hampton Roads, Virginia to determine what its subsidence rate. And something interesting was it showed this one bridge, summer, fall, winter, spring, to see how the bridge expanded in the summer. You're talking millimeter level. But this technology is good for things other than just the millimeter level stuff.

We need to track subsidence in a lot of places in the country. I personally have seen many cases where lidar data sets did not fit together by two feet because of subsidence in the Florida panhandle and down near Palm Beach. Both

had subsidence rates in excess of two feet in Florida.

We know there's major subsidence in Louisiana and Houston, Texas -- your backyard, really. And then out in California there's a famous photograph of a place that's subsided. I don't know if it's 30 feet. It's however high that telephone pole was, but in 1926 it was at the top of the telephone pole and now it's -- by the 1970s it was at the bottom of the telephone pole.

So, some of these are very huge subsidence rates, and what they're doing is absolutely vital for keeping track of how things are changing.

CHAIR SAADE: Great. So, let's say there's an earthquake in California -- two months ago there was a 7.2 -- that you know things have moved significantly. How quickly are you able to go out and update that one, for instance?

MR. SCOTT: So, we can see that, because we have active control, because we have

GPS station that are running 24/7 and feeding that data back to our office, we can see that pretty quickly. Now, getting that information uploaded and into our tools and models takes a little bit more time. But because we have active control, we can really see things, how things are moving, pretty quickly.

CHAIR SAADE: Okay. That was really great. Thanks a lot and we're going to take a break now. Thanks, Galen.

(Applause.)

(Whereupon, the above-entitled matter went off the record at 9:47 a.m. and resumed at 10:03 a.m.)

CHAIR SAADE: Okay, everyone, we're going to get started. We're going to turn this session over to Julie and Audra Luscher. Sorry.

VICE CHAIR THOMAS: Thank you, Ed. Good morning and welcome, everyone. I am Julie Thomas. I'm co-chairing this session on sea level and subsidence along with Audra Luscher from NOAA CO-OPS.

As you know, these topics are key issues in our coastal states and territories. We are fortunate today to have a panel of subject matter experts, and we're looking forward to finding out what their unique perspectives are on this important topic.

Audra and I are going to split, a little bit, the introductions of the panelists, and it's over to you, Audra, and we'll get going.

MS. LUSCHER: First of all, I just want to thank the HSRP for allowing me to help with this session. This is a topic that has been a part of my career for 20 years, and it's been a pleasure to work with Julie and others on crafting some recommendations with the group and the energy around this issue.

I also just want to acknowledge, Larry, you know, he started this over a year ago, and Julie was gracious enough to take it over and continue the energy. But you know I thank Larry for his effort and just really enjoyed the time I had to spend with him on this issue.

So I'm going to turn to the introductions now. This is our second session. Just a little bit of a recap. You know, we started this in D.C. We had a number of panelists then and there was a lot of energy about continuing it on in a local area around Louisiana, and to dig in a little bit more around the subsidence issue.

We have Nicole LeBoeuf, our Acting Assistant Administrator. You know Nicole has this issue in her foresight and has a lot of energy and activity around that. I've been serving on a detail and it's been a privilege to help kind of think about this continually, both in the span of HSRP as well as within NOS. So I want to introduce her and thank her again for joining us. And then I'll pass it back to you.

VICE CHAIR THOMAS: All right. I think we're going to introduce as we present them, as we do the speakers. Why don't we do it that way? And we'll just jump right into Nicole's presentation.

MS. LeBOEUF: All right, good morning, everyone. As you may have heard on Tuesday, I've got roots here in Louisiana and it puts Louisiana top of mind for me at NOS when we talk about these issues. And, quite frankly, I wonder what the future holds for towns like Morgan City, Cut Off, Galliano, Grand Isle.

If you know a little bit about Louisiana's geography, you'll know that sort of roughly the order of those towns is giving you north to south, deeper into Cajun country, and further at risk from both episodic events like hurricanes and floods, but also chronic events like sea level rise and subsidence.

And as we watched Dorian largely miss Puerto Rico but set its sights on Florida, I am reminded that none of our coastlines will be immune to these events and we'll all need to adapt. As a leader of NOAA's coastal programs and services, I can say without a doubt, and Audra just alluded to this, providing information about coastal change so that others may adapt is

quickly becoming one of our top priorities.

More and more each day government, industry, and the public are looking to NOS as the authoritative, consistent, reliable source of geographic positioning, water level data, and much else. Fortunately, along with our Coastal Zone Management Programs, NOS provides core services, as you heard about today, from the National Geodetic Survey and the Center for Operational and Oceanographic Products and Services. These are all essential to understanding coastal change.

The programs that NOS has under the purview of this Panel are increasingly playing an important role in supporting coastal resilience. But our long-term investment and commitment to sustaining these observations allows us to do things that we would not have been able to had we just arrived on the scene.

So we are able to identify not just sea rise or sea levels, but sea level rise trends. And that provides inundation statistics

and assessments of the probability of extreme water levels, and this is all really essential to resilience.

Events like Hurricane Barry, right, a relatively moderate storm, modest storm, delivered over a seven-foot storm surge in some locations here in Louisiana, costing between $500 and $900 million in damage. And that was just a moderate storm.

And it doesn't even take a storm these days to cause damage and destroy lives on the coast. Today, what we call high tide flooding can happen on a calm sunny day, and these elevated water levels can disrupt coastal communities and crucial infrastructure like septic and storm water systems.

We are, at NOS, combining our scientific, technical, and our resource management expertise to deliver tools to coastal communities to help mitigate the impacts of the future that we're seeing, and also provide advisory services. For example, we just released

our High Tide Bulletin and our 2018 State of High Tide Flooding and 2019 Outlook report.

For many issues associated with coastal change, Louisiana is ground zero. We've heard a lot about that both directly and indirectly this week. And it is true that Louisianans have lived with the impacts that water brings for some time. They are deeply invested and expert in adapting to rising waters, I think as only Louisianans along the Mississippi can be.

But, despite this expertise, change here in Louisiana is going to be hard. That change is going to have to come from planners, the shipping industry, conservationists, pilots, government, and local communities all the way down LA-1. They're going to have some really tough choices to make.

I sincerely appreciate the HSRP's willingness to shift its focus at least to cover a panel in its second year on this, because these impacts are going to be pervasive not just here

in Louisiana but throughout our coasts.

I'm confident, with the HSRP's help and advice, we'll be able to bring value to our coastal communities here in Louisiana and elsewhere. And I look forward to hearing your input, not only on what NOS is doing well, but on what NOS can do to change its programs to improve our services for you. Louisiana's future matters and the rest of our coastal zones matter just as well.

With that in mind, before I conclude my introduction, I wanted to recognize that today marks the 14th anniversary of the landfall of Hurricane Katrina. This region continues to recover from the loss of life and the devastation from that historic storm. Ed Richards, senior law professor at LSU photographed poignant images of Katrina's aftermath. And as we recall the events of that day and the days that followed, I hope his photos will speak not only to the memories in our minds, but those in our hearts.

In honor of those lost and those whose

lives were forever changed by Katrina, please join me in 14 seconds of silence.

(Moment of silence.)

MS. LeBOEUF: Thank you. Thank you again for the opportunity to introduce this panel. I look forward to your presentations and our partnerships with you all as we continue to provide reliable and authoritative data and services so that our collective future is not just wetter but brighter as well. Thank you.

(Applause.)

VICE CHAIR THOMAS: Thanks, Nicole. It's great to have your passion and your support of this topic as we move forward.

Next I'd like to introduce Clifford Mungier. Clifford is with Louisiana State University and we're looking forward to hearing about your focus on geodesy. Thank you.

MR. MUNGIER: Thank you, ma'am. Good morning, everyone.

So, talking about some of the observations that have been done in Louisiana

with precise leveling, in the middle '70s Congress appropriated money for the channelization of the Red River, primarily in the state of Louisiana, to enhance commercial shipping traffic, primarily for barge traffic for transport of construction materials.

The Corps of Engineers gave money to the National Geodetic Survey to do precise leveling along the Red River down to what is the instep of Louisiana, and then they split up one leveling crew down the Mississippi River, the other one the Atchafalaya River to Morgan City. They looped around and then met up outside of New Orleans, went through metropolitan New Orleans, and closed in to Logtown, Mississippi, with a spur down to near the birdsfoot delta in Venice, Louisiana.

And after $1.5 million of Corps of Engineers money, they found that there was significant subsidence that had occurred in south Louisiana, realized primarily in New Orleans, where they had done their observations.

About around that time, in '78, the National Geodetic Survey changed the name from Sea Level Datum in 1929 to the National Geodetic Vertical Datum. For decades, my students have had difficulty remembering that, so I tell them just think "No Good Venereal Disease 29," and it's been burned in their minds ever since.

(Laughter.)

MR. MUNGIER: Well, it worked didn't it? You won't forget it either.

So, because there had been such a significant change in the values for elevations realized in New Orleans through that recent leveling, NGS decided to try doing a paper adjustment for the South Louisiana region.

Around the same time they had catastrophic floods due to rain in metropolitan New Orleans in '79 and '80, and FEMA contacted the Justice Department and complained about the amount of money that they were paying out in insurance. So, the local parishes -- Orleans, Jefferson, Plaquemines, and St. Bernard's --

along with every land surveyor and professional engineer in metro New Orleans, were co-named in a suit for $96 million. That got everyone's attention.

So, some of the parishes authorized and paid for densification of leveling networks in metropolitan New Orleans. In addition, the New Orleans District Corps of Engineers was concerned with the NGS free adjustment and the chief of engineering back then, Fred Chatry, decided that, to bring some order to everything, Fred said, from here on, or for the time being, subsidence is not authorized. And elevations were frozen by fiat.

The purpose of that was to cut out confusion with the construction in progress for the levee system. And after the levee construction was completed, then Fred Chatry then sat back and said, all right, now we can recognize subsidence, its effects. And eventually, in the early 2000s, the New Orleans District Corps of Engineers asked for permission

from the Office of the Chief of Engineers to then update everything to NAVD 88, which they did.

In '86-'88, because of those lawsuits, Jefferson Parish and St. Bernard's Parish established new benchmark systems. And it was 350 benchmarks in Jefferson Parish, 100 benchmarks in St. Bernard, as well as additional marks that were put in by NGS in Orleans Parish and Plaquemines Parish.

This is the type of instrument that the National Geodetic Survey used in metropolitan New Orleans. This is along the riverfront along Tchoupitoulas Avenue. And this is the type of instrument that was used in the local parishes by contracting registered land surveyors.

In addition to those first and second order densification surveys for leveling, I was at the University of New Orleans at the time and I had students doing relative gravity surveys of all the benchmarks in metropolitan New Orleans. And we observed about 450 benchmarks that are included in a relative gravity network.

Everything was bluebooked according to NGS specifications. NGS accepted the data and incorporated into the National Spatial Reference System.

The North American Vertical Datum was announced for 1988. They actually published data available starting in 1990, except for South Louisiana, because by then Louisiana, South Louisiana, was recognized to be a crustal motion area. Around the same time, with the U.S. Department of Defense allowing some things to become public, Dr. Faller at University of Colorado invented the absolute gravity meter, and one of these instruments was purchased by the National Geodetic Survey.

The instrument is good to plus or minus one microgal, which equates to about one centimeter change in the distance from the earth's surface to the center of mass. So it's quite capable of making absolute gravity measurements to detect subsidence.

So, the National Geodetic Survey came

through New Orleans at the University of New Orleans in '89 and returned again in '91, and the increase in absolute gravity showed that this one spot at the University of New Orleans was getting closer to the center of the earth by nine millimeters a year, which raised a few eyebrows.

In '91 was the fall of the Soviet Union, and with the fall of the Soviet Union some of the Air Force generals in the Soviet Union started turning the switches off at their missile silos for the intercontinental ballistic missiles. Because of that, then the need for a classified, top secret geoid or a gravity model of the earth was less critical than it had been.

National Geodetic Survey returned to New Orleans in '91-'92 and did field observations in support of the Orleans Parish GeoCadastre, which was federal money funding for a GIS system for Orleans Parish and Jefferson Parishes. And they tied to a couple of benchmarks in the metro area, J-92 at the Rigolets Bridge, what at the time was thought to be one of the most stable

areas in the area, and unfortunately it's not, as well as to Veterans Boulevard.

There was a '93 adjustment by NGS for subsidence zone elevations in metropolitan New Orleans, and that was the last visit of NGS to South Louisiana for the century. Because the prices of first order leveling at about $1,500 a mile for double-run first order leveling, Congress was less than enthusiastic about funding that. The GPS constellation continued to grow as more satellites were put into orbit successfully. And the security classification of the geoid, which at one time was Top Secret code word, was declassified.

The National Geodetic Survey returned again in '93 as well as '94, and continued observations of absolute gravity showed it to be continuing to increase at the steady rate of nine millimeters a year.

In '96, the Defense Mapping Agency awarded a million dollar contract to Ohio State University, for Professor Richard Rapp to

recompute the geoid using previously classified data held by the U.S. Department of Defense. What we were looking for: what was necessary to replace differential leveling, first order leveling at $1,500 a mile. Because to get current elevations in New Orleans, you start in Pensacola. You walk to New Orleans, and you keep on walking until you close out in Austin, Texas. And that's a lot of kilometers at 1,500 bucks a mile.

There was a different way of getting elevations, and that was with GPS. The problem with GPS is it give you heights. Heights aren't elevations. And the difference between height and elevation is on the diagram; the little H in green gives you the height of a point on the surface of the earth from GPS. It gives you the distance down to the ellipsoid, a smooth ellipsoid of revolution that is a mathematical guesstimate of the average shape of the whole earth.

But the shape of the earth in terms of

mean sea level is a mathematical model called the geoid, G-E-O-I-D. And the geoid is represented on the diagram by that wavy red line. That approximates mean sea level. The surface of the ocean as the mean of rise and fall of the tides, as well as what it might represent inside the continents.

And that distance from the green line to the red line, this capital N, that's the height of the geoid. That's what used to be classified. That's what used to be used for -- well, and still is -- used for targeting purposes of intercontinental ballistic missiles. That was declassified.

So when we get a little H from GPS observations and knowing what N is, courtesy of the National Geodetic Survey, we subtract from the other and we get capital H, which is elevation. And that is where elevations are coming from for the entire world, but most accurately in the United States of America courtesy of the National Geodetic Survey. And,

each year, the National Geodetic Survey incorporates more and more gravity observations through the air, through satellites, and through ground observations to enhance the quality and knowledge of the situation or the knowledge of the geoid in the United States, as well as its territories and possessions.

So when the world geoid was published by the Department of Defense through Professor Rapp, the National Geodetic Survey took it upon themselves to take that world model and to warp it, to forget about the rest of the world and fit best to the United States. And that was published as earth gravity model 96 -- or, I'm sorry, GEOID96, just for the continental United States. And that vastly increased the reliability of obtaining a good idea of what elevation was from GPS observations. And since then, every year, the National Geodetic Survey has been incorporating more gravity models into the geoid for the U.S. and its territories and possessions, and publishing them as different

geoids. Keeping up with science as it progressed, the NGS has been right on the forefront of the development of geoids.

Because of that and the price of differential leveling over long lines, Congress asked NGS for the best solution to continue forward in the future. And in 1998, the National Geodetic Survey came out with the National Height Modernization Study. That was to use the geoid and to use GPS to get reliable elevations in the U.S. And Congress accepted that as the sanest, most economical way of proceeding forward with current technology.

In metro New Orleans, we're concerned about subsidence and we're putting up -- LSU is putting up Continuously Operating Reference Stations throughout the state. Here's a couple in metro New Orleans, out in the east, where one of the antennas we have is mounted on about a 5,000-foot welded steel casing into the ground. That one there. And we've named that Station Mary. And there's a mark next to it that's just

mounted on the surface that has a strange name of Moon.

And Moon and Mary are two first names that are familiar to people in New Orleans. It's Moon Landrieu, the past mayor of New Orleans; and Mary Landrieu, who for many decades was a Senator to the U.S. Congress.

What we do with these two is we watch Moon go down with respect to Mary. So we're seeing differential subsidence in action on a day-to-day basis. Subsidence occurs throughout Louisiana at different places, at different rates, at different times. One place near the coast, an area called LUMCON, this particular benchmark where we've got a range pole sitting on the center of the mark, that disk was inside of that PVC pipe about ten years prior.

And through ten years of surface subsidence, the ground has subsided away from the benchmark. And this is a rather graphic illustration of what subsidence can appear to be throughout areas, particularly along the

Louisiana coast, when you can still find the coast, that is.

So, the University of New Orleans has established Continuously Operating Reference Stations throughout the state. We have also observed absolute gravity at all of these stations. In 2006, we observed a second time. And the summer before last, LSU purchased our own absolute gravity meter. And we are continuing to observe, as well as get assistance from the National Geospatial Intelligence Agency. And by NGA we have now observed 15 stations in 2019; by the Louisiana Spatial Reference System, we've observed 22. We have a remaining 17 to go. We will continue to observe absolute gravity in Texas, Mississippi, and Alabama, and results so far, just with absolute gravity, show the amount of subsidence we've seen at different locations throughout Louisiana.

In addition, we will be observing absolute gravity and defection of the vertical, which we just acquired an instrument for that

this summer, at all of these stations, including at tide stations throughout the Gulf of Mexico.

This represents the Continuously Operating Reference Station that we administer with our software through the Louisiana Spatial Reference System. And of those in Louisiana, LSU supports 31 national COR sites in the state. In addition to regional subsidence, we also have the Baton Rouge Fault, which happens to be subsiding at five millimeters a year, in addition to regional subsidence.

This represents graphs of Continuously Operating Reference Stations at LSU, down at Venice High School Bootheville, Destrehan, Grand Isle tide gage, Houma, LUMCON, Shreveport, Sicily Island High School, Thibodaux. And that's what the new digital zenith camera looks like that we just bought for 100 grand in euros.

So our objectives are to continue all of the absolute gravity observations, along with deflection of the vertical. We're doing GIPSY processing of all of our historical COR sites for

correlation with InSAR, because, courtesy of funding from the National Geodetic Survey, the Louisiana Spatial Reference Center has a subcontract with the Jet Propulsion Laboratories and NASA to do InSAR flights over South Louisiana, and they are using our COR sites as benchmarks for current elevations. And we will continue to provide all of our data to the National Geodetic Survey.

And, finally, Louisiana Revised Statute, Chapter 50, Section 173.1 says, in Louisiana, if you want current elevations, come to LSU.

(Applause.)

VICE CHAIR THOMAS: Thank you very much, Clifford. You've got a wealth of information and I wish we had more time to spend more time on it.

Next is Rich Luettich, and Rick is at the University of North Carolina-Chapel Hill. He has been a real asset to NOAA. He's advanced community modeling. He's been chief on several

testbed projects, so we're looking forward to listening to him.

DR. LUETTICH: Good, thank you. It's a pleasure to be here. As I thought about what to talk about here, the starting point was sort of who am I and what perspective am I coming from.

