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Acting Chair: Ed Welch

Vice Chair: Ed Welch

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P R O C E E D I N G S

ED WELCH: Good morning. Let's welcome everybody to the second day of meeting of the Hydrographic Services Review Panel, a NOAA Federal Advisory Committee.

And I think we had a productive day yesterday with our public witnesses and speakers from NOAA and interchanges among ourselves, so we'll prepare to look forward to a second day of good information.

We've got a few administrative things to take care of, and one of them is some of you are like me, who have forgotten completely to fill out Tiffany's reimbursement form in our blue folders, but it's really important for us to do that before we get out of here today.

So Tiffany is over on the side, and let's all make sure she doesn't have to track us down.

Secondly, Kathy wanted me to announce that many of the presentations that we had yesterday, the PowerPoints and other items, are already up on the HSRP webpage, and several that aren't up there will be up there soon, so

that's a good resource.

And third, Kathy wanted me to announce some other thing, but I've forgotten what it was, so Kathy -- I told you I was going to call on you, Kathy.

KATHY WATSON: It's for the public attendees. If you haven't signed in, please do so. Thank you.

ED WELCH: That's good, Kathy.

Are there any other administrative things from Kathy?

KATHY WATSON: No, sir.

ED WELCH: Or anybody else? Okay. We -- we're delighted that Juliana Blackwell is today's designated federal official.

Juliana, do you have anything you would like to bring to our attention?

JULIANA BLACKWELL: No. I just wanted to thank everybody for their participation yesterday and look forward to today's discussion topics, and just to restate the fact that I'm just acting on behalf of Captain Lowell for the remainder of this meeting.

Thank you.

ED WELCH: You seem real hesitant about the possibility of this roll becoming a little bit more extended.

Our first item of business is sort of a recap and a review of yesterday and to talk about some of the recommendations. And I assume that means the recommendations that we might be making in our report to the administrator.

So I don't really propose to go through yesterday's schedule and go through a list of everything we did yesterday, but I guess at this point, I would open it up for any kind of comments or questions from panel members about is there something that we did yesterday that needs a little bit further discussion or upon reflection at the restaurant or the bar last night people want to get into in a little bit more detail?

Larry Whiting was reflecting and contemplating.

LARRY WHITING: Yes, Larry Whiting.

I have copies of a couple of bills that have been presented in the sentence -- the

Senate, not the "sentence," but that were presented by Mark Beneche [phonetic] and Lisa Merkowski [phonetic].

They're a little bit longer and are being printed off that relate to the testimony today. They'll be coming in soon.

ED WELCH: And do these have to do with hydrographic activities in the northern regions?

LARRY WHITING: Correct.

ED WELCH: Very good.

Other comments?

Matt Wellslager.

MATT WELLSLAGER: Thank you, Ed.

Was this the time to bring up the possibility of discussing some modifications to the most recommended --

ED WELCH: Actually, I think we're going to get into that a little bit later as a separate agenda item, so if -- I mean, if you really want to now, but --

MATT WELLSLAGER: No, no, no.

ED WELCH: -- there will be an opportunity a bit down the road.

Anybody else? Because otherwise, we'll just get ahead of schedule.

Yes, Elaine.

ELAINE DICKINSON: Elaine Dickinson.

I just wanted to bring your attention to a new initiative that relates to charting that there's a small group of us that have gotten involved in it and we didn't have a chance to talk about it yesterday, and Captain Lowell didn't mention it, but we've formed this -- we call it the Alliance for Safe Navigation, and it's a public outreach and education effort to get recreational boaters to focus more on not only carrying charts but also carrying up-to-date charts and making sure the charts they have, whether they're paper or electronic, are fully updated.

And the partners, which include NOAA, they have very graciously agreed to sponsor this alliance. It's NOAA, BoatUS, the US Power Squadron, Jeppesen Marine, which we have Ken Cirillo here representing Jeppesen, OceanGraphix, the print-on-demand provider for NOAA and the Sea Tow Foundation

And so far what the Alliance has done in press releases announcing its formation is we put up a website, and the website is allianceforsafenavigation.org, and it's all tailored towards boaters.

You can go to that site and plug in whatever chart number you -- you are most familiar with that you use. You click on it, and it will tell you how many updates there are to that chart so you can see right away that what your carrying might be really, really outdated and it's time to get a new one.