I am a coastal resident in coastal North Carolina. I'm a part of the coastal scientific community there, and I'm director of a Department of Homeland Security-funded Coastal Resilience Center of Excellence. I'm working with the State of North Carolina on to -- actually, we now have permission to talk about climate science and climate change in North Carolina. We didn't for a while. But we're working on a climate science report, and so I'm helping with the sea level rise component of that.

So, all of those could have me talk a lot about NOAA products related to sea level rise, the high tide flooding work that CO-OPS has

been doing, and particularly the future projections with probabilities attached with them. I think these are all incredibly valuable. But that's not what I'm going to talk about today.

Another hat that I could talk from, and I'll come back to it at the end, is I had the great pleasure -- this is a hat that I just recently took off in June -- but being on the board that was formed after Katrina to oversee the levees here in New Orleans. It's sort of an uber-board that had a fairly high level of outside and technical expertise on it. And so that's certainly -- and I served on that for seven and a half years and rotated off in June. And so I'll come back to that at the end, but that's certainly shaped my perspective, definitely, of the greater New Orleans area.

But specifically what I'm going to talk to you about, from the hat that I'm going to talk to you about, is just that of the coastal modeling community at large. This is comprised

of the academic community. There's probably, at least within the U.S., a couple of dozen universities that have active coastal modeling groups of one sort of another interested in process-based understanding, interested in actually developing better models and then applying them in complex situations. And many of my colleagues are very interested and work closely with mission agencies to help transition this capability into operational applications.

A critical part of the coastal modeling community are indeed the mission agencies: the Army Corps of Engineers, NOAA, the USGS, FEMA, the Coast Guard, EPA. And those are all at the federal level, but many state levels. Here in Louisiana, Louisiana CPRA is a critical organization in this space. And they're interested in hazard assessment; for example, the National Flood Insurance Program and also the Coastal Act are both hazard assessments. You need coastal modeling for that.

Mitigation and design. Certainly

navigation, and I know that's a lot of this committee's charge. But CO-OPS runs the PORTS models and others specifically to aid navigation. And then more recently, ecosystem models to predict HABs and dead zones, and the Gulf of Mexico is a big concern in terms of that, to make better management decisions in the heartland particularly related to fertilizers and what not.

And then also during events. Barry was a good one. I'll come back to that in a minute. But Dorian we're all looking at. There's decisions that are made during those events that are based on people's interpretations of models. And so advancing all of those is what the coastal modeling community is working on for the benefit and through the mission agencies.

And then private sectors and NGOs work in this space as well extensively. And, again, here in Louisiana the Water Institute of the Gulf is a significant player in all of that.

All right. So that's kind of the perspective I'd like to present in the remaining

minutes I have. My specific lens in that big space tends to be hazards lens related to coastal flooding. I've been one of the primary developers of the ADCIRC coastal modeling system. This is used by many mission agencies. It's used through academia, it's used in the private sector. NOAA uses it as the basis of their VDatum calculations. They use it for the ESTOFS system, the Extratropical Surge and Tide Operational Forecast System. And then its partner that's not widely talked about, the hurricane version of that, the HSOFS system. And then also for the new Coastal Act work, ADCIRC is the heart of that.

It really starts out as a storm surge coastal circulation model driven by tides, driven by meteorology, winds. More recently, we've added in wave properties, both through the SWAN wave model but also NOAA's Wave Watch III model has been linked to it through the Coastal Act work. And now we're working hard to try to get fresh water into it, all to be able to better

model hazards in the coastal zone.

So, those models start out with a whole bunch of equations, and they get translated into a bunch of computer code, tens and maybe even hundreds of thousands of lines.

But at the end of the day, if you want to use them, it's place-based. And so you come to Louisiana and you say how in the world do I apply these in Louisiana? And certainly this is one of the most complicated areas I've ever dealt with in modeling. And you've got water, you've got land, and you've got stuff in between.

As, you know, Cliff has talked about, others have talked about, it's changing in time. So the real challenge here is, how do you model this in that context? And, of course, the outlying areas are an issue. They're subsiding and people are faced with terrible decisions, and we heard about that. But Greater New Orleans is in particularly difficult shape because they're below the Mississippi River in many places, and they're below Lake Pontchartrain and Lake Borgne.

And so they're below everybody, and as a result there's been quite a system constructed to try to keep the water out.

How does one model all of that? Well, you cut the world up into little pieces. And through our ADCIRC system we cut it up into little triangles. This just gives you a sense of what it might look like, or what it looks like in our modeling context here in this general area. And on the right-hand side you can see perhaps the bird's foot sticking out and Lake Pontchartrain sort of circled. The higher density the triangles are, then the higher resolution the information is and the more it looks black on this figure.

But the reason we do that is because, at the vertex of every single one of those triangles, we need to know what the bathymetry or the topography is. So to apply these models and to apply any model in the coastal zone, we have to know what the ground elevation is relative to datums of various sorts, water datums as well as

geodetic datums, throughout that entire region.

So, again, on the right is what our representation of the ground was at this particular point in time when we did this work. Colors, warm colors being higher water or higher land, and down into the blues, which are actually below mean sea level.

When I first started working in New Orleans with this model, it was actually the late '90's, prior to Katrina. And I've got to tell you, it was chaotic. We had multiple data sets from a lot of different places. We were trying to piece them together. None of the water data sets and the land data sets were integrated. We were doing all of that. Shorelines were a mile or two away, and we were trying to estimate things. We were actually trying to reconcile datums and data sets just by trying get the shoreline in the right place.

Of course, those were aerial photographs that were dated, in many cases. I can remember Lake Pontchartrain had at least a

one-, maybe a two-foot step that cut right through the middle of it north to south, because there were two different datums, and we just heard a mention of that, in Galen's talk, in Florida.

Same thing here in Lake Pontchartrain. Different surveys done at different times referenced to different datums, none of which were well-recorded. And so it was quite an adventure at the time. It's certainly got much better, and NOAA has been the primary driver of that and certainly our community is grateful for that.

All right. Well, sort of with that history, then, what is my priority list of key things that NOAA can hopefully continue to provide for our community? And I realize this is all what Louisiana calls lagniappe in many cases. It's the extra stuff that you get after you do what you were designed or intended to do to start with, which is navigation, I know, through NOS.

But, for us, it's really critical to

have up-to-date coastal bathymetry and topography integrated -- integrated, integrated -- into a seamless data set. It's much better today. It's much better today than it was, but it's still not very good in a lot of the sort of shallow near-shore areas.

Those aren't necessarily high priority navigational areas, but nevertheless they're really critical in this coastal hazard issue, because they're where water gets from the ocean onto the land. They've got to go through those areas. And so light-penetrating or water-penetrating radar or lidar and things are useful tools, but there's still a lot of work to be done to make those things work well.

Having that data well-tied to datums is absolutely essential, both tidal datums and, again, geodetic datums. Every model out there needs to know what the bathymetry and topography are relative to mean sea level, relative to the geoid, as Cliff's graph just pointed out.

Interestingly enough, and you can't

read it in this figure, but from the VDatum website, there's in red this disclaimer that basically says this VDatum product is doing well except for in coastal Louisiana, from the birdsfoot up through Lake Pontchartrain, in which case it's probably off by at least 20 to 50 centimeters and we're working on it.

Keep working on it, because it's critical. We also need a robust water level gage network, and again NOAA has done very well with that, particularly post-Katrina. Virtually all of the water level gages were knocked out during Katrina, and so the models were relied on to try to recreate what happened in that storm.

Since then, it's gotten much, much better, but we rely on that heavily to validate our models. We are now doing real-time data simulation of water levels to make our models more accurate. We rely on that data to be able to access it in near real-time so that we can do that. So, that data is critical for operation of these models in this space.

And, again, in my wish list, really getting the coastal water level information well-connected with the land and some of the inland waters. As we try to piece together the hydrologic component to this, it's critical that we can connect that on the right datum, and Galen said this as well, that we make that connection well with the coast, and that we're all on the same datum and we know which way water is flowing. Essentially, it boils down to it.

Now, in New England it's easier; there are steep slopes. In the Gulf and the South Atlantic coast, it's really flat and so you've got to be pretty accurate in order to get water to flow in the right direction. That's all about getting the datums right and the connections made well between the inland and the coastal waters.

So, just to end up, we'll come back to my hat with this flood protection authority. Everything that's colored in various colors in this map are inside of this protection system that actually started decades ago, but sort of

brought to fruition post-Katrina. Everyone that lives inside of this is depending on this, for a variety of reasons, for life safety, but also just simply for being able to buy insurance. This is built to the one percent or 100-year standard, and that's critical for getting affordable insurance.

So, continuing to keep this well-understood, how rapidly the protection system itself is settling, but how rapidly the area around the protection system is settling as it relates to then the implications of that in future storm surge or future impacts on that system is absolutely essential. It's a forever challenge now living here in New Orleans, living with water here. And the system has to be recertified periodically. So it has to be remodeled. So it's absolutely essential for the viability of the City of New Orleans and the greater New Orleans area. Additional systems are being built in the outlying areas, and that makes sense, but this area requires that. And in order

to do that, we require what NOAA has taken on as a huge mission, which is providing the bathymetry and topography to support that modeling.

So, with that, I will say thank you again for the opportunity to speak with you.

(Applause.)

MS. LUSCHER: Thank you, Rick. It's always a pleasure to hear you. I've been working with Rick on the community modeling collaboration, and he's just creating such foresight. So, again, thank you both for traveling here and providing your expertise.

We're going to change directions a little bit and talk about the viewpoints of people who work on the ground, from people who work with stakeholders making planning decisions, and how we bring information through what's called the Northern Gulf Sentinel Site Cooperative.

So, this is one of the NOAA programs that's done through extension with Sea Grant. So, I'd like to welcome Renee Collini. She

really is kind of a boots on the ground person, where she's helping people make sense of what her information does to the coastal planning community. Thanks.

MS. COLLINI: Thanks, Audra. I would make a joke here about being Italian and talking with my hands, and that's why I have to stand up so I don't hit my fellow panelists. But it turns out I'm in the spot where all the AC goes, and I'm freezing. So I'm going to stand up for a little while and get my blood moving.

So, thank you for the introduction. Before today, who had heard of the Sentinel Site Cooperative?

(Show of hands.)

MS. COLLINI: Nice. That was a lot of hands. I'm very excited about that. For those who have not heard of the Cooperative, we are a partnership, so this spans from people on the ground doing the research and the science all the way through to people who are making decisions, and really everybody in between, specifically on

how we can practically address sea level rise.

This is, as we heard, a NOAA-funded product. But really what we want to do is take all the pieces that we have, products, services within NOAA and external to NOAA, and put them together in a way that people can move forward and make progress on what it is they're trying to accomplish.

Which sounds really nice, but the question boils down to, how do you actually do that? So, the way our partnerships work together is to identify and help provide access to new science, or even old science if it's available; and then, second, to help people use that accurately and to the best of its ability; and then, third, generally facilitate the conversation around sea level rise.

So, this does not just mean having dialogues in community halls and with residents, but it also means developing a two-way flow of information. So we're working on all sectors, the science, the stewardship, the service towards

addressing these problems on the ground. So from that place of facilitating the conversation is where you're going to hear a lot from me today.

So I talked to three different groups when I found out that I was coming here, because I figured better to hear from them than from me. So, the three general groups can be thought of as extension and outreach professionals, people like myself helping to make sense of the science for people trying to use it; coastal decision-makers, both natural resource managers and built environment; and then researchers, which I'll probably skip over pretty quickly because we just heard a lot of great stuff from Rich.

So, starting with the extension outreach professionals, the way people are using the products and services, the big three I heard about: aerial imagery, especially over time; sea level rise projections, both the projections themselves and the impacts; and then the historical water level trends. The sea level trends page was cited quite a lot.

Transitioning to talk about operational purposes for decision-makers, which I hadn't actually thought that much about. So, in addition to the things the extension and outreach professionals are putting in front of them, the things you just saw, they also talked about how, when they have to go out on boats or when they have to do dive ops, they use the tides and currents information.

But one I had not thought about, Jackson County Utility Authority had said they use these projections to know when to go out and observe where there could potentially be sewer overflows so that they can be ready to take pictures, block off roads, because if they can't document this problem, they can't ever get resources to fix the problem. So I thought that was a really interesting way to use these products and services.

Thinking about researchers, some of the information's the same. Instead of using the trends and those already-analyzed data, they get

into the actual tide gage data. They look at the rates of sea level rise for siting as well as for doing post-analysis. Also the datum information and services is very helpful.

And then this sort of broad category of what I call NGS services, some of the post-data analysis that we heard about and several other things, and also the on-the-ground people with NGS, those advisors.

So I'm going to transition and spend the rest of my time talking about some of the needs. This is one quick page on data needs, but I want to caveat that the rest of what I'm going to talk about is how to get this information to people efficiently and some of the requests around that.

So, some of the specific data needs were about sea level rise observing gaps. I don't think this surprises anybody, for both water level as well as CORS, which you've heard a lot about already.

This one, contextualizing and

connecting data sets, I thought was really interesting. I had two specific requests. One, on those tide gage sites, when you go and look at a tide gage, also having the subsidence rate there somewhere as just an identified piece of information.

And then another one, which came from an extension agent, was asking for, when you have aerial imagery over time, also have an indication of where that water level is, where with sea level rise we're at. I thought that was really interesting. And then this last one, which we actually just heard about again, was some of these non-priority for navigation areas for aerial imagery.

So, moving past the data needs, there is the sentiment that kept coming up, and the best way to capture it, I think, was this Finnish proverb, which is that happiness is a place between too little and too much. I think when it comes to tools and resources, this is the best way to describe that. A rusty screwdriver by

itself is not going to get it done for you, but really how productive is a giant pile of tools as well? So, happiness around tools and resources, maybe somewhere in the middle there.

There was a study done by Dr. Tracie Sempier. She did a survey of all Gulf Coast stakeholders, asking them specifically about resilience tools. So, when understanding what tools and services are needed, these are the responses. You can see here these percentages break down to around a third of the people wanted something that was explicitly no more tools or something other than tools. They wanted capacity, they wanted assistance, they wanted awareness.

And then a third of the people who answered have like a case-specific thing they needed. It was hard to generalize, but almost none of those were new tools or a specific tool. So just keep in mind that new tools is not necessarily the answer that people are looking for.

When I came up with my title, which is, "Tools: Renovate Before You Build and Other Bad Analogies," I was hoping to make analogies for all these points, but it got pretty tortured pretty fast. So, only one analogy and then the rest are just summary points. So, I'm going to get into each of these more in-depth, but I wanted to hit on some of these big points around the existing resources.

The big one, again, renovate before you build. Before you build a new tool, look at how you can fix the one you have. Organization of current resources, technical support on the ground, and then leaning on existing outreach extension services. And I'm going to get into each of these after I have some water.

So, for renovate before you build, every time you ask somebody to learn a new tool, you are asking for a significant investment in their time. You are promising it is worth it to put in this effort to learn how to use this tool. Whenever we ask people to tell us what tools they

use, of the hundreds available on the Gulf Coast, five were listed. Five. So, people have the things they like. They want to keep using it. If you want them to add something new, you're going to have to ask them to put in a lot of effort. So keep that in mind, that as you add new tools to people's toolboxes, you're starting to wear on the trust.

And then also evaluate the current tools that you have. Think about the impact they're having. Are people using it, how as they using it, how is it helping them? And then think about how that could be improved from an end user's perspective. So, these are sentiments I heard in various capacities throughout the people I talked to, and just generally we hear in the Gulf Coast.

In terms of organization, it's pretty straightforward. I pulled out some key sort of example quotes. So, bringing the existing family of tools together, regardless of who in NOAA put it together, just a place to search NOAA

resources by problem or need. Another quote that sort of highlights this is make it easier to find or have simpler guidance on how to develop relative sea level rise rates. And then another one was clarity specifically on imagery data, being able to search a location and no matter who collected it when or why for NOAA, it would all be there.

So, an example of how we did something similar to help resources be more available, we developed this tool for tools, if you will, called Gulf TREE. And so we asked people across the Gulf of Mexico what kind of climate issues they were facing. We went and collected a database of all the climate resilience tools in the Gulf of Mexico and developed a resource where someone can answer five questions and it will take that 109 tools and narrow it down significantly.

Then we provided quick hit information, strengths, maybe drawbacks or limitations in a summary to see if that tool best

met your need before you invest time in learning it. This has been very successful, people really like it. It's just an example of how you can think about this organization process.

So, moving on to technical support. Datum conversion, calculators, guidance came up repeatedly. I know we have VDatum but this is still an area people are struggling with, and I noticed it particularly among the ecologists. That seemed to be a group that is needing an assistance.

And then on-the-ground people. So, this is a quote from someone who works in Florida, and I think it's a testament to how valuable these NGS advisors are, and just that people want more of it. One person can't be in every room. There's just a limit to how many field sites and phone calls and things you can make. And so there was just a request to have more people.

And so then using existing outreach and extension services. First, I just want to

make sure that y'all understand, this is something that came from people who benefit from extension and outreach services, as well as the people doing the extension and outreach. Got a little bit of both here in these comments.

Defining extension and outreach services so we're all on the same page. I'm just going to use groups y'all are probably familiar with. The Office for Coastal Management does a phenomenal job of this. Sea Grant is well established at this. There are also regional partnerships: the Gulf of Mexico Alliance, the Climate and Resilience Community of Practice, and then this is what the Sentinel Site Cooperatives does.

Galen Scott I think described it best earlier this week when he said the Cooperative sort of takes that fire hose of sea level rise information that's coming from all across NOAA, and then distills that down and pours it into cups so people get just what they need, depending on what they're asking about.

Specific things that these partnerships can do, specifically around delivery. There are sort of two ways to think about this. One is this socializing the data and information. It takes time to integrate something into someone's toolbox. There was research that was conducted through NCCOS that people had asked for. They wanted to know what storm surge was going to look like with sea level rise. It takes somewhere between four and six personal touch points with one person to get that science integrated into their daily mental model that they asked for, that they wanted. If this is something they don't even know they need, it's going to take even more time. And so people that are already on the ground doing this are people you can benefit from and work with.

Additionally, communicating the science clearly. There's a whole other branch of science about how to communicate science, and we live there and work there and understand that. And o relying on that helps y'all focus on what

you do well, and they can focus on what they do well.

We can also help with that tool development and evaluation that I talked about, looking at the impacts, how are they being used, how they can be enhanced, identifying gaps. People talk to us. They tell us what they want, they tell us what they don't have.

And then also thinking about which tools would be ripe for expanding. Instead of coming with a new tool when you have new science, let's find existing resources people already know how to use, have already invested the time in, and see how we might add stuff to it.

So, to give you an example of how these partnerships can work well, in 2017 the Sweet et al. paper came out, the CO-OPS technical report, which looked at both global and regional sea level rise scenarios. This was wanted information. It was locally relevant. It was contextualized with those exceedance probabilities. This was great.

But people whose job it is to communicate science were struggling. This was sort of inaccessible for them, which made it even harder for some of the people on the ground. So the Sentinel Site Cooperative worked with the study authors, worked with Audra, worked with OCM, who was already working on communicating this, and came up with a standardized template and a data analysis helper to pull all this information in and help communicate it in a standardized, easy way.

So, it's two pages. Let me tell you, Billy's a trooper. We took 130 pages of technical report and put it on two pages, which I'm sure was painful for him but it worked out really well. I don't expect you to look at and read all this, but just see that we have local curves for that area. We have the projections of high tide flooding, and then we have exceedance probabilities and tips and tools on the back.

This allows someone like myself to walk into a room and have a conversation with

anyone. It structures the conversation. I'm not supposed to hand this to a mayor and walk away. This helps open the door to enhance that conversation, to have it be informed, to have it be based on the best available science. Because of these two-pagers, we've seen these new curves and the new rates integrated into restoration projects, several planning efforts, and sea level rise communication across North Carolina, Florida, Georgia, all of the Gulf Coast, several places on the west coast. And so it's just helped get this information out there faster and more efficiently, and I think it's a good example of how we can keep doing that. Thanks, y'all.

(Applause.)

VICE CHAIR THOMAS: Thanks so much, Renee. That was a great presentation and I can tell you're really connected in the area.

All right. The next person we have is Brian Lezina, and Brian is with the Louisiana Coastal Protection and Restoration Authority. And I understand that you're a key player in the

Louisiana restoration here, so we're looking forward to your presentation.

MR. LEZINA: Yeah, I play the keys.

VICE CHAIR THOMAS: That's right. You play the keys.

MR. LEZINA: Yeah, I feel the chief dartboard sometimes on there. But good morning, everybody. I appreciate the opportunity to be here. I'm going to try and sit down just because of the one hand as well, and hopefully everybody can see. Also because, like a lot of us here in South Louisiana, I'll climb on a soapbox and get to storytelling a little too much if I can stand and walk around the room.

As was mentioned, I'm Brian Lezina. I work for the Louisiana Coastal Protection and Restoration Authority. In that capacity, I'm honored to serve as our Chief of Planning and Research, which is generally the catch-all for what we have in the organization on there.

A little of background. I do want to say, awesome job, actually, on the structure of

the panel. I think we're going to see, and what I hope to get with y'all, is start to stop on how the data goes and how we collect that. Outreach is a huge component of those things that we have, especially when you get down to a state level organization like ours in planning.

I'll give you a little sense of how important these things are to Louisiana. You see here, you can see where we are in the world. If you walked out the door and saw where you are in relation to those ships passing, you'd get a sense of urgency on doing things. And, of course, we've seen some before that. And then hopefully transition -- and I'm going to leave, hopefully, a good bit of time for Mr. Windell -- to show you what it really means to localities to enact some of these things, especially hard protection.

I do want to give a bit of background from the organization. I think it's important to see how Louisiana is sort of treating these things. So it was mentioned today is the 14th

anniversary of Hurricane Katrina. We all remember the devastation of that, those of us that were here, and also Hurricane Rita that passed in its wake some time later.

So, with all that devastation, and you saw some of those images which we appreciate seeing, it was recognized that the state had to do better. We had to do better than piecemealing how we did these things through the umpteen levee boards that we had. Many state agencies that were all responsible for the protection of its citizens and then the restoration of the coast.

So we did just that. In 2007, this organization was stood up. So, we are a very young state entity on there. Really to become, as you see on the first part there, the single state entity with authority to articulate a clear statement of priorities to achieve that comprehensive coastal restoration and protection on there.

We always try to add sustainability when we can, because that's also a big driver. We

heard some of that yesterday and that's really where we're trying to get with that. So we're a little bit difference, like I mentioned, with other agencies. We exactly were set up a little bit to perform more as a private kind of sector model on there.

So we have an executive director. We have oversight from a board of directors that are largely public officials and some others. So it gives the ability to move a little faster, to react differently to things, which is exactly what we need when we're dealing with so many stakeholders, so many entities, really that sense of urgency on there, but all at the same time trying to articulate that one real need that has been spread across the state organizations on it.

How do we do that? Well, our mandate is to develop, implement, and enforce a comprehensive coastal and restoration master plan. Just had a change in the legislature, so we do that now every six years, and- if you see and you can check it out, it's Louisiana's

Comprehensive Coastal Master Plan on there, for sustainability. Let me add that part.

So we all realize it's our attempt to try and move the state into a more sustainable coastline to protect its citizens and to keep the critical habitats we have. Not the same coastline, I think we all recognize that, but a more sustainable coastline.

So what the plan does is we take a resource-constrained approach, resource being monetary. It's actually a -- it's got a $50 billion price tag on it over 50 years. Of course, we don't have that in hand. We could use 100. That would be awesome, too. We've got about a quarter of that maybe recognized right now.

What we do is we go and take a robust science-based approach on how to look at things such as hard structure protection, those critical elements, versus restoration and what we can do, and really integrate those projects. So the challenge, right? It's dealing with multiple

stakeholders as we see bigger challenges.

How do we do that over a 50 year timeframe? We plan projects that we're going to do tomorrow. We have to try and envision what the world's going to look like in 50 years, not only for what projects come down that way but what the projects we're placing now, if they're going to be viable projects in that timeframe.

That's a huge deal. We'll see some of these projects now are approaching -- have exceeded or may exceed a billion dollar projects on there. That's not something that we can take too lightly, right, with the situation we're in to say that these projects won't be viable 50-plus years on there.

So, speaking of the coastal program and through the implementation of the master plan, this kind of sets up some of the challenging the state faces. We really tried to do this through a broad approach on what the goals are, and number one is flood protection on there, which we'll hear a little more about

later. But really it starts and stops with that. If we can't protect their citizens through whatever means, well, really everything else is just kind of there. I won't want to downplay. Before I had the title administrator I was an ecologist at one point in time. So I don't want to downplay that, but obviously this is a critical need.

Second is natural processes, and that's restoration of those things that built coastal Louisiana to begin with, those things that can help offset sea level rise and subsidence. I think I've already set up right there maybe a little bit of competition between those, and sort of the challenges the state feels.

Of course, protection of our coastal habitats, our cultural heritage. You'd see that here in New Orleans and certainly all around the coast. It's something that's vitally important. I don't know of too many other places that across the coast you see such a strong working coast

mentality on there. So that's also -- whether it's you're clearly aware of the benefit to this state and the nation, maritime transportation, but that's also local sea food harvest. That's recreation, all those things that are really big components.

So when we get into topics of subsidence and sea level rise, they mean a little bit different thing to all of these groups. I'm glad we can talk about it here. That makes it a little easier since you see it. You saw presentations of what subsidence looks like in action on there. But at the same time, it's critical for us to be able to put good numbers on that, put good variability on that outreach of that, which is dramatically important, to get folks in a posture to be able to make decisions about their future.

So, a little bit about some key products in use. I can go on and on like most of the folks here about what we use with such a large program. We'll take it all, and then we'll

take a little bit more. But water level information, critically important on there. We heard about ADCIRC. We are a huge user of that model for both long term prediction, but really we're also charged with tidal inundation.

We used to call it nuisance flooding a lot, but it's so common now it's mundane, right. It's whatever. So we're back to high tide flooding, too, on there, but as well as tropical surges, all those things. So that water level information is critically important. Bathymetry, same. Topo-bathymetry, we heard that and I'll show a little slide later kind of highlighting the need on that.

But also salinity, temperature, altimetry, all those things in an offshore zone that we aren't necessarily charged with management, but inform water levels here. What's the loop current doing, what are we seeing with eddies? How does that play into our models or our sort of edge effect on those? Relative sea level rise and atmosphere.

I also want to talk about sort of the time scales on that. So, you see the map on your lower level. It's kind of a spatial look at sea level -- or, excuse me, subsidence rates, just broadly generalized south of here. Of course, we can see anything from, you know, six meters, six millimeters a year -- six meters, oh my -- six millimeters a year, you know, upwards of 12 and greater in some of those spots.

So we rely on that real-time data to make some of our decisions on when we put things there, how do we do it, right? And our engineers, our construction, what do we need to do, compaction, all those things going into it, into what makes that subsidence critically important for the now. But we also have to take that future look. The map on the right there is an inundation flood risk map.

So this is where it's critically important that we continue to refine our estimates of sea level rise, and not only that but the brackets around that, because folks are

making decisions about their future on data that we're putting out there, be it a business need, be it a personal choice.

We're already seeing communities in Louisiana are dealing with that very choice some time ago actually, and now it's become a critical need. So our ability to outreach and put that in action is huge.

And of course we're looking at compounding, top right, is where all these things come together on here. This is actually a little visual image of one of the model runs from a proposed project that's a reconnection of the river to the estuary. And on the left what the landscape looks like now; on the right what the predicted landscape.

Those of you that are in the modeling world know that everything on the left went into that and probably some other science that I can't speak of, but a critical need. But that's a ten year look right there in the particular model run. But I mentioned 50 years, and I think in

Louisiana what we're really grasping with is how do we take that, get it to our citizens and really plan on that. So we're moving in strides.

An example is the various relative sea level rise sort of graphs that you see up at the top on NOAA. The first circle on the left you can see is 2020. That's usually where we start our planning horizon. Not a big deal, right, in that spread. It might be a couple of inches here and there, which is not a small item but then -- get to 2070, the larger circle right there on the right. That's that 50 year term we looked at. That spreads in meters, right. It's feet, and when you're in a microtidal sort of situation like we are here, that's everything. Heck, that's Baton Rouge you know on there is back door. So that's really where we get into how do we communicate that, how do we put that in the planning, how do we give folks that range on there.

You can see an example of one of the restoration projects on the bottom there. This

is Bayou Dupont. We pumped sediment from the Mississippi River. You can see on the left and right it looks dramatically different. Standing there it does not look dramatically different in certain years. So what it really means is it's important for what we build to target elevation, how we design capacities.

If we put something on the ground now like a sediment diversion, can we still move that same amount of water in the face of sea level rise 50 years from now? And have to make critical choices on do we have the money in hand? Do we feel that we can even build to those? So that decision-making comes in. You see where the nexus of all this kind of uncertainty and hopefully prediction comes in.

Timing and locations of projects is huge, and really whether or not we put hard or soft infrastructure in some of these things. We try to rely on those integrated projects. We try to rely for those coastal habitats. But sooner or later you might have to see a wall there. You

might have to see a floodgate or non-structural measures. We do a lot in these parishes, raise a home, flood proof, those sorts of things.

Did want to touch just a little bit on future efforts and where I hope to see, and we have some things. First is kind of taking a next step on some of this and it's cooperatives like the EESLR program. So ecological effects. We have our work cut out for us on sea level rise, how we view subsidence, all those things. But really it's the next level, what does that mean?

So we're already seeing in Louisiana and some places some of our coastal marsh types can keep up with what we see for subsidence, current sea level rise. Might be just increases in growing season, organic kind of accretion, those things on there. That's vitally huge for us to know in how we plan with Louisiana with sediment resources that are finite, money resources that are finite, right, time that's finite, all of those things.

So it really does make a huge

difference on those sorts of things when we take it to that next step, and you mentioned some of the modeling. A lot of this goes into that, whether it's not just morphology but all those other things we look at. So increases to real-time monitoring. I know we're going to harp on that, and I won't need to necessarily harp on that anymore. But we all have missions here that are what it's going to look like tomorrow and what it's going to look like 50 to 100 years from now, and that real-time monitoring helps us tie all of these things together.

Increases to sampling frequency. So real-time is good, but we have a lot of other programs out there. Topo-bathy has been mentioned a lot.

And just some examples on there. So I think the before slide I buried behind. But on the left is one of our reference sites. The state of Louisiana maintains about 400 of these sites across, looking at various variables. Several years before this, this site was a really

degraded marsh with none of those willow trees. So you can imagine that that means in the world of lidar, right, what that means in the world of subsidence, all those things.

Just driving that home on the right is some actual NOAA chart images. On the left is 1965 and 2013 on the right. So this is a federal nav channel, the Empire Waterway south of here in Plaquemines Parish. Just the change on that map alone, and I can tell you if Tim Osborn was here, he would tell you -- would agree that a lot of these place names now are historical. They are relegated to historical, and that was in my life time.

So I've seen this in my lifetime on here with my eyes. So that just highlights the need for update. Most of these changes are occurring as we see it, right now. So that highlights the need.

Coordination across data platforms. Obviously huge when we're all in different datums. We all have a lot of different things

going on, really that central focus. Where I think that comes in and we appreciate the efforts so far is the NOS led teams to interrogate sea level rise data.

That's not just what we all are collecting each agency, but some of us collect, right, soil samples, core samples. We look at a lot, what's the difference between shallow subsidence and what's going on at the bottom in deep subsidence, and all those things make a difference on what we plan. I think getting all that together in one spot can only help when we look at future planning here and the decisions that Louisiana and the nation has to make as far as this.

Before I lase everybody with the wrong button, I thank y'all for your time and opportunity to be with y'all today.

(Applause.)

VICE CHAIR THOMAS: Thank you very much, Brian. I appreciate the highlighting of the NOAA products there too and what's really

critical for you and important for your efforts. Windell, Windell.

MR. CUROLE: Bonjour, comment ca va?

VICE CHAIR THOMAS: Mais voila! Wendell and I discovered -- well, he speaks French very well. I speak a little old French, but still we had a good conversation. So Windell Curole is with the South LaFourche Levee District, and we're really looking forward to his presentation. I understand he has several Cajun jokes too. I don't know if we'll get to those, but we're looking forward to hearing about the impacts in your district. Thank you.

MR. CUROLE: I guess with the gravity of the situation, we don't get to talk about Pierre de Marie (phonetic) now. It may be after. But bottom line, I was actually a Sea Grant fisheries agent at the beginning of my career, and then became manager of the Levee District. I've been doing that for 39 years.

GPS elevation by far is the greatest technological improvement in our work and

survival in South Louisiana. All the work he just described is all better and more doable because of GPS elevations. Our system that was built that I've been working on for all these years, I guess around 2000, I called the Corps and said look, just eyeballing it, you're telling me the levees are at this elevation. I see the water here. I don't see the differential that we're supposed to have, and then earlier Mr. Chatry has mentioned, and in fact I wrote a letter to the Corps because we're the local sponsors of that Corps project. I said the levees don't look right. They don't look like they're high enough, and he says "Well, after the project is finished, we'll reassess."

I'm thinking the project might take ten years, 15 years to finish. That's 15 hurricane seasons. We can't do that. So we started looking. I get my engineers to start looking at it, and sure enough, and this started happening right when GPS was coming in, all right. We had basically an 18 inches low. The

levee system was built, the entire levee some 18 inches low, and that's critical. Every inch matters when you're living in a subsiding delta.

That's where we live. We live in a subsiding delta. I'll get into the geology a little bit about it. But if you live in a subsiding delta, where GPS lets us do what we need to do, elevation is a salvation to inundation. It's that direct, that easy.

The other thing is in a subsiding delta, without flood protection nothing else matters. The best roads, the best libraries don't do well under four to five feet of water. That is the bottom line, and that's the challenge that we have. Everything we're doing today is 20 years late.

My father was born in 1930, I was born in '51, and in that timeframe I thought we had lost a lot of land. My dad saw a lot of land loss, and I was sort of realizing in my lifetime, we were losing as much as 70 square miles a year in coastal Louisiana. Since 1930 we've lost the

size of Delaware, you know.

You know when I saw President Clinton talk about $8 billion going to the Everglades, I'm saying that's good. But he didn't talk about South Louisiana, which is basically the Midwest's way to get to the rest of the world. It's where we have this energy. It's where we have these fisheries. If the Midwest is the nation's bread basket, South Louisiana is its seafood platter. It truly is.

The thing is, a farmer in Iowa if he never visits Florida, would get very little benefit from the manipulation of the Everglades. That same farmer in Iowa never visits Louisiana. He's still dependent, the price of his fuel, his fertilizer, his ability to get his goods to market are all based on South Louisiana functioning and it's sinking, and that is the challenge, to keep those functions for us and also for the rest of the country.

The other thing is, you know, I didn't learn about the geology of South Louisiana until

I was in college on the aquatic biology club and they have a geologist come and speak to us. When he explained that when you look at the Mississippi Valley from western New York to Montana all the way into Canada, that the drainage of that Basin is what built all of this land.

In other words, we live in the United States, but we live in the real United States right here, because every bit of soil comes from somewhere up there brought here by water, and that's the next big difference. It was brought here by water, so our highland is actually near the water way, because when a delta builds it drops a load quickest when it starts going over the natural levee.

That's very different. The rest of the country has -- your land tapers. That's where your waterways are. Different animal here. I've been involved with the National Association of Flood Plain Managers, and they say you want to flood; you build near the waterway. I said you

got to be crazy. The high land's near the water, and then I realized we are very different.

In all those things, and again because we live, you know, there are only seven great deltas in the world and this is one of them. So when there's a national law, a lot of times they don't apply very well here because of that difference. I have a term. I call it "generally correct but specifically wrong." But we do that a lot in the Gulf of Mexico.

Okay. I'm going to show you some of the reality on the ground. Again, you see the delta sitting there, Lake -- everything south of Lake Pontchartrain was basically built by the Mississippi River. God gave us the Mississippi River, the Mississippi River gave us South Louisiana, and you see how it's built all the way to the continental -- there's a continental shelf. To the end of the shelf, now 70 percent of that sediment goes over the end.

All of South Louisiana was built with that sediment spreading out and flooding. When

we started really good flood protection in the 1930s building the Mississippi River levees we solved that. We starved that land from the way it was built. Now gravity's been pulling all the time, but you would have a flood every once in a while. The sediment would replenish and get four, two, three, four feet higher. When the flood would go down, the land would be higher. Of course it's a different situation when you have hurricanes come.

But this is the process that built it, and it's not a surprise that we're having problems, because we've deprived -- we basically have deprived the supply that actually built the land itself. So we're trying to fix some of that, and this is the loss since 1930. This is not only the land going down or losing the land; that allows the Gulf to get closer to us.

My estimation that the Gulf, because of salinity lines, is 30 miles closer than it was 50 years ago. That means hurricanes, that means tidal differences, that means tidal prisms are

that much more powerful, and that's the crux of our problem. Again, if you look -- if you look, if you see New Orleans, Lake Pontchartrain in New Orleans, my system is 30 miles south of New Orleans, yeah. And you can see we've lost so much land you can see from space now that there's that -- it's sort of -- if you look almost straight down from New Orleans, you'll see a very distinct line, and that's the levee system. We're the only levee system that has not flooded for any of the storms since 2000.

If you look at that little gray area, you know, people in the north, south, east and west zones have flooded. Combination of good luck and good work, because with Katrina pushing a 28 foot storm surge that hit Pass Christian, that hits anywhere from Brownsville, Texas to Maine, you're wiped out.

Superstorm Sandy, eight feet, right. Most of it's six feet flooding. 28 feet, it hit past Pascagoula, I mean Pass Christian.

This is Hurricane Barry. This is a

little tidal, a tropical storm that hit two years ago, but this -- the same scene, I'm on the end of my levee system. The picture on your left is inside the system. It looks like an everyday thing. I'm standing on the levee and looking down on LA-1 headed toward Port Fourchon, which supports all of the -- about 90 percent of deep offshore oil. And leased our only 20 -- about another 20 miles leased the only inhabited island in Louisiana is 20 miles south of where that, and the road was completely covered.

Barry did the same thing. Storms that hit Texas and Florida this happens. So it goes underwater a lot. With the levee system inside, that road there is lower than the road on the outside where the flooding is taking place, that the flood -- that basically makes it all work.

I mentioned that port, Port Fourchon. The average 1995 till today, the average income to the federal government from the leases and royalties that come from what that port supports is $6 billion a year. Yet we've never had money

to use it.

We had to sue the federal government, and our governor, on our request, has to sue for the lease sale to get a share, and we finally started getting a share of that money, 37 percent of all the new leases coming in, where other states that have that type of operation in their boundaries get anywhere from 50 to 90 percent of that money.

That wall was supposed to be at 12-1/2 feet. After we checked it out, it was only 11 feet, but it worked. I'm showing you something you don't see in the news, successful flood protection. You see we play a game, that when you win, nobody knows the score. When you lose, people can't stop talking about it, you know. All my friends get all the press, and I'm happy about that.

This is Leeville, and this is -- this happens every little storm. Now Leeville's still a good place to fish, to do business, but the road goes under very often. This is where my

grandparents actually moved from the coast of Leeville because it was a high land, and then after a hurricane in 1915 they moved further up the coast.

That's just 12 miles from the coast. That levee system I had to build, they went there because it was high, but because of subsidence. People like, the press likes to talk about sea level rise, but in Leeville, for example, let's see if I can get -- yeah. Here's a cemetery. The land appears to be about a plus four foot elevation, and that was about 1935-1940. They're putting in a pipeline here, have to put a bulkhead, and this is about 1995.

This is at low tide we had to take these pictures, and that is subsidence. In the last 100 years in Leeville, probably if you look at the cake, if the cake is subsidence and sea level rise is the icing. Now those parameters might change but South Louisiana's problem is subsidence is a key factor.

People keep talking about sea level

rise, and that is a factor. But the controlling factor is subsidence, and again you see this and let's see. And again, Roy Dokka, we were looking for accuracy. Roy Dokka comes in and sets up the Corps' project and I'm thinking it's like heaven, man. It's like you know, we can't tell what's -- how high the water's going to come in. We can't tell that.

But we need to know at least what we have to protect it and what we're building to, and because of the GPS system we have confidence. It saves us time; it saves us money. When I used to get a centerline survey of the system, we have a 48 mile ring levee system, it would take two months, three months, cost $100,000 and be inaccurate, you know, by a foot, foot and a half.

GPS shows up. They can make the round basically in a couple of days. I get the data out, pay $8,000, and I'm accurate to the size of a golf ball. We can do some real work when you have that type of accuracy. Now I just want to -- again, that program is invaluable for what we

do in South Louisiana.

I just want to show some of the other things that, you know. I'll show Roy, one of Roy's work. He went down to LA-1 and showed the subsidence. It's 20 years, a one foot drop in elevation. This is not stopping, guys. This is something we have to deal with, and that's why everything we do we look at it that way.

But, like I say, elevation is a salvation to inundation. That's the trick. And again, these are all of the issues that we have to deal with. That's Leeville on a good day. It don't look too good, you know. Again, thank y'all.

(Applause.)

VICE CHAIR THOMAS: Well thank you, Windell, and I think this quote of every inch matters when living in a subsiding levee or district, it's like that really does drive it home. And I think that also highlights why NOAA is so important with their datums and their products and their aerial surveys and every other

thing that they're doing.

So we'd like to open it up to Panel questions. Dave.

MEMBER MAUNE: Hi, I'm Dave Maune. I'm going to ask each of you to answer a question for me, and hopefully give me your business card that you write "yes" on. But you don't know what the question is yet, so let me give you a little background.

NOAA and the U.S. Geological Survey are constantly trying to determine what their products are worth, what's the value to their clients, and NOAA right now has a 3D Nation elevation requirements and benefits study going on, along with USGS, in which they're asking various federal agencies and states what they need in terms of inland topography, inland bathymetry, near-shore bathymetry and offshore bathymetry.

What quality level data do you need? How often does it need to be updated? What do you use it for, and what is its value if you get

what you ask for? That's the background on this study. They then carved those requirements up into business uses. There are 30 business uses, one of which is sea level rise and subsidence. I've been evaluating the results of that study, and on sea level rise and subsidence, the only states that said this was an issue to them was Florida, Maryland, Delaware, Massachusetts, and New Hampshire.

We knew we did not talk to the right people for this study, because when I hear people like you who know what ADCIRC is and the value of topographic and bathymetric lidar, I think we haven't talked to the right people. So I'm asking each of you would you be willing to answer some questions on a questionnaire, and tell us what the value of these data sources are to you for sea level rise and subsidence.

I'm hoping that you can answer my question here, but give me your business card with a yes written on it. That's my challenge to you. Anybody care to comment?

MR. LEZINA: No problem. It's yes for Louisiana. Yeah. I think yes, and also it's -- we can do that. I think what we see and what we -- a lot of us don't have time to go into each little detail about all our presentations on there, but one thing we try to do -- so not only the value it is to prediction and what those things give us in real-time, but we put economic value on what happens if we don't do these things or what expected annual damages are. It's something-B on there for each year. So yeah certainly, certainly.

MR. CUROLE: Yeah. Again, I would say I was involved in a lot of the legislation after Katrina, and centerline surveys are the key to know where you're at. Because of the cost of the old way of doing it, we talked about doing it once every three years. But once GPS came in, I pushed that every levee district should have a center line survey every year. It's cost effective.

And that's the other thing about, you

know, some of the speakers were talking about it earlier. The issue is, you know, we would have this -- our benchmarks measured every 20 years when you have the type of loss we have. With GPS it's constant, constant, and the improvements we're having. Before our guys would have a point you'd have to go to and calibrate. Now with the new technology, they get an email and they get it done. I mean this is unbelievable how good it is. So that's maybe like a yes.

MS. COLLINI: I'll just add to that that if you want, I can also share it with other partners that I know are using those data.

MEMBER MAUNE: Great. If you can pass this information on to other people who can answer it, you also may see that there's other business uses there that could be critical as well.

MS. COLLINI: Yeah. I'll absolutely do that.

MEMBER MAUNE: Please pass it around and keep in mind we're looking -- if you can find

a way to quantify the dollar benefits in the future.

MS. COLLINI: You might consider also sending it. There's five Sentinel Site Cooperatives. So it's all people with partnerships around sea level rise all over the U.S. So I would send it to those coordinators as well.

MEMBER MAUNE: Thank you.

VICE CHAIR THOMAS: Great. Thank you for the feedback there. Anyone else? Clifford?

DR. LUETTICH: I'm happy to as well, and I think we have to realize New Orleans is sort of leading the charge, but we have a lot of other coastal cities, none of which seemed like they showed up on your list, all of which are facing this now and a fairly predictable future. And so there seems to be an awful lot of information out there that you could take advantage of, yeah.

VICE CHAIR THOMAS: Great. Other questions? Sean?

MEMBER DUFFY: So I'm going to be nice and tactful and not ask a question, but this panel was great. I really appreciate a lot of the feedback, and I have mentioned many times that I have a problem understanding the implications and impacts of our datums. It's nice to see that leaders in this effort locally have some of the same problems, and are right to say that if we ever do a tour bus in this area, I would like to have Windell on as our tour guide.

I've had the pleasure and I've had some side-splitting pains afterwards. But I remember one of the first time I met Windell and, you know, if you go to the CPRA board meetings and hearings, I represent navigation. So all the efforts and projects, and many of them especially on the river will have an impact to navigation. You know, there are other people that have different interests, and the one thing that I remember when I first spoke to Windell was he said because of my Cajun heritage, this is a working coast.

And so we see things very similarly for different reasons, but the working coast part for me is represented in the navigation industry. So the best economics we have on the total value of the river system, and I think it's still kind of understated, is about $735 billion a year. So one thing that Windell said I have at times tried to show him, we've increased the beneficial use of dredge material a great deal, and I will say that the CPRA helped us in that they found the projects we were doing complementary to or consistent with the state master plan.

By the end of the year, I believe we will have restored 10,000 acres below Venice which, if you remember, some of you were here when Captain Miller made a presentation. There were two looked like beach areas along Southwest Pass. Those are the base of two lighthouses. I have to look at the 1871 and 1834. And those beaches were where that was restored.

But it also shows that, you know, it is a changing landscape, and by increasing the

beneficial use of dredge material, I think this year we will be at least 55 percent of the material beneficial use. So as we do that, and the one thing that I always say is we can do a lot of restoration with dredge material if we dredge -- if we beneficially use it close to where we're dredging it.

That's one of the big challenges, is it becomes very costly when you start moving it a long way away. But I want to -- I'm going to probably say something about Hurricane Katrina at the end, but these efforts and things going on here, and I know Brian is in the hot seat a lot, I'm in the hot seat a lot. We're all trying to work together and figure out.

But what may benefit a restoration effort may hurt navigation and may hurt, you know, another stakeholder group. There's a lot of impact to fisheries that are being discussed, and the other thing that I have to add is that we, as we see increased precipitation, these problems are going to continue to be exasperated.

We are at a time in our history where I know enough that I'm concerned, really concerned. You know, look at Bonnet Carre, all the operations of what we see is we're going to have more water to deal with.

So I'd like us to continue to meet behind closed doors with leaders and talk about the path forward because I understand the complexity of just hearing from a navigation guy, and then having to go in the next room and talk to somebody who may, you know, see things a little differently.

So there's a lot to the state master plan. It's very -- it's very hard to argue against beneficial use of dredge material, but that's not to say some people won't do it. But there are a lot of real-time positives, where you can see land built in minutes or marsh restored in minutes.

So I don't have a question. I won't do that to any of you, but I appreciate your panel and your knowledge and its comforting for

me to know that it's not easy, and I think you all added to my understanding of that. Thank you.

VICE CHAIR THOMAS: Thank you, Sean, for those comments. Rich, did you have a question?

MR. EDWING: This question is for Rick. Actually, it's a comment then a question, and the comment's about your bullet about needing a robust water level network, you know, for the models.

So the comment part is you're right. When Katrina and Rita hit, it destroyed all of the stations in its path with the exception of two stations, which were the only two hardened stations that were in existence at that time. That was Dauphin Island and Grand Isle.

Since then, all of the stations that have been reestablished have been hardened to some level. With all the hurricanes since, not just here in the Gulf but also in Florida and other areas, the tide stations have been, you

know, really surviving much better.

But the question is do you feel like you have enough water level information to accurately drive, you know, assimilate it and drive your models? More data is always kind of characterized as being good. But are you able to actually kind of say if I had three more tide stations, you know, located here, here, and here, that would significantly improve the performance of that model?

DR. LUETTICH: So I agree with you 100 percent. The gages are, have been hardened since, particularly since Katrina because of the lessons learned. And so we are very grateful for that, and you see them surviving these events. You see almost all of them survived Michael, a Category 5 landfall. And so that's, you know, quite impressive.

In terms of where else would we need gages, I don't have an answer for you. I can't give you lat-longs. Our biggest challenge now I think is really making this connection with the

land, with the hydrology. So it really is trying to model that, those processes, those processes that are becoming more and more important as we're seeing higher and higher precipitation, land falling events.

And so there's an aspect of this that may not be where along the coastline we need more gages, but it may be how those gages, how we penetrate inland with those gages to make that connection, and so that we can do a better job in that arena. So my sense is is that that's where, that's where we could have bang for our buck if you will, in terms of additional stations.

But it's certainly possible to look at specific areas with, use the models for that purpose. But I can't -- I don't have any pet places at the moment.

MR. EDWING: Thank you.

VICE CHAIR THOMAS: Thanks, Rick. We have a couple more minutes. Anyone else have a question? Yes. Go ahead.

Oh, hold your question for just a

minute because we're actually going to take questions from the Panel, and then we're going to go into the Public Comment. So if you want to just take a seat right there, we'll get to you in just a minute. Audra, did you have a comment you wanted to make?

(Off mic comment.)

VICE CHAIR THOMAS: We could. Audra and I were talking. We both have a couple of comment questions. You know, I'll just make one comment. It's such an eye-opener to be here for me coming from San Diego, you know. We have outreach people, Sea Grant people in San Diego. We do a lot of, through the IOOS region that I'm connected with in Southern California.

A lot of outreach and public engagement on climate change, sea level. Subsidence is there. We know our benchmarks are sinking, but we don't have the obvious. We haven't been through the hurricanes that you have. It's a different public, and even though they believe in climate change, when we talk

about sea level that's still a little bit too out there for them. They don't see the immediate impact.

And so I'd just like to hear, you know, I mean I'm assuming that here the public believes in sea level. They see these changes. They -- what type of response do you get from the public?

MR. CUROLE: They know, they know there's less land. I mean again, it's not something unique someone will tell you. This, we knew -- what we didn't know was the whys, okay, that's what really came out; with the 60s we had better research. We know the whys of it. But the other issue's that understanding, I believe we talk a little bit too much about the warming climate and not enough about subsidence.

It's important to be -- have the truth when you deal with stuff. The big issue is subsidence, which we can't do a heck of a lot with. Well, you need to know that, and then continuing measuring the sea level rise that

takes place and how it adjusts now and into the future is critical.

But yeah, people -- in fact I'll tell you this. We have a working coast. We have a real excuse to have everybody living on the coast. We're losing population on the coast. Even with the jobs, even with the fisheries and the shipbuilding, when the oil's doing well. People work from all over the country, you know, 7 and 7, 14 and 7, 14 and 14 and go back to their home.

And even in Louisiana, our populations have dropped in the Lower Bayous and have gone north, not because the jobs are not there because the jobs are still there, but living there. Leeville used to have 100 families. Now there's six people living there, okay. Still, you can do great fishing. You can do work, the boats are still there, but you can't do an everyday dry existence. So that fact is just there.

But it leaves an opening. Because of the storms there are teaching moments, and you're

always going to teach when you have those things there.

MS. COLLINI: So --

MALE PARTICIPANT: Oh, go ahead.

MS. COLLINI: Something I just want to bring up that this, I think, raises for me is that between what you have said and then what you said is that it's so place-specific. So here, subsidence is a dominating problem. But when you move over just a little bit to where I work in Mississippi, Alabama and then northwest Florida, sea level rise is sort of the dominating factor.

There, they're -- it's different that people see it, but they've been living there, these are rural communities, their whole lives. So there's not a lot of concern because the idea of acceleration is the thing that we're working on. So all of these tools help us have a data-based way to have the conversation.

But here, I think that it's just important that it is about the place and the people that you're working with.

And then I wanted to take a second too to highlight the difference between outreach and extension. So outreach is, you know, when you're talking to coastal residents, but coastal residents aren't necessarily users of data. They are beneficiaries of data, and then when you talk about extension, you're talking about helping people integrate into decision-making, the science.

So even then, you have differences in terms of what people's needs are and the kind of information that they need, and how they need it packaged to better meet their needs. Because in some places, they're a lot more advanced when it comes to subsidence and elevation problems than they even are over two states.

VICE CHAIR THOMAS: Brian?

MR. LEZINA: Just to echo that there's no correlation that I'm sitting between the two here on here. But looking in even Louisiana, I think you see a mix on there. You see folks like Windell says those of us that grew up in coastal

communities. In fact in a bayou just east of here where my family was, we're on pilings, right? Everybody's elevated on there; it's how you live.

You kind of got used to the fact that over decades, if you went out the front porch steps you might have fallen a little further than you did in the back porch steps, because the house wasn't settling on there but the steps were actually settling on some of this stuff. That was -- that was -- you get it.

But at sea level rise, folks kind of acknowledge it, but they don't acknowledge maybe the acceleration of sea level rise everywhere on there, because some folks haven't seen subsidence the same. They don't put the two kind of separating. So that's something that's hugely important, and that's why, you know, Windell showed that big red map. This is my first presentation in a long time I haven't shown the big red map.

So that's awesome, and folks look at

it and say oh, it's shock, it's awe. You want to do these things just to drive home sort of your message and your point. That's where we get into that run-in about, you know, look a little longer, look out to 50 years and while we're trying to put some bounds, put some real world information for folks after this.

Because we do see it. They might acknowledge it, but not to the extent that we're all kind of talking about.

VICE CHAIR THOMAS: Great. Thank you, and oh, Rick, go ahead.

DR. LUETTICH: Yeah. Just a couple of quick things. I also think that there's just been some very smart messaging done. You know, I'm not from Louisiana, but I certainly knew that Louisiana was losing a football field of land a day. So somebody has figured out some messaging, and similarly, the notion -- in North Carolina we have pushed back against the notion of sea level rise and in fact attempted to legislate against it.

And but the idea of the messaging of sunny day, nuisance high tide flooding I think has been critical to try to say this is what sea level rise, which is long and you may not think it's happening, is going to affect whether you can build there. But you're seeing it, and so it's -- and the first person I ever saw talk about that was Larry Atkinson in talks.

In fact, I asked him if I could borrow a slide of his probably ten years ago. He was showing, he was showing that information. So I think that messaging is really critical. I can also say from the perspective of Flood Protection Authority here, I think the authority feels like it struggles with messaging and keeping people well informed and that they appreciate just what the protection system around greater New Orleans does and doesn't do on their behalf. So again, I think it's a constant battle that needs to be worked on.

VICE CHAIR THOMAS: Okay, thank you. You know, we are running out of time. I want to

just -- I know Liz has a comment and Nicole, I know we've talked about this messaging in San Diego. Do you have any closing comments here? Not putting you on the spot or anything.

MS. LeBOEUF: No, not at all. I think that the points made about location-specific information is critical. One of the issues that we're sort of grappling with in terms of products and tools and visualization is what is our role versus the roles of folks on the ground who might know some things different or might know the messaging different or better, more tailored than us.

And so you know, a comment that I'll just make is, and we met with the Foundation for Louisiana and their partners yesterday morning, and it was a really powerful session here in front of the communities throughout Southern Louisiana about how they're -- the different parishes, how they're dealing with messaging to their own communities about these threats.

One of the issues that I raised for

them that we're talking about internally that resonated with them as well is that communication handoff, and how important getting the handoff right is.

So, you know, I'm doing this and I'm saying this, and I need, you know, maybe you to do this and say it differently, you know, and be very clear about how we're -- what we're doing and how we're messaging that, so that that handoff is quick and seamless and we're not giving different messages or different confusing tools and that kind of thing.

And that takes a lot of work. That takes a lot of work because there's so many actors and there's so many people that are doing what they think is right. But I think those handoffs are critical, and just saying let's just hand it off. You take that part, I'll take this part, and just that's got to be okay.

VICE CHAIR THOMAS: Okay. So I know that Windell's dying to say something. You have 30 seconds.

MR. CUROLE: But in -- what I've learned as a Sea Grant agent, as I teach -- is that make sure what you message matches what people are seeing on the ground. Observation is what the science is based on, and when we put a message that doesn't match what the people see, you lose everything. We don't do a good job. We worry more about the people farther away that don't see it every day.

Once we talk the same language and see what the locals see, then you can get your message across when you get that gap of some trust, and then you can build education on top of that.

VICE CHAIR THOMAS: Good point. Okay, Liz, closing remark.

CAPT KRETOVIC: No, it's a question for the panel. Thank you. Thank you to all of you on the panel. It was very thought-provoking, and all of your passion comes through loud and clear. Rick, this is a question for you, sort of around the requirements that you may have for the

near-shore mapping.

In terms of the resolution needs that you may have for bathymetry, do you have any idea of the resolution needs that you may have?

DR. LUETTICH: Vertical or horizontal? Both?

CAPT KRETOVIC: Both, and also across what depth range, zero to 30 meters relative to mean sea level?

DR. LUETTICH: Well, so the areas that are probably the most poorly represented in existing bathymetry today are inside sounds and estuaries. So an awful lot of those are -- now sometimes the dredge channels are at least -- we know what the authorized dredging depth is, even if we don't know exactly what the current depth is.

But a lot of the depths around those areas are completely, you know, completely absent or very, very old. So I don't know that I have a -- it's not as simple as the deep ocean coming up onto a continental shelf and once you get inside

the 20 meter or something, all of a sudden the data isn't there.

It's more geospatially in those types of water bodies that the data is by and large missing. Now that being said, as I think was mentioned earlier this morning and this is probably even more of a west coast problem but it's also an east coast problem with our shifting barrier islands and all of that, is that as you get into the surf zone and the real near shore, things are changing very dramatically.

So keeping up with that is a challenge, and that's really important as you start to try to understand what the run-up of the water is that is associated with the waves that come in shore. That's very sensitive to the beach face slope. And so there's a number of different areas that by virtue of lack of sampling or rapid change, that we have real challenges with bathymetry.

And then the other areas are just simply this area at large that's subsiding so

quickly and things are just flat out changing. So those are kind of the priority areas for bathymetry. I don't know if that answered your question.

CAPT KRETOVIC: I believe it does.

DR. LUETTICH: Yeah.

CAPT KRETOVIC: Thank you very much.

DR. LUETTICH: Sure.

VICE CHAIR THOMAS: Thanks, Liz. So I know we're getting into -- you know, I just really would like to thank first the panel here. It was a really nice diverse opinions and impacts and whatever down here. It's just an amazing location. So thank you all very much.

(Applause.)

VICE CHAIR THOMAS: Ed, do you want to take the public comment?

CHAIR SAADE: Okay. It's time for Public Comment online and here in the room. So, Qassim, if you want to go first? Please identify yourself.

DR. ABDULLAH: Yeah, thank you.

Qassim Abdullah with Woolpert. I was going to ask the panel but it can be a general comment too. On the -- we notice the last couple of days there is a lot of issues associated with the vertical datum of data and historical data, because this is always confusing topic, intimidating topic.

A lot of people don't understand it, and it's causing -- on the practical level it's causing a problem. Now we see from Galen's presentation what the NGS is doing. The 2022 is coming, the NAPGD 2022, you know, which is if you're not familiar with it already, is a true gravitational model to model the elevation.

You know, this is the most accurate thing we ever achieve in the -- the professor give us great introduction to it where we are. So now we're going to model elevation to one centimeter to two centimeter accuracy. The nice thing about the gravitational model, it is almost sea level, you know. So my invitation or my question is can we use, as we move into the 2022,

can we just migrate, leave all the low mean water. Low mean water is a problematic now. The harmonic cycle of 11 years with the sea level rise, and with the global warming.

I don't think it will be as reliable as a gravity modeling, you know. So can't we just leave all these behind and we use one unified national, where you're going to be geodetic and going to be tidal water. The reference to very accurate geodesy model, you know. So and the nice thing is like again that's very important is reference to the sea level. It's almost sea level, you know.

So when we talk about navigation, people can relate to it, you know. So that's really my question. I think we should -- we should push it toward, push not just NOAA, the Corps for the interior navigation. Stay away from these confusing, you know, datum, different datum, and stick to where we nationally move the nation to that, a new system and stick to the 2022. That's really my comment and a question.

Thank you.

CHAIR SAADE: First of all thanks, good stuff. I don't know if Juliana here or anybody wants to respond.

MS. BLACKWELL: This is Juliana Blackwell. I'll just, maybe just say a few words along the lines. It is our hope that utilizing GNSS, taking the ellipsoid heights, applying the North American Pacific Geopotential Datum of 2022 will solve a lot of these problems. We have a long way to go to, one, get to that point, which is only just a few years away so we're working hard to make that happen.

But really about taking data, getting new data, updated data no matter where you are in your dynamic environment, and making sure that we have new information and apply the datums properly. I think there's -- I think what Qassim has commented on is certainly the vision that we have, and is really the fruition of the National Height Modernization Program that Cliff alluded to in the study that was done in the late 1990s,

that sort of -- that kicked off the use of GPS to get not only ellipsoid heights, but to get the elevations and have that be relative to sea level through the geopotential datum that we're developing.

So we're all -- we're moving in that direction. I know that it's confusing, but there's going to be a lot of historical local datums, whether they're geodetic, river, tidal. There's going to be a lot of work to be done to get that translated and understood. But hopefully the idea is that the future will be a lot more simple in trying to connect both water and land using one common national geopotential datum.

So we're working that way, and continue to invite you to help us with case studies, to make it relevant to your areas of expertise and your geographic areas. So we can prove this and show -- and get the locals talking about how important it is and the benefits of it. So thank you.

CHAIR SAADE: Thanks, Juliana. Any other questions from the room?

MS. COLLINI: I have a public comment whenever it's appropriate. You can go first.

MR. DAVIS: I don't know if my -- oh, I'm good. So I guess this question is kind of related both to the panel and to NOAA at large. As a surveyor here in South Louisiana for six years, I've worked for both the Corps of Engineers, seen it on the government side, and now on the private industry side.

You talk about datums. It's always -- I think that NOAA does a really good with the water level datums. We have such a good -- -- such a good job that NGS does on the terrestrial side. I think what we're lacking is where those two meet, which is on a coastal area. I'm sorry.

Also, my name is Thomas Davis. I've lived in New Orleans for the last six years, originally from Texas. I worked for the Corps of Engineers for the last five years and just recently switched over to a private engineering

firm building marine terminals on the Mississippi River.

So I think that seeing it, seeing our perspective of being here in the nitty-gritty and trying to work with these in an ever-changing environment. I think that the biggest lack that's communicating is when land and water meet. So specifically like anything that talks about coastal, right. So when we go from the water to the land, especially on the Mississippi River.

I think that NOAA does a good job in the tidal world and in the land world, but I think where they're missing is the two. So I think that -- so if anybody looks on CO-OPS, all the gages in South Louisiana are pretty much missing NAVD 88 ties, which is for a variety of reasons. So I was wondering, my question to NOAA and to the Panel is I think that creates so many problems for us on the surveying side.

Everybody's, since it's not published, number one VDatum's out almost 50 centimeters here, right? So people that are using VDatum

aren't talking to the same people that are using gages, because they don't publish an NAVD 88. So everybody goes and publishes their own NAVD 88 on the gage.

So I was wondering is NOAA working towards publishing those NAVD 88s, maybe with some kind of unknown inaccuracy on them? And then just moving forward, is also VDatum going to get more accurate, because I think that's what everybody wants to use. It's the easy answer, right? You plug it in, you get an answer out. So I think that just those two questions.

So I guess my answer is two part. Number one, is NOAA going to publish better guidance on gages? So that's to NOAA, and then my question to the panel is how are you guys using -- are you guys using VDatum or are you guys using CO-OPS gages?

CHAIR SAADE: Juliana, you want to go first?

MS. BLACKWELL: This is Juliana Blackwell. As I said before, I mean we're

working on providing an updated geopotential datum with -- there are not good NAVD 88 heights. We've talked about the lack of new observations, the fact that many of the marks are no longer above water or, yeah, they're below the water surface now.

It's impossible to recreate and update all of the NAVD 88 benchmarks that were available in the past. Therefore, you can't really have an update to VDatum. We need new observations. We need a new geopotential datum to replace NAVD 88. It's not -- certainly in this area, it's not a model for success to try to continue to rely on passive marks to determine the datum.

But the importance of having repeat GNSS observations on marks that are available is critical for us to be able to update and provide velocity models, inter-frame velocity models for the area in which you all are working and making those connections to water level stations. And so having GNSS and increasing the number of observations, feeding that data to NGS and then

enabling us to provide updates and keep those marks and the coordinates and the elevations and the heights fresh is really important to have, have crowdsource information that meets our criteria for geodetic control, so that we can continue to keep that fresh and put it into our conversion models and provide that to Stephen White so that he can build that into things.

But it's not going to happen quickly. So there is no -- there is no quick fix to this. This is something that we've been working on and we'll continue to work on, and unfortunately this is one of the areas where it's just really tough to do. But we welcome your support and we'll continue to work with you and work through our regional advisors to figure out how we can do that better.

We'll also continue to work with our geospatial modeling partners, with the University of Southern Mississippi, Texas A&M-Corpus Christi, Louisiana State University; we've got Alabama involved as well as Florida.

There's a partnership effort there to figure out how we can get coordination in getting additional observations to help make this better sooner rather than later. But bear with us, we're working on it. Thank you.

Rich, do you have anything you want to say?

MR. EDWING: I'm really just reinforcing what you're saying. I mean it is our practice to publish NAVD 88 on our benchmark sheets when we have good connections between that datum and our water level stations. But that's just not been possible down in Southern Louisiana because for the reasons Juliana just stated.

But the solution is, and that our offices are working together in bringing cGNSS and the water level stations together. But it's going to take new datums to really allow that problem to be addressed.

MR. DASLER: Jon Dasler, David Evans and Associates. So I understand the problem with the passive marks and hopefully as we move

forward in datums, I mean passive marks and keeping updates on passive marks is going to be a never-ending battle that ultimately probably needs to be abandoned, right?

In the interim, just having tidal datums and things relevant to ellipsoid heights would be a great benefit, right? I mean those things should be -- you know, it's not as much as a moving target, it's a little more fixed. Having that update would certainly help. I totally get the comment relative to the marks and the challenge in the professional surveying community in bringing that together. But having ellipsoid heights published would be of great benefit.

Just I guess one more comment, I guess, on the datum thing. I'm not sure if I understood, Dr. Abdullah, your comment. But there is a tremendous need for gradient datums and tidal datums. I mean you need to know where things are wet from aquatic vegetation and permitting, and then navigation.

I mean the whole point of mean low level water for navigation is if a mariner doesn't have tide predictions, they have conservative depths, right? So again, that critical tie of those two datums is really vital for the surveying community, and getting -- meeting the different needs of the users. But again, I think using ellipsoid heights as that could be a good short-term solution. Thank you.

CHAIR SAADE: Thanks, Jon. I think there was one last comment from the panel, and then we've got to break for lunch.

Oh we have one more? We'll do one more public comment, sorry.

I'm sorry. We're going to finish up with the public comment over here.

MS. FRENCH: Thank you for giving me the chance to say this. Yesterday, you guys had asked about -- my name is Wendi French, Wendi Couvillion French. My name's Wendi. I'm a GIS consultant here in Louisiana, and I've been doing GIS for 30 years, since 1990.

So I wanted to just kind of comment on your conversation yesterday about the priorities of what issues should be at your following meetings about internet of things and AI and emergency response. I started my career doing Superfund litigation cases with the New York Harbor cleanup and the Richmond Shipyard cleanup in California, and we spent a good five years with Barataria-Terrebone National Estuary Program here, and ended up doing emergency response for the state for the hurricanes here and the BP oil spill.

To say that, in 1990 when we were doing GIS, there was not that much desktop mapping capability at all. NOAA has come along with several programs that has fostered the actual development of base map data. NOAA Coast Now, the nowCoast, was instrumental in both Hurricane Gustav in (microphone interference) Louisiana.

As for an economic value of what your data was. The parishes that we've used Coast, we

used the nowCoast for the (microphone interference).

Sorry about that. We received our payment reimbursements quickly and rapidly using those base maps. The fastest way to make a municipality go underwater fiscally is to not pay those reimbursables, and for us to be able to track exactly what happened and when.

And as we were moving supplies around, we were completely documented up and received our payments fast enough to keep our parishes out of bankruptcy. So I wanted to transition to that to say that water is -- every piece of the water column plays in our economic cycle. Whether removing the dredge from the bottom or we're paying attention to the salinity rates for the fish population, or we're tracking it to see if we have invasive species coming in on the ports.

Insurance is a place where these data sets help us mitigate risk, and there's no way to exponentially figure out the impact that these new systems are giving us the ability to move

money around and solve critical problems that in the past have been just beyond our reach.

In Louisiana, we've had not enough money to do the things that we need to do. But with a collaborative working environment, we've always been able to play a chess game, where we've been able to say you do this and I'll do this and we'll just patch it up and get a better accuracy later, but we need something.

It's really appropriate that NOAA is inside the Department of Commerce, because I think you guys have a huge role of policy and governance and authenticating data sets. The ports are the gateways to the global economy, and anything that you decide here for the tenants and the pilots, they're going to get used to those tools here in America.

But they don't stay here. They're traveling all over. So you guys have a unique opportunity to set the right structure up, about how to bring in new data sets and let the private sector lead that way with authenticated actual

data that decision-makers, insurance risk monitors, stockbrokers, supply chain, block chain can follow up on.

Without your support, those things won't happen and other places in the globe won't get that experience that we're getting here. So I don't want to scare you, but I want to encourage you.

CHAIR SAADE: Thanks a lot. Okay, we have one more comment, and then we'll have to break.

MS. COLLINI: I'll be quick. I'm between y'all and lunch. I essentially just wanted to say, and I didn't put this in my talk because I didn't know exactly how it refers specifically to CO-OPS, Coast Survey and NGS. But we've spent a lot of time talking about all-hazard, about sea level rise and sort of a little bit with subsidence. But a big need, especially across Mississippi, Alabama, and northwest Florida is understanding how sea levels coming up are going to reduce the capacity of our storm

water systems, who are all gravity-fed with the exceptions of some communities here in Louisiana.

And we're really suffering from increased precipitation-driven flooding that is a result of our storm water systems not functioning as well. We don't have research really on that to help quantify what that might be, and I think the role of these organizations is to provide supporting data that will enable that research to move forward.

But I just wanted to get it on the record that across the states, this is a very real problem, moving from univariate hazards to multivariate hazards and considering them together and how they're going to interact with each other. Thanks, y'all.

CHAIR SAADE: Thanks, Renee. Okay. Thanks, everyone. It's great to have good feedback. I really appreciate the public's participation as well. We're going to break until 1:30? Until one o'clock. See y'all back then. Thanks.

(Whereupon, the above-entitled matter went off the record at 12:14 p.m. and resumed at 1:09 p.m.)

CHAIR SAADE: So we're going to do the general wrap-up right now, specifically for the bullet items and things we want to put into the letter. So Julie's going to go ahead and lead that, and we'll get your feedback now.

VICE CHAIR THOMAS: So I have been making a note of items that came up, and I want to say that I did look at this last night after my couple of glasses of wine at Sean's. I realized that there's still some topics that we have mentioned in previous letters, and they're still important. So I'd like to read -- I'm going to just focus on the recommendations, and I have still six of them or something.

So if you don't mind, I'll just go through and tell you the topics here, and then you can comment on them, keep, take out and then we're going to ask for any additions that people might have. The first one is this continuous

investment in establishing and maintaining the CORS network, and I thought with that -- so we've heard a lot about how important this is, and I thought what we might do is just add another sentence there and talk about how particularly critical in the Mississippi River region and these accuracies are important.

I thought Juliana, Sean, a few of these people can help me word it correctly, okay? Is that -- that's a keeper, right?

MEMBER PAGE: It is, yes.

VICE CHAIR THOMAS: Okay. Number two, this is the navigational restricted visibility portion. So this is the fog sensors that came up again. I wanted to work with Rich on the exact wording here, but I'm assuming that that's still a keeper. Is it? Yes, okay.

Number three, all right. This is supporting emergency response and sea level rise studies. We might do sea level rise/subsidence studies based on the discussions. But we did have a section last time regarding that, and what

about that one? Okay, okay.

I'm going to put it in right now. Sea level rise/subsidence, okay. That one's done. You're going to see this letter, and you can wordsmith it and help me with the wording. But I just want to get the ideas. Okay. Now this one -- last time we had this thing about the Coast Guard and AIS.

Based on the discussion and what we learned, I was thinking about deleting that as a recommendation and up in the letter portion, like we said, thanking and how we appreciate the progress that's been made on that topic. Is that okay with folks?

MEMBER PAGE: I think so. I don't think it's succeeding, I think it's making progress on --

VICE CHAIR THOMAS: Right. So I put it -- okay. I should read you what I actually put in. I put a sentence in.

MEMBER CHOPRA: Julie, can I make a suggestion? So because NOAA is also leading CMTS

at this time, in your letter which you're sending, maybe you can split it in two parts. One would be which is purely related to NOAA, and one which is related to as a leadership point within CMTS, because Corps of Engineers is involved or Coast Guard is involved. That's where the split would happen.

So I don't know how you think it's better to word it in your letter, where certain items are applicable to CMTS, and certain are applicable directly to NOAA. Does that make sense?

VICE CHAIR THOMAS: Let me just say one more comment here. I do congratulate Rear Admiral Gallaudet on his appointment as chair of the CMTS. "We were pleased to hear from the Admiral that his goals of assessing the state of marine transportation, advancing technology behind it, and continuing the effort of product integration. These goals align well with the priorities of HSRP."

And then I say that we're pleased --

further down, "We're pleased to learn of the progress regarding the Coast Guard's effort towards AIS." I mean I was going to just put a statement in there. Okay. So like I said, I was going to take this out as a bullet of recommendations, and just acknowledge it up front. Okay.

The next one is to do with PORTS, the continual advancement of PORTS. I think this is actually a large section. I think we can cut it down some and make it more succinct. Rich isn't here, but we have heard quite a bit how PORTS is still useful, so we'll keep it in there, okay.

The next one is support the efforts to expand 3D Nation, Ed and Juliana and all, from the shoreline into the deep ocean, and so keep that as a bullet, as a recommendation?

MEMBER MAUNE: 3D Nation from the land area to the ocean. It's not just on the shoreline now, it also includes land.

CHAIR SAADE: And the mountaintops.

VICE CHAIR THOMAS: Mountaintops --

MEMBER MAUNE: From the tops of the mountain to the depths of the ocean.

(Off mic comments.)

VICE CHAIR THOMAS: All right. So we'll keep that one. Is this -- is this still applicable, the -- last time we said one example of the critical application of this effort was Gallaudet's reference to the White House increasing interest in the Southwest Pacific as an area of key strategic importance for the country, and NOAA will be working to fulfill their hydrographic mission in --

CHAIR SAADE: Definitely. He was in --

VICE CHAIR THOMAS: Leave it in there? Okay.

CHAIR SAADE: Yeah, and two reasons. The Admiral mentioned it, and it's a nice lead-in to Hawaii.

VICE CHAIR THOMAS: Okay.

(Off mic comment.)

VICE CHAIR THOMAS: Right.

(Off mic comment.)

MEMBER MAUNE: -- in the oceans. I'm sorry.

VICE CHAIR THOMAS: Do we want to put that level of detail, or do you think just mentioning their work would be okay, or do you actually want to mention the minerals?

MEMBER MAUNE: Well, if you can put it in a sentence, that the Pacific Islands are important for a number of reasons, including the search for critical minerals.

MALE PARTICIPANT: Rare earth minerals.

MEMBER MAUNE: And rare earth elements.

MALE PARTICIPANT: Yeah, rare earth elements.

VICE CHAIR THOMAS: Do you want to send me -- send me a sentence, okay?

CHAIR SAADE: Yeah, and let's not forget, we're going to be able to edit all this. So this is kind of brainstorming right now.

VICE CHAIR THOMAS: Yeah, but the more I can get written sentences right now, the better because I have a short time line.

CHAIR SAADE: So I would suggest the more sentences you put in, the better, so that we can edit everything down, okay?

VICE CHAIR THOMAS: Oh, I see what you're saying, okay.

CHAIR SAADE: Okay. I don't think we should leave anything out if anybody has a point of interest.

VICE CHAIR THOMAS: Got it, got it. We're putting it in.

CHAIR SAADE: So the other thing along those lines relative to Gallaudet is I don't know how many times he mentioned this White House summit in November.

VICE CHAIR THOMAS: Okay. So I've got -- that's coming.

CHAIR SAADE: Okay.

VICE CHAIR THOMAS: That's coming. Let me just do my, the last bullet that I have

for recommendations, and, Sean, you were going to send me a sentence on this. But I do -- I was thinking that we could mention something about the multibeam surveys and about maybe in the Mississippi River delta like expanding or whatever. What do you think?

MEMBER DUFFY: I'll send you a sentence, and I'm happy to --

VICE CHAIR THOMAS: You did send it to me?

MEMBER DUFFY: Yes, ma'am.

VICE CHAIR THOMAS: Whoa. That's because I'm behind on my emails.

MEMBER DUFFY: I didn't want to call you out.

VICE CHAIR THOMAS: Thank you. I appreciate it. I will get it -- I will look at my emails some time in the next day. Okay, that's great. So we have whatever Sean sent me a bullet here on the multibeam. And to your point, Ed, I put after all of this, I said "Rear Admiral Gallaudet mentioned the proposed White House

Ocean Science and Technology Summit. As you know, the HSRP has many members who are subject matter experts in mapping and hydrography. Please let us know if we can help out in preparation or presentations for this meeting." So I mentioned it.

CHAIR SAADE: Okay, that's good.

VICE CHAIR THOMAS: Next. What are -- that's okay. That's about as many ideas as I have in here.

CHAIR SAADE: Okay, so I've got a few.

VICE CHAIR THOMAS: Okay.

CHAIR SAADE: And I can say -- you don't need to write these down necessarily.

VICE CHAIR THOMAS: I'm not going to write them. I'm going to check my --

CHAIR SAADE: So we've got to mention the 14th anniversary of Katrina landfall. I'm not sure how to word it, Juliana, but the GPS benchmarking volunteerism advocacy. If you can give us a sentence or two, we need to put that in.

VICE CHAIR THOMAS: We could put that actually in the Corps -- or the Corps section of the recommendations.

(Off mic comment.)

CHAIR SAADE: Advocate. I was going to write a sentence advocating for multibeam Echosounder using the words that were from the panel members.

VICE CHAIR THOMAS: Okay. So that will go in with Sean.

CHAIR SAADE: So the two of us can bounce that back and forth. I really like the quote "we want to get the most draft." I don't know how to put that in there. You got the White House Summit. How does relative to critical minerals and deep ocean mining and Seabed 2030, how does the NOS/OCS play into all that? I'm not sure how to word that question either.

VICE CHAIR THOMAS: Yeah. Can we put that in with --

CHAIR SAADE: Or maybe we could recommend how NOS/OCS should play in all that.

Maybe that's better.

VICE CHAIR THOMAS: The 3D Nation. Well remember there is a 3D Nation bullet here for recommendations.

CHAIR SAADE: Yeah. We could weave all that together. That's good, that's good, yeah.

(Simultaneous speaking.)

VICE CHAIR THOMAS: --if we could put it in there. Okay. I think what I'll do is email this out to you, or Virginia's very good at emailing it out to the group. Right now, even though it's very much in draft form, just so that you can see some of the writing that was in here before. And then you can like work in the 3D stuff and everything, okay?

CHAIR SAADE: Yeah, yeah, good.

VICE CHAIR THOMAS: Any other comments?

MEMBER HARGRAVE: I have one quick one. We've talked about the Mississippi River, but we haven't talked about Port Fourchon, and I

think it's important to at least capture that and I don't know if the letter is the right place to do it. But the entire energy industry in the Gulf of Mexico goes through Port Fourchon, and the same problems that Sean's talked about these last three days apply there as well.

And unfortunately I'm not expert in framing exactly what the issues are there. The director of the port is here and could possibly help us with that. But if that can be worked in, I think that would be good.

VICE CHAIR THOMAS: Sure. We can wrap that into the language for the Mississippi River delta. Did that not --

MEMBER DUFFY: That might be a good place to do that, and not to cut that out in any way but related to coastal land loss, those impacts, and because the port systems are different. But I don't mean to -- I'm fine with the thought. I just think how we include it, we'll have to look at it. But happy to take input and complete that goal.

MEMBER HARGRAVE: The comment that I heard was related to not being -- having to close the port and not being able to open it until the authorities allowed it to be open, even though the port has the means internally to do the same work and open the port sooner. I think that was kind of the concern.

So in a way it relates to multibeam and being able to turn data around quickly in a usable way.

MEMBER DUFFY: And that's true, and the other side of it is, at least to some degree, the reopening is really impacted by the road, the accessibility by roads. If Katrina taught us one thing, it's we could move on the water quicker than we could on the roads.

VICE CHAIR THOMAS: Okay, Virginia? Yeah.

MEMBER PAGE: I was just curious about Port Fourchon. But other areas, was it the case that the other areas were surveyed and there were no obstructions in the bottom? Did they do that

for Port Fourchon? The Coast Guard shut it down because of some reasons or I was just kind of curious. What really was the reason behind Port Fourchon not opening I guess?

MEMBER DUFFY: So I mean one of the problems of answering that is we have to shut down multiple times every year for different impacts. So if it's specific to Katrina, I couldn't answer that and I'm happy to -- like I think we can fine tune that and include it. I want to be clear, I didn't want to cut it out. I just wanted shape it into what we were talking about.

But right, because I mean that -- you've seen one port, you've seen one port reopen, too, is really --

(Simultaneous speaking.)

MEMBER PAGE: Gotcha, okay. I was also going to add, and I don't know how you -- maybe I didn't pay close enough attention to what you said as far as the letter, but if so I apologize, but I was kind of thinking at the same

time. But maybe reinforcing this -- apparently the term that they like to throw around, and I think we can embrace it in this blue economy concept, that you know, our visit to New Orleans, you know, was a great example of the blue economy, the impacts of the blue economy and what a vital role that NOAA plays in ensuring the blue economy is sustainable. So something along those lines, because I think blue economy --

VICE CHAIR THOMAS: So that's the opening statement.

(Simultaneous speaking.)

MEMBER PAGE: Something like that. I don't know if it's an opening but I think it's a good thing to open, because I think we went to New Orleans, you know. I think most of the impact is like wow, this really impacts the country. This is the blue economy. If you want to define blue economy, I think I could do it better here than talk about Alaska quite honestly. I might start off with an argument talking about New Orleans and how impactful it is

to the whole, you know, central of the United States, and then how vital, what a big role NOAA plays and the National Ocean Service plays in facilitating this blue economy and keeping it up and running.

So I think that's kind of a powerful story, why we were here, you know. It kind of reinforces why we move around the country, because my eyes are opened much bigger now that I've seen other ports, and then we can contribute more understanding what your roles are. So I think to capture that, the why we showed up in New Orleans versus in D.C., in the office in Silver Spring, you know, is because of things like this.

So anyway, I would kind of urge some kind of -- and if you want, I could help give a first draft of the language of that, while I have it rambling through my mind.

VICE CHAIR THOMAS: You're about -- except for my Internet is not working right now. My wireless is not connecting. I tried to send

this letter to --

(Off the record comments)

VICE CHAIR THOMAS: Ed, I was just going to say, when you get this letter, if you could just -- you'll see the blue economy mentioned right up front, and if you could go ahead and just edit that sentence right there, that would be great.

MEMBER PAGE: Okay. All right, done.

(Pause.)

VICE CHAIR THOMAS: Ed, all right. So hold on. So Lynne, I don't think you were in the room. The Emergency Management Group doesn't need to meet. So we're trying to do everything other than issue papers first, I think is the idea.

So Lynne suggests that we run through the meetings for Hawaii and San Francisco real quickly as far as what we have so far, and I have been on one planning meeting for Hawaii. Most of you know Joyce Miller who -- Joyce used to be chair on the HSRP for eight years. So it's

really great, because she is in Honolulu and she is helping out with the planning of the meeting.

And I know quite a few people because we've done so much work at the University of Hawaii at Honolulu, and I've been working already to set up a panel on sea level over there. It includes people from the Army Corps, people from the National Weather Service, Chip Fletcher, who's known on Hawaii as one of the key -- in the Pacific Islands as the key sea level person, and John Marra from -- what is he, who is he with? He's with NOAA. He's a NOAA employee in Honolulu. Anyway, there's quite a list of people that have a lot of expertise in that region.

So I've kind of been connecting with that and seeing who we can have and set up over there. Do you want to talk about it some more Lynne?

MS. MERSFELDER-LEWIS: Okay. Sorry, technical difficulties. I like these different push to talk mics. We've got the dates. Again, I'll run -- it's April 27th, the week of April

27th, likely our same pattern which is fly on a Monday, meet Tuesday-Wednesday-Thursday, depart on Friday or depart on Thursday night. We are going to be in Oahu, likely in Waikiki. Once a long time ago NOAA had me go to Hawaii all the time to run special events and meetings and workshops.

So I've got a bunch of contacts and a lot of people stay in the same jobs there, so they're all the same contacts. So we'll find some, a great place to meet. I want to just mention the meeting team and partners first. You might have heard, it's Ed Carlson. He's a geodetic advisor for NGS. It's Crescent Moegling. She's our NAF manager for the Pacific. She's out of Seattle. It's Laura Rear McLaughlin from CO-OPS, and it's Galen Scott and NGS as well, and then it's Julie Thomas and Joyce Miller, who's our past chair, who had offered before she even left, she knew the meeting would be in Oahu in a year after she had left. And then there are regional team coordinators out

there. There's a bunch of Weather Service folks out there, so we'll involve some of those folks.

Rick Brennan generously offered to also help us, and Liz Kretovic also was a captain of one of the NOAA ships out there. She has a lot of experience in Hawaii. So we have a lot of -- there's a lot of stuff going on in Hawaii and in the Pacific. So we'll also consider the rest of the Pacific.

NOAA has a big presence -- a small presence compared to the rest of Ford Island. But we have a presence there. We have a presence there. We have a new, relatively new Estuarine Research Reserve. We have their partners at University of Hawaii and NOAA that do research on Coconut Island. There's all kinds of cool stuff going on.

There's also a really awesome container terminal that MATSON runs, and that's another possibility of something we might do. Some of the past ideas, not incorporating the stuff we talked about today because I haven't

updated those notes, but we did talk about doing a big ocean mapping piece, hydrodynamic modeling from OCS and model validation and training the models and maybe an IOOS, or we may move that to San Fran.

VICE CHAIR THOMAS: We're going to move the hydrodynamic one --

MS. MERSFELDER-LEWIS: To San Fran, right, okay.

VICE CHAIR THOMAS: --to San Francisco.

MS. MERSFELDER-LEWIS: Okay, so San Fran. And then a sea level rise session/resilience, probably co-chaired by Julie and then she's going to decide who's the other co-chair with her. There's a lot of stuff going on in datums in Hawaii and maybe even the new tidal datum updates and new geodetic datums coming soon.

So I want to look at Juliana, and I know Juliana mentioned there's a lot going on in the Pacific, and so you might want to -- would

you follow-up after we go through this. So you guys these are the notes from the, excuse me, the couple of meetings we've actually had.

One of the NOAA ships is out there and also launches are out there right now doing work, and I might have Rick Brennan comment on that, as well. Joyce has already been in contact with the University of Hawaii. They have a marine center and both her husband works at the marine center on the ship research projects, and as well as our old Rear Admiral Anita Lopez.

So she also went to the Hawaii Ocean Safety Team meeting to talk about them, to talk with them about ideas for their topics and to let them know we're going to be coming. Brian Schatz, who used to be Lieutenant Governor at the time, spoke to the HSRP when we were last there, and he is now the senator. And so either he or staff might be available.

We are not going to be there during Congressional break, so it's unlikely we'll get him but you never know. She did say the last

meeting, the pressing issue was sea level rise, and it's a nice continuation of the topics you guys have been talking about since Miami.

So Joyce also wants you to consider there's a cultural ship that is called the Hokule'a and it's a native Hawaiian made ship that tried to recreate a Pacific navigation itinerary, and she would love to somehow have that. It's a very large canoe, somehow have that integrated into the meeting if it was possible.

And then there's -- it's not always in Hawaii, right. It moves around, but right. So that's another kind of cool, interesting thing. You guys, there's a lot of traditional things in Hawaii in terms of fish ponds and early sustainability management of coasts and fisheries. So if, you know, if there's the right mix, we could try to also mix those.

Also Joyce has offered us to do member hospitality at her house, which is super nice of her. So we'll try to take advantage of that, as well.

VICE CHAIR THOMAS: Only fruit and yoga.

MS. MERSFELDER-LEWIS: Right, only fruit and yoga right, okay, and a little bit of poi. I know that there's work from NGS going on in American Samoa and Hawaii and airborne gravity surveys, and -- excuse me, and quite a few other things. I'm going to actually call on Juliana and then Rick. If you -- we would really love to hear what ideas you have.

MS. BLACKWELL: Thanks, Lynne. We can cover all of those things as far as giving a status update on where we have and where we plan to finish up our modernization efforts with the airborne gravity collection. I do think it would be really helpful to have our advisor, Ed Carlson, who's been mostly the point person in interacting with the other territories, do an update about the work that he has been championing out there in form of doing workshops and talking with other island nations, and just give an overview of some of the other activities

and how it will fit in with the rest of the agenda as we look at the entire -- perhaps look at the entire Pacific in support of some of these national security issues.

So I would like to pencil Ed in as somebody who would not only be there present and help plan this, but also give a Pacific Islander update as far as the geodetic work being done. I think we could also tie that in to some of the needs that we're still trying to fill as far as the Pacific Plate, because primarily we're talking about the North American Plate when we're here, and I think there's some other challenges with the data that we need to be able to be successful for our modernization efforts.

Obviously, coastal mapping, you know, is needed everywhere. So there's another element of that. We can basically tie in everything that we're doing with the Pacific Islands. So I don't know what else you're looking for right now, but I think we certainly can fill in a number of details as we work through the planning for this.

MS. MERSFELDER-LEWIS: Thanks Juliana, that's perfect.

CAPT BRENNAN: So there's a couple of things going on. We -- I think since the last meeting, we had the Hi'ialakai had been taken offline and we've redirected Rainier to the Pacific Islands. So Rainier's there now working northwestern Hawaiian Islands, doing mostly reef assessment and monitoring work.

But she did discharge her launches and the launches have been surveying on the north side of Maui and on the south side of Molokai, and doing hydrographic surveys in those areas in the different ports there. So certainly there would be an update here. But I think in the bigger scheme of the Pacific, I know there were -- there have been interests in NOAA taking a larger charting role in the Pacific Islands and how we would fit into that.

When you look at the Seabed 2030 arena and you look at the volume of data that is in the Pacific Islands that needs to be mapped, that is

a significant issue there. So talking about the pertinence of mapping to the larger Pacific community, I think, you know, could be resonant.

I think the other hot topic that has been bubbling up in our arena is critical marine minerals, and when you look at the permissivity maps that USGS has of those minerals, a lot of them exist within our EEZ, within our current EEZ.

That's not even the extended continental shelf understanding of that in the Pacific Islands, because those particularly manganese nodules only exist in the deep water. Then there's also areas of hydrate crusts out there as well, and so -- and from a national asset, the biggest issue is a lot of those areas, at least in the public domain, I'm looking at my Shell and Fugro friends, you know, that information does not exist.

And so there are major mapping gaps that need to be acquired there, just so USGS and BOEM can make assessments on the lease blocks

for those, and so that was -- that was the outfall of a recent meeting that NOAA and BOEM and USGS all participated in, to talk about critical marine minerals, and that consistently revolved around the Pacific.

So I think that also is one that would be timely and interesting. As far as the Hokule'a goes, sanctuaries has had Nainoa Thompson, who is the -- I think he's the current president of the Polynesian Voyaging Society. If there's any way that you can get him on the agenda to talk, spellbinding and really interesting discussion about voyaging and how that, you know, the history of them in the Pacific Islanders, and how they've resurrected voyaging just from a general interest level.

I'm not sure exactly of its pertinence to the board, but you know, it may be that a dinner or a lunch or something. If we could get him in, I mean it's really, really interesting from the perspective of the Pacific Islands and that cultural heritage that they carry there.

MS. MERSFELDER-LEWIS: Traditional knowledge of navigation.

CAPT BRENNAN: Yeah absolutely, because there's no -- you know, they do this thousands of miles without the first stitch of electronics, and it's all based on birds and clouds and stars and wave directions and sticks, you know, it's sticks and shells are their maps, which are really amazing, you know, to look at their voyaging maps that they make.

So I think from that level, it would be a really interesting talk to have him come in just as a general perspective goes. So those would be my ideas for that.

MS. MERSFELDER-LEWIS: That's excellent and I really appreciate it. Rich, if there's things you'd like to highlight. Laura has given us a list, but if there's stuff you want to mention.

MR. EDWING: Okay. Hopefully what I mention matches what Laura's provided. So I can't say we have a tremendous amount going on in

the Pacific. We certainly have an NWLON network out there. There are about I think six or seven stations on the main Hawaiian Islands, and then stations in some of the other territories like American Samoa, the Marshall Islands, Guam, Wake, Midway.

I would say for that part of our network, it certainly helps with safe navigation. But they don't really have the navigation challenges in the ports and harbors that we see more typically around CONUS. Really the value, I think the greater value of the network out there is for tsunami warnings. Those are kind of early warning stations for tsunamis, as well as sea level rise.

The Islands are particularly valuable because they are out there in the middle of the ocean, and there's not many data points for global sea level rise. So those type of uses of the network I think kind of outweigh the marine transportation aspects that are usually driving most of the rest of the network.

CHAIR SAADE: So one thing about Hawaii, it's probably the only place we'll go where the coastline is growing, and that may be something of interest to talk about. And there is a lot of deep ocean mining. There's even renewable activity. It may be something we want to look into from an industry presentation point of view.

MEMBER CHOPRA: I wanted to suggest something for Marshall Islands. We know they have some islands which are now sinking. They're getting underwater, and we know they have been very active in IMO and United Nations. Maybe it's worth inviting them for a presentation, to see how we can support them or what's their current scenario or awareness.

VICE CHAIR THOMAS: So I'll just mention that actually I was in Marshall Islands because we put a wave buoy down there, and we actually had dinner with the Ambassador at that time. It was a woman. PacIOOS, who we're kind of wrapping in, I mentioned her. Melissa Iwamoto

is the director of PacIOOS, and she's fantastic. They are so connected to the Marshall Islands, and they have people from the Marshall Islands on their board.

I already talked to Melissa about it because I don't know how much funding. When you start talking about bringing in people from the Islands, it can get expensive really quickly. What would be really good is if Melissa could plan her PacIOOS board meeting during the same week or something that we're meeting, because then she'll get people from American Samoa, Guam who use that.

I know the tide gage on Guam, because I've worked with them about it down there too. There's a lot of interest on all of the topics that we've talked about. So ideally we can get some of these people up to Honolulu or Oahu anyway, and I think that's one thing that I wanted. That's why I'm glad that the date is narrowed, is firmed here now, because now we can really make some plans.

But you're right about the Marshall Islands. Eight feet elevation, and that's the dump piled up.

MEMBER CHOPRA: Right. So their shipping minister led the EPA, the MEDC at the General Assembly, and then even the last COP meeting to focus the attention on climate change and greenhouse gas emissions, and what they were having and the issues they were having. So there's been some changes. It's actually made some changes on the maritime side of where we go.

So maybe it's worth getting that update directly from them. That will be more awareness for all of us.

VICE CHAIR THOMAS: Is there anybody else on the Panel that has ideas about Hawaii, other than fruit and yoga?

CAPT BRENNAN: Julie, one more comment on that. There is a national security angle out there as well that may be worth discussing.

(Simultaneous speaking.)

VICE CHAIR THOMAS: Is that the one?

CAPT BRENNAN: No. Well, I mean just the general area. And so I think, you know, I think just -- I think that there's a large security issue there I think in general, and I think projecting even soft power, particularly with regard to the services that the -- that our offices provide to those U.S. territories, is very important.

VICE CHAIR THOMAS: Okay.

CAPT BRENNAN: And so there's a large DoD presence right there in Honolulu that would not be difficult to get them to come down the hill and talk to us, and that may be another angle if you decided to go that way --

VICE CHAIR THOMAS: You're talking the Navy there, not the Army Corps?

CAPT BRENNAN: Specifically the Navy, yeah. But there's, I think all services are represented there at that campus.

VICE CHAIR THOMAS: Okay, yeah. No, I know the Army Corps is very involved on the islands but --

CAPT BRENNAN: Yeah, no. Specifically the Navy is who I'm thinking of, and we have contacts there that we could --

MS. MERSFELDER-LEWIS: That would be great to talk to them, because the other -- I know that other parts of NOAA are doing things as well. We mentioned the Estuarine Research Reserves have a new reserve that's with the state, but the OCM, the Office of Coastal Management also has a blue economy report, and you know, there's other -- so there's other. Yeah, there's a ton of stuff exactly. So right. So like exactly.

So I think like I said, we have at least a third more if not more than that of -- as we brainstorm and then need to cull down some of that stuff. Like so that team of people will try to work on that, and make sure everybody's happy enough as we can.

MEMBER CHOPRA: Regarding blue economy, the biggest refinery there is Par Pacific. They're also the main oil supplies for

the full islands, all the Hawaiian Islands. We can get them to -- we can invite them to come and make a presentation, to tell us what and how they're doing.

So they're the sole oil providers in the islands at this time, Par Pacific. I know them well. I can put them in touch with you.

VICE CHAIR THOMAS: Yes, Gary.

MEMBER THOMPSON: So I met with some surveyors from Guam a couple of weeks back, and they had some questions about elevations. So Ed may have someone from Guam that may want to take part, to talk about the 2022 datum.

MS. MERSFELDER-LEWIS: So you guys, we will put out a really early announcement that we're having a meeting in Hawaii and a few of the potential topic areas, so that you could share it with, if you have contacts, especially folks coming from far away would have to budget far in advance and/or kind of another meeting nearby that they should be attending or make their meeting around our meeting or whatever.

So that would work if we could get that to happen. All right, that's awesome.

VICE CHAIR THOMAS: Do we want to touch base about San Francisco or not?

MEMBER HARGRAVE: Could I add one more for Hawaii before we move on, if that's okay?

VICE CHAIR THOMAS: Yeah.

MEMBER HARGRAVE: So there is a -- there's a company in Hawaii called Oceanic Imaging Consultants, and the originator of that company is Dr. Tom Reed. He was a professor at U of H, and he developed or his company has worked with, partnered with the Navy and NOAA and a number of other groups for many years, probably 40 years, developing acoustic technologies in both the hardware and the software realms.

I think somebody like that would be a good tie-in to this issue of bringing data quickly from acquisition to usable information. I think that's -- that would be something that he could speak to, and I can provide you that contact.

MR. EDWING: Julie?

VICE CHAIR THOMAS: Yeah.

MR. EDWING: So I should have mentioned, you know, the Tsunami Warning Center is located there in Honolulu, and if there's a coastal hazards panel or something of that type, you know, it would be good to invite the head of that center.

VICE CHAIR THOMAS: I'm sorry, I missed.

MR. EDWING: The Weather Service Tsunami Warning Center is right there in Honolulu.

VICE CHAIR THOMAS: Right, yeah. No I --

MR. EDWING: Okay, and Laura's probably already flagged that.

VICE CHAIR THOMAS: Actually, that's an interesting tour that they have. San Francisco? Do we want to?

MS. MERSFELDER-LEWIS: Yeah.

VICE CHAIR THOMAS: Okay. So we're

going to jump over to San Francisco, and so now that's been decided to be on September 21st, I believe, and we're just starting to put together ideas and agenda for there. That's a really rich place too, along with Hawaii. Different challenges, but a lot of wealth of information. A lot of NOAA partners in the area there.

I work really closely with NWS there, with the Army Corps, of course OCM. There's a lot of different NOAA partners. And so I think that we will not have a shortage. If anybody has particular things that they want to talk about for San Francisco, you can always send us ideas. We'll probably have another sea level panel there.

Patrick Barnard at USGS in Santa Cruz is one of the leading people on the west coast for sea level. Leslie Ewing and the Coastal Commission. They wrote the plans for all of the cities for sea level, for all of the California planning.

MR. EDWING: So they had a lot of

problems like what Superstorm Sandy brought to bear on lower Manhattan. So with Silicon Valley on the south end of the Bay, there's a tremendous amount of focus on how are we going to protect the South end of the bay from sea level rise. There's lots of contracts out there at the state, local and multiple federal agencies. I mean we need to dig into that, but there's going to be plenty of really good darn topics and papers and things.

VICE CHAIR THOMAS: Let alone the whole airport is a whole other thing there in San Francisco.

MR. EDWING: Yeah.

VICE CHAIR THOMAS: So yeah Ed, I know you have lots of contacts there too. But you know, I just wanted to throw it out there if anybody has any particular things that they want to talk about. Yeah.

MEMBER KELLY: We're kind of going into the heart of the, you know, tech area and future thinkers and what not. Would it be

worthwhile for us to have one of those organizations, like a Google or something come to talk to us about thinking outside the box, potentiality for what they're doing for artificial intelligence, internet of things, things that might be applicable to what we do?

VICE CHAIR THOMAS: We can certainly put that down. You know, Google had a whole Ocean section, and they actually came to Scripps. We talked a lot with them and then they kind of pulled it back. But that's different than what you're talking about. You're talking an actual AI and a different point of view with them. So we can certainly make a note of that.

We also talked about Saildrone, maybe, and ASV. I mean we have a lot of things that we could visit. Saildrone has an open invitation. ASV has an open invitation to go, so working with those companies I think it would be fun.

Okay, and ESRI's right there. Well, yeah. They have a headquarter there. That's not their headquarters but yeah. So let us know if

you have specific ideas.

MS. MERSFELDER-LEWIS: I do have a list of brainstorm, some really early brainstorming ideas, so if there' somebody else who would like to sit on that organizing session, let us know. I can't get it to open. Google Docs anybody? Sorry.

CAPT BRENNAN: A number of our USGS partners that we've been working with, particularly out of the Santa Cruz office are not that far, and that would be easy for them to participate. We've had a very fruitful collaboration with them on the EXPRESS project on the west coast doing a lot of the mapping work. A lot of that has been done in collaboration with a number of the researchers there. Danny Brothers, Amy Gartman, Guy Gelfenbaum, et cetera there.

And so, you know, they -- if we don't do something regarding critical minerals or geohazards in Hawaii, they could certainly bring that in because from the ocean mapping standpoint

they certainly -- that's their --

VICE CHAIR THOMAS: They excel. I've seen, I've actually been to their shop and seen their bottom classification, right. Sam Johnson was the person involved with it initially. It's incredible. Off of Point Conception, where they're thinking of putting a wind farm offshore. The detail, the amount of detail. I mean you could see a pinhead on the bottom. It was just like overwhelming.

So it's too bad they're not closer. They have a nice display. Santa Cruz is a little bit far to take the whole panel. But I agree. We'll try to get, both from the mapping and then from the sea level perspective, they have good people.

MS. MERSFELDER-LEWIS: Also just a reminder. We think that will be September, the week of September 21st, same pattern. Travel on Monday, return on Thursday night or Friday, meet Tuesday-Wednesday-Thursday.

CHAIR SAADE: Julie, that's an

interesting comment because nothing says we have to be in San Francisco proper. You could do it in the South Bay, and then you're close to the universities and you're close to USGS.

VICE CHAIR THOMAS: We could do it in South Bay, and I've actually been thinking. There's a really nice hotel in Pacifica. I don't know if you know where Pacifica is. It's right on the ocean. I've been to a million conferences there, and they have -- I mean it's actually not a really nice hotel, but it's an okay hotel and it's right --

What makes it good is you look out the window and the Pacific Ocean is right there. So it's -- and it's a great, it's set up for conferences. So that's another thing. Tiburon also has good conference space.

MEMBER KELLY: In San Francisco, they just sleep on the street.

VICE CHAIR THOMAS: Only in certain sections. I was just there. It's not -- it depends what section you're in.

MS. MERSFELDER-LEWIS: That is one place I would be happy to take recommendations of where you would prefer to be located, because it's very hard to find housing for groups in San Fran so -- and I don't want to just -- I mean if you want to go to the broader San Fran and you want to be in South Bay or Pacifica or Tiburon or something to get, you know, to consider that.

MEMBER PAGE: I mean I think what you're suggesting here that you may be, that Santa Cruz might be an option, or further south. It's only like -- I think it's like an hour and a half drive maybe. I'm not even sure. An hour maybe?

VICE CHAIR THOMAS: Yeah, it's a couple of hours out there.

MS. MERSFELDER-LEWIS: It's about two and a half hours to get down to Santa Cruz, and it's not convenient to any airports, and that would be the same thing with Pacifica. But you could look at Oakland if San Francisco's pricey. There's a convention center in Oakland at Jack

London Square. It's right across from where the Saildrone building is and --

VICE CHAIR THOMAS: And the advantage of being there is that then it's more central in San Francisco. Then we have the San Francisco Bar Pilots, which are fun and they have a great facility to visit. There's like a lot of the Army Corps facility at Sausalito with the Bay Model is very good. The Army Corps guys that were in the Dillard of Sausalito, they would give us a tour.

I know they put our buoy in every other week because it gets hit, and they would -- they have a great boat vessel there to go out on. So it's -- the Dillard is the name of the vessel. It's the Army Corps Sausalito Bay model.

So we -- there's, you know, all these different pockets have pluses and minuses. In a way, San Francisco has an awful lot to offer also.

I was just -- there is the Westin Marriott right, and Union Square. I was just

there and that is a great place for meetings.

MEMBER HALL: They tend to be booked up already for September, which is a gorgeous time to be in San Francisco.

VICE CHAIR THOMAS: Oh, I see what you're saying. It's the timing.

MEMBER McINTYRE: Yeah. I think if you look at the Jack London Square in Oakland, the Port of Oakland, their offices are there. And the Marine Exchange is quite close to there. It's pretty central and convenient.

MEMBER KINNER: Let me just chime in too. It's sometimes a lot easier to fly into Oakland than to fly into San Francisco by a long shot, and Sausalito means you fly in some place and then you have a very long drive to get there.

MS. MERSFELDER-LEWIS: Okay. So I'm going to check that out first and we'll work from there, and I think we can -- but we would -- so we'll worry about logistics when we get closer to the time. If we're really stuck, we'll take you to Santa Cruz or wherever. If we really get

stuck, we'll let you know. I mean, the times we've been stuck we've changed the pattern.

So like we could do a meeting on Monday-Tuesday-Wednesdays sometimes or Wednesday-Thursday Friday, and they don't always love Tuesday-Wednesday-Thursday because we take all their good time. So okay. Thank you guys for the details. I think we can go ahead to the next topic.

VICE CHAIR THOMAS: Anything you want to say about future locations of meetings? No, okay. Ed, do you have -- the only -- I mean I still would like to go into a breakout group for the sea level. Ed Page, Arctic breakout group. Do you want to do a little more?

MEMBER PAGE: Well, we took a round turn on it and made some edits. I don't know how important it is to get it out right now as opposed to allow others to look at the other draft and just let it percolate for a while. So unless there's a real urgency to get this out now, I think we're ready to just share with the

group and absolutely put it to bed today.

Oh, I did notice that we're slowing down, because in February 2018 we put out nine position papers. So if people are talking about we're putting out too many with three --

MEMBER MAUNE: No, that wasn't all at one time.

MEMBER PAGE: Well, it was --

(Simultaneous speaking.)

MS. MERSFELDER-LEWIS: Those were the updates of some of the old ones.

MEMBER PAGE: I gotcha. I was like whoa, we're slowing down here.

MEMBER MAUNE: We did have a goal of two per HSRP meeting.

MEMBER PAGE: Okay, all right. In any case --

VICE CHAIR THOMAS: How close is your Arctic? I mean, I actually feel that since we had the chance to do a lot of revisions, that our sea level one has come a long ways, and I'd like just another 20 minutes, half an hour with the

people that are on it to kind of wrap it up --

MEMBER PAGE: That's fine.

VICE CHAIR THOMAS: -- and see if we can come to closure. If you guys meet again, are you in a place that you would be there, or are you --

MEMBER PAGE: No, we redrafted it and --

MEMBER McINTYRE: Yeah. I mean we've made some edits.

MEMBER PAGE: We made some edits. So I guess the question is how would we get it disseminated right now in this order and get closure on it? I mean --

VICE CHAIR THOMAS: Okay. So you don't need to meet again to do -- I'm just trying to get a feel.

MEMBER McINTYRE: Yeah. I mean I think we've done our edits.

VICE CHAIR THOMAS: Your edits, okay.

MEMBER PAGE: We got consensus.

VICE CHAIR THOMAS: So then it should

go back out to the group.

MEMBER McINTYRE: Exactly, and then maybe firmed up at the next meeting?

VICE CHAIR THOMAS: No. Firmed up within the next five days.

MEMBER McINTYRE: Got it, okay. Well, then we need to have a breakout group.

MEMBER PAGE: If we want to put it out now, people can look at it. I mean --

(Simultaneous speaking.)

MS. MERSFELDER-LEWIS: The process is that the working group meets on it. You guys send it to everybody, everybody has concurrence, and then if you have small edits, copy edits, corrections, that's fine.

VICE CHAIR THOMAS: I mean we have two hours to work on this.

MEMBER PAGE: Well, I don't mind if we -- we can print it out right now.

MEMBER KINNER: Ed, can I suggest too that you push it out first as a PDF so that it cleans up the edits? It's a little tricky to

read right now.

MEMBER PAGE: Yeah. Well, I'll just make sure it accepts all my changes.

VICE CHAIR THOMAS: Yeah.

(Simultaneous speaking.)

MEMBER KINNER: I haven't been able to make that work on my system, no.

(Simultaneous speaking.)

MEMBER KINNER: With that, if you can do that, then I can read it.

MEMBER PAGE: You have a printer handy there?

MS. DENTLER: We'd have to go up to the copy center, but we can print it.

MEMBER PAGE: Well, but I mean I could send it electronically to everybody too.

MEMBER KINNER: That would be the easiest.

(Simultaneous speaking.)

MEMBER PAGE: I'll do it that way.

VICE CHAIR THOMAS: Okay. Let's take just a minute -- Lynne would like five more

minutes to discuss some logistics.

MS. MERSFELDER-LEWIS: So the only other thing we didn't take about is next meeting location for 2021 through let's say 2026. But we're not going to go through all of those. We're just going to say that in 2021, we had proposed Puerto Rico and at one point there wasn't a lot going on. But now that we've had a lot of response and a lot of other stuff going on, and I know NGS had a lot of stuff and I think CO-OPS had some things. So there's plenty enough to go to Puerto Rico and talk about, but not during hurricane season.

So that would be a spring meeting or before hurricane season, and then 2021, the other -- some ideas that were floated, again this is like probably a year ago, were to consider a meeting like Norfolk-Hampton Roads or Savannah, Georgia. I think Norfolk-Hampton Roads was really with Larry Atkinson in mind, and we miss him dearly and wish he was around. I think Savannah -- we went to Charleston about six years

ago.

VICE CHAIR THOMAS: Savannah would be fine.

MS. MERSFELDER-LEWIS: Savannah might be a good one. I know we're doing -- there's a lot of port stuff going on there, big, big --

MEMBER KELLY: Precision navigation.

MS. MERSFELDER-LEWIS: Precision nav, okay.

(Simultaneous speaking.)

MS. MERSFELDER-LEWIS: So would you guys weigh in on Savannah?

VICE CHAIR THOMAS: I would say Puerto Rico and then Savannah.

(Simultaneous speaking.)

MS. MERSFELDER-LEWIS: Puerto Rico is a pretty --

(Simultaneous speaking.)

CAPT KRETOVIC: I just want to say, Savannah is going through a major expansion that will be completed at the end of '21. It may be better from a precision nav perspective to hold

off until '22, so that way we can have something to really talk about there, because we should be working there in '22. We might have preliminary data that we can share with them. Just a thought.

MEMBER MAUNE: When is the last time we went to New York?

MS. MERSFELDER-LEWIS: 2014, so I think we might not be the right time to go back there.

CHAIR SAADE: I think we needed to go to New York and I think we need to have a focus on offshore wind farm at some point.

MEMBER MAUNE: I thought it might be good to go there while Ed is still on our board.

MS. MERSFELDER-LEWIS: Three more years Ed, yeah.

MEMBER CHOPRA: Do we want to look some place within the continental United States up in the river system, northern Mississippi, you know, somewhere there because we discussed this. We saw some amazing data yesterday and day

before. But we haven't -- I don't think we've ever met, let's say I don't know, Chicago or south of Chicago some place. Cleveland, yeah. Somewhere on the rivers.

MS. MERSFELDER-LEWIS: We met in Cleveland in the last couple of years. So like there's a list in your materials that says where we've met recently. So you could just peek at that and you can see that we met in Cleveland in '16. So Chicago is on the list for like as maybe 2022 or you know, it could get swapped out for -- Chicago could get swapped out for Savannah, and Savannah, that would actually work really well. So maybe Chicago for 2021 and Savannah for 2022, and also D.C. for 2022, I think. So we didn't -- go ahead.

CAPT KRETOVIC: I would just say that the amount of people, the stakeholders that didn't come to D.C. gives me a little pause about going back there so quickly. You know, maybe if you want to be Mid-Atlantic, what about Baltimore, you know, or something else? Just I

feel like we swung and we missed with D.C.

We really didn't have a lot of folks show up to that meeting, and I think we really want to get input from the local stakeholders. So I would suggest something like Baltimore or Delaware, you know, Philly. I don't know when the last time we went to Philly.

MS. MERSFELDER-LEWIS: We are talking about Mid-Atlantic for like 2024 maybe, so maybe we move that to 2022. So like that would be like Philly, Delaware. That could even be New York/New Jersey, I mean that's the right mix. But anyways that was your partial update. I think we're -- I think it sounds like Puerto Rico and then Chicago, or it's Chicago, Detroit/Ann Arbor, but I think Chicago.

MEMBER DUFFY: So I just want to chime in on the Mississippi River system and Chicago. Illinois is our largest trading partner between Louisiana. But there are other -- like Chicago of course isn't on the river, and maybe being strategic if we want to capture the river, we

should look at some way that is on the river.

St. Louis comes to mind, kind of the gateway to the Midwest. There's, you know, a lot of connection to barge traffic, locks and dams. A lot of people that -- no offense to Chicago. It's like we're just kind of getting away from the river that we are trying to focus on.

CAPT KRETOVIC: I think it's important though Sean to remember where NOAA's jurisdiction is on the river, and I am not sure if we were in a place like the Quad Cities, if because that's the Corps' area there, they are responsible. They're the authoritative source. So Chicago may be the better option because that is an area where we have jurisdiction.

MEMBER DUFFY: Okay.

CAPT KRETOVIC: Just as a -- I mean I agree with you 100 percent, but I also think like, you know, we really don't have the jurisdiction on that part of the waterway.

MEMBER DUFFY: Okay, good point.

MS. MERSFELDER-LEWIS: I think we're

a wrap talking about our locations and we'll get back to you like with confirmations for 2022 and on.

VICE CHAIR THOMAS: Yeah, I think we do breakouts. I don't know what -- Kim, if you want to take this time to work on the Emergency Management paper or? Okay.

MEMBER HALL: I appreciate the offer.

VICE CHAIR THOMAS: So for -- let's just -- we'll go back to the original places that we were. I'm just finishing up one thing here, but let's go back to the rom then over here for the two groups. I don't know what the Emergency Management group's going to do.

(Whereupon, the above-entitled matter went off the record at 2:13 p.m. and resumed at 3:00 p.m.)

CHAIR SAADE: Okay, everyone. We're going to get back into this for the next 55 minutes or so, maybe 50 minutes or less. But it's Julie's got it all under control. So here we --

VICE CHAIR THOMAS: I have nothing under control, but I think we're really happy because I understand that the Arctic paper is being mailed around, and the sea level paper is being mailed around. So I really want to thank that working group for sea level, the NOAA folks having their participation and having local participation, and the other Panel members that were there. It was great, really good discussions.

So I believe that both of these papers are pretty darn close to being finalized. Please read them if you can on your planes going home or take some time right now, because we have a little bit of time before we break, and the more you can give me feedback. Like I said, within a week I'd like to get the letter out to the Administrator. So --

(Off mic comments.)

VICE CHAIR THOMAS: Their schedule.

MS. MERSFELDER-LEWIS: Your schedule.

VICE CHAIR THOMAS: My schedule. No,

they all know I'm leaving Tuesday, and I'm disappearing for a month. So that's why I really want to try to get this out over the weekend. So if you can read both the Arctic and the sea level and give back feedback even while we're sitting here. If you don't have to -- if you have time before your four o'clock bus, that would be great. So that's the issue papers.

The matrix, the one thing I'm doing that you didn't see was I'm adding in under the issue -- I'm sorry, the Issue Matrix is what I meant now. I'm adding in under the issue paper section on the Alaska coastal mapping, which is what Dave Maune talked about, and that will be pending and tabled until the Hawaii meeting to discuss, but I'm going to put that line in there for the issue papers.

So that's the one addition that will be in there. I will send that final copy out to you probably sometime this evening, and then the last thing is the letter to Neil Jacobs, and so I believe that Virginia -- thank you Virginia for

all of your help, too. I believe that she's sending that out. That's a really, really rough draft. The reason why I mailed it out to you is because several of you had comments to include, and I just wanted you to see --

That's a little bit of a mismatch now between what was in there before and what new comments are. I've just plugging them in. But that if you can just two sentences. You don't even have to edit the letter. Just put it in the email to me to include this, and I'll make sure it gets it in there. I just need your wording.

MEMBER MAUNE: Julie, on the issue papers you sound as though you want us to send in input next week or something.

VICE CHAIR THOMAS: No.

MEMBER MAUNE: I thought we were going to try to vote on it today.

VICE CHAIR THOMAS: We are going to vote on both of those today. Okay. We're going to vote today. If there's still -- what I was going to say was can we vote to approve these,

knowing that there might be a typo, a minor -- right, minor editing, and really I said a week but this is like -- just read it and send it back to me. Send me your approval or send me your edits if you have typos, if we had typos or something.

So I think we do need to take a public vote on the issue papers. The Arctic paper first. Do we approve that there will be an Arctic paper included with our letter to Neil Jacobs? That's the question.

(Chorus of ayes.)

VICE CHAIR THOMAS: Is there anyone that is opposed?

(No response.)

VICE CHAIR THOMAS: Okay.

CHAIR SAADE: Passes.

CAPT KRETOVIC: It's unanimous.

CHAIR SAADE: It's unanimous.

VICE CHAIR THOMAS: May we have a vote on the sea level paper, sea level rise and subsidence paper I should say, that we include

this letter with the -- this issue paper with the letter to Neil Jacobs.

(Chorus of ayes.)

VICE CHAIR THOMAS: Anybody opposed?

(No response.)

CHAIR SAADE: Passes.

VICE CHAIR THOMAS: Okay. Thank you, Ed. We got that on record. Okay. Is there anything else we need to vote on Lynne? No, all right.

MS. MERSFELDER-LEWIS: Are you voting anybody off the island or onto the island?

VICE CHAIR THOMAS: What do you want? We'll take care of it. Okay.

MEMBER THOMPSON: And we're working on the emergency services. We're focusing it more on, completely on AI. So we're going to go in and reformat it and we'll get out so that people can review that.

VICE CHAIR THOMAS: And thank you very much for that working group too, and Gary can -- whenever that is ready, you can send it to

Virginia and Lynne, and then they can send it out to the group. We will definitely -- that will be our number one task, issue paper to tackle in Honolulu, okay.

I wanted to mention one more thing. Lucy, do you want to stand up and come on up to the microphone, and why don't you tell them about your webinar series, because what I'm thinking is this might be two things. She offered to do a webinar that we could join in on the Planning and Engagement call, and then she's also asking for additional ideas. So why don't you explain a little bit? Introduce yourself.

MS. HICK: Yeah hi. So I'm Lucy Hick and I'm the chief of Customer Affairs for NOAA's Office of Coast Survey. We recently started a new webinar series within Coast Survey called the NOAA Navcast. The original or the inaugural webinar was in the spring or no, back in June I think, and it was on S-100 and surface currents. We were aiming to do it quarterly, although we don't have a set schedule necessarily.

We have a list of potential topics that we're kind of picking off of, and our next NOAA Navcast will be I think at the end of September and it's going to be on nowCoast. So John Kelly is going to -- or one of his minions, will talk to us about nowCoast. However, we were talking about the need maybe for a webinar on OFS's. You guys were mentioning that.

VICE CHAIR THOMAS: Ocean Forecast System.

MS. HICK: Oh thank you, and I was thinking that perhaps maybe that would be a good topic for the next NOAA Navcast. If we were to do it, it wouldn't be limited to just the HSRP; it would be open to the public and we do publicize them. But we could look at trying to coincide it with the --

VICE CHAIR THOMAS: Planning and Engagement call.

MS. HICK: The Planning and Engagement call, so that it could serve dual purposes. So that was the first thing. If you would like to

do that, we will definitely look and see if that's possible, and we could work with CO-OPS, as well. CO-OPS was happy to work with us because obviously we have dual roles in that or complementary roles.

The other thing is of course if you, if the Panel has ideas for things that you think would be a good thing for us to publicize to the community. We're looking at it as like, sort of replacing in a way or supplementing what we used to do was an Industry Day at different events, and we're trying to get a wider distribution or wider participation from different industry partners on different topics that we're working on or different projects.

So I am more than happy to hear from the Panel on ideas for subjects that you think would be applicable or appropriate to do during one of our NOAA Navcasts. After we do the Navcast, we post it on our website. So we post both the video -- or not video, but the audio of the Navcast, the PowerPoint deck and also a

transcript of it. So any materials are available, and we'll continue doing that. So thank you for the opportunity.

VICE CHAIR THOMAS: Thanks Lucy. So we'll plan to coordinate and get word out to the Panel as far as when, particularly the Ocean Forecast System. I thought it might be a great opportunity since we're going to be discussing that one in San Francisco, and it might be a great opportunity to at least get a heads up on what it's about.

All right. One more -- okay. So who amongst you -- we had a lot of comments to include with the letter to Neil Jacobs. Have people had a chance to email me that comment that they want included?

No. Can we take the next ten -- we've got until four o'clock. Can people please go email it to me? I mean unless it's short, yeah. That's what I was wondering. Could we take the next ten minutes and just let people that want to include a comment, as we talked about, if you can

just send it to me.

Not comment on the whole letter, Ed. Just there was some very specific things to be included or a quote to be included, and I just was not writing those down. I was hoping people could email them to me.

CHAIR SAADE: So how about we do it this way? If you don't send your comments in before you leave, they don't get to be in it, okay?

MS. MERSFELDER-LEWIS: So this is Lynne. We've had an issue with people following up after the meetings, and so it's really delayed the letter or just made it not nearly as useful. So if you guys would take a few minutes to give her your one or two comments. It's like, you know, a sentence, two sentences. That's what she's looking for so she could include those.

MEMBER DUFFY: So the one item that I sent over, I didn't see that. I saw it in a different way. I didn't know if that was an edit or if I was supposed to still put mine in. I'm

happy to do either. Go ahead, okay.

VICE CHAIR THOMAS: So that you did see what was mentioned the last time, because some of them were redundant and I said it's already in there. So that's all. Yours is okay.

MEMBER DUFFY: My homework is turned in. Thank you.

(Pause.)

CHAIR SAADE: Thanks Julie. So if there's any more general comments of anybody, kind of the wrap-up of the wrap-up? I'm always a big fan of it's okay to end meetings early, if you've got everything done. So if there's anything else anybody's got that they want to bring up, now's the time. The clock's ticking.

Oh yeah. Oh, I'm sorry. My list first. Wait, wait.

Thanks, Rich. So I got a couple of things. First of all, I'd like to recognize the fact that the audiovisual folks in the venue was really nice. This worked out great.

(Applause.)

CHAIR SAADE: And then Lynne and her team did a really good job. That worked out extremely well, and thank you.

(Applause.)

MS. MERSFELDER-LEWIS: Just a super thanks to Amanda Phelps, Christine Burns, David Ermisch and forever Virginia Dentler, who did everything I couldn't do when I was stuck in bed with a sore neck.

(Applause.)

CHAIR SAADE: Thank you. Of course a huge thank you once again and recognition of Sean and Michelle for everything from last night, and everything for setting this up, the panels. You all did a super job on the panels, and it's really easy to see that you put a lot of effort into it. Last night, the number of comments that I received in terms of everybody just -- it was a great example of team work. It was a really great example of the camaraderie and the interaction of everybody here within HSRP, and you're home and the way it was all set up really

brought all that out. So thanks a lot.

(Applause.)

MS. MERSFELDER-LEWIS: I have a short list. My short list is I think it worked amazingly well to have a HSRP member/co-chair session with a NOAA subject matter expert, and I just really liked how that worked, both in D.C. and here.

MEMBER DUFFY: So I've like worked on my team approach here, and I'd like to leave you with one of those things, and it's real simple and it's that when you're a team, you win and lose as a team. So all the success in the things that we do we all did together. We all have a role in. Something that I do have to say is that Hurricane Katrina was a very hard time for me.

I took over. I was the assistant to the president of the Steamship of Louisiana, and the Friday before Hurricane Katrina I was promoted to the president of the Steamship Association of Louisiana. I had a whole lot of happiness and then a whole lot of "holy crap,

life will never be the same," including sending my young son away. He had never been away from his dad in his life when he was -- see, he would have been about seven years old at the time.

There's a song that is very important to people in New Orleans by U2, the Saints are Coming, and there's a line in it that just says "I cried to my daddy on the telephone." To this day, it chokes me up a lot because my son was crying to come home and I couldn't bring him home because I think it just simply wasn't safe.

But the other thing that I want to add is that as you leave New Orleans today, remember to focus on the people you care about, and know that life can change very quickly at times. So part of that team work means looking out for each other. So please travel safe as you go home. I look forward to catching up with you next time, and that the successes of HSRP and NOAA and our government agencies are part of team work, and we win and lose as a team. Thank you.

(Applause.)

CHAIR SAADE: Thanks a lot, Sean. I've got one other question. When will all the presentations be posted? They're already posted, great, and we all have the link right? The regular link.

MS. MERSFELDER-LEWIS: There's an HSRP meetings page that has every meeting and almost every presentation, except sometimes the very last minute change doesn't always get posted. But like when we get the third version from somebody, but the second version might still be up there.

CHAIR SAADE: Okay, thanks. Go ahead.

MEMBER HALL: As the sole departing member of the Panel, I just I wanted to leave with two things, well three. I've really enjoyed my time and I've really enjoyed seeing the progression of this Panel. Not that it was horrible when I first got here, but it's really kind of a nice, a well-oiled machine and that's thanks to everybody including Lynne for putting up with it and doing it.

But really all of us should kind of take a piece of that, because we're part of, like Sean said, the team. One thing I do want to say that might sound more critical than I mean it to is I really want to encourage participation through kind of rotating leadership of the working groups, because I think poor Julie's turning into Joyce, which was kind of doing all of the things and I don't think that's fair.

I'm sure Julie enjoys some of it, but I think that there is a responsibility when you get on these Panels to try to, and I know you're trying to, some of the new folks are still trying to learn what this Panel actually is. I think it's really important to just keep the energy up, and I think we can really get and have in the past gotten into just we just do what we do.

I think it's really important for things like the Planning and Engagement Working Group, which is so important to the meetings, that you shift and you rotate some of the leadership there. That's not critical of any one

person. It's simply because I think you can bring new energy and some new ideas and really help, you know, the priority matrix or the issues or whatever.

I think there's a lot of good ideas here, and that's a really great place to take on a leadership role for the committee. So I'd encourage that as you guy want to do that where it makes sense.

The second is I'm just going to pat myself on the back for the legacy of the bottom line up front. So thank you for -- I mean that was Day 1. I had just joined the Panel, I had just been sworn in Galveston, Texas, and I said put this bottom line up front.

So for four years, you all adapted it, made me usually write them. So somebody else is going to have to take on that role. I did see in the subsidence/sea level rise paper that there is a bottom line up front and I didn't write it. So my job here is done, and if I could drop the mic, I would. So thank you for that. Thanks.

CHAIR SAADE: Thanks a lot Kim, and thanks again for all the input, the participation, the writing, everything. It's been really beneficial to the Panel obviously. So we -- yeah. Anybody, anybody? We've done a couple of round robins, but I'm not going to force anybody to speak. So if you're all done.

MS. MERSFELDER-LEWIS: I would second Kim's suggestion about rotating leadership. Like we've -- that's a regular thing that has happened in the past and continues to happen. So where you feel like you want to take something on or do something or lose something, you guys can discuss that amongst yourselves, and you can also mention it to me and I'll mention it to whoever.

But it's a great -- it's great to have folks who have energy and want to do something. I really appreciate it. Like Ann McIntyre saying she would take on the comments to the OCS Strategic Plan and, you know, other folks saying they would take on -- Gary has very generously offered to do a couple of issue papers and that

kind of stuff. Really, yeah.

MEMBER PAGE: I'd just like to add I really appreciate Julie stepping up to the plate and taking such a strong leadership role. I'm pretty sure -- I'm sure Ed appreciates that too, since he's juggling a lot of stuff. So you make a great tag team, so I applaud all your energy and tenacity and pushing us, controlling us to be productive. So kudos to you and thank you for doing all that. I appreciate it, as do the rest of us I'm sure.

CHAIR SAADE: In the spirit of all this, Julie and I were talking earlier, that you know, I'm reupping for several years, but I don't think it's right for me to be the chairman for multiple years. I think it's really important that we rotate this position. I think it's really important that we bring up other people to be the deputy chairmen or the co-chair.

So I think keep that in mind. It's incredibly satisfying, I have to tell you that. It's incredibly educational and again, this

meeting topped the last one, which topped the last one before that in terms of things that I learned. So we don't know exactly what days we're all going to start to do the rotate.

I'm not leaving the Panel, but I don't think it's right to be the chairman year after year, you know, for many, many years. So that's coming, and we can get into that in the next meeting or two.

(Pause.)

CHAIR SAADE: All right. Meeting adjourned. Thank you all.

(Applause.)

(Whereupon, the above-entitled matter went off the record at 3:23 p.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Hydrographic Services Review Panel

Before: NOAA

Date: 08-29-19

Place: New Orleans, LA

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R Gross

Court Reporter