The next thing we're going to do is do a survey of recreational inventories and ask them in greater detail what kind of equipment they carry, whether it's electronic or what kind of paper charts they carry, whether they're NOAA charts, chart kits, chart booklets, whatever.

So it will be interesting to see what the results are that we get from that survey.

There was an announcement from NOAA that there's a press release that they put out, it's probably on their website, and anyone who wants to put up a link to this site is welcome to do

it. Or if you have any discussions of any other material we can put on the website, that would be good, too.

We're just trying to get more publicity for it so more people will be aware of this issue.

And also, Ken Cirillo wrote a great white paper report on why outdated charts are a problem, basically, for your safety

So that's my infomercial.

ED WELCH: It's a good one, thanks.

Do you know when the survey will take place and be compiled?

ELAINE DICKINSON: It should be very shortly, because I understand -- since I've been here, the final wording of the questions was sent to the group, so I think it's pretty much ready to go.

And when I get back, I'll get it posted on BoatUS.com, which we will retract and make some response.

ED WELCH: Maybe at our next meeting you could have a couple of minutes like this and give us whatever you found out in the survey.

Admiral West.

ADMIRAL WEST: I was going to mention this later when we talk about the next meeting, but this related to what Elaine talked about.

I think this group ought to take a look at technology is outpacing our ability to use it and creating accidents.

Three or four meetings ago I mentioned that I attended a navigation conference at Kings Point, and the deputy director of National Transportation Safety Board gave a presentation on accidents caused by too much technology, people not understanding how to use it.

He was an aviator, but he did it across the board. It was really good. And I think I suggested that we have him one time, and I don't think that we ever did.

But we may want to consider a theme for one of our future meetings. Doesn't have to be the whole meeting, but maybe half a day, on what -- is there a responsibility of the federal government when they provide this technology to provide equivalent training so

people don't get themselves in trouble, or something along that line.

And I think that's what Elaine is doing with the small boating community. But is the federal government responsible?

They flipped the switch on LORAN Charlie [phonetic] one February, I think it was. And, you know, I knew what that meant, but I'm not sure a lot of people knew what that meant. I heard yesterday -- I think they talked about somebody flipped a chart and went from LORAN to GPS and got themselves in trouble.

So think the federal government has to think a little bit more about that as it pertains to navigation safety.

So maybe a half-a-day theme out at Portland, maybe, to take a look at this and maybe lead off with what Elaine's doing and see if that applies across the board or something.

Anyways, think about it.

ED WELCH: Okay. Thank you.

Any other --

ADMIRAL WEST: I would like to get that presentation -- somebody from the NTS give

that. It's really an interesting, fascinating presentation.

ED WELCH: Okay. Good suggestion. We'll see if we can follow up on that.

Any other comments or suggestions reacting to Elaine's information or Admiral West's comment on that?

Okay. Well, I think, then, we're prepared to go into our first presenter, so I'd like to welcome Adrianne Harrison from NOAA's Coastal Service Center in New Hampshire. Are you in Portsmouth?

ADRIANNE HARRISON: In Durham, New Hampshire.

ED WELCH: Okay.

And she's going to talk about the sea level rise and the climate. Thank you, welcome.

ADRIANNE HARRISON: Well, good morning. Thank you for having me here. My name is Adrian Harrison. And I'm with the NOAA Coastal Services Centers Northeast region based out of the University of New Hampshire.

And I serve as the coastal climate

adaptation lead up here.

So today I'll be reviewing some of the sea level rise information products and services available through NOAA and it's partners.

I'll also describe some of the planning challenges faced by NOAA customers and the decision support products available to improve the adaptive capacity of the coastal states and local communities.

Next slide.

Oh, one quick note. Although the Coastal Services Center's logo is on this presentation, a lot of the products and information come from throughout the agency. So if you have questions on where specifically within NOAA this information is housed, let me know.

So why does any NOAA provide sea level rise services? In addition to it being a pretty hot topic right now, NOAA has a legislatively mandated responsibility to provide climate-related services.

And the Coastal Zone Management Act specifically requires NOAA to look into sea level rise products and services.

In addition, we conduct needs assessments and solicit stakeholder input to drive the development of our sea level rise products. Data and tools related to climate adaptation planning and sea level rise are consistently ranked high among coastal managers, so we've put a particular focus there.

Next slide.

There are a number of factors that contribute to changes in sea level. There are short-term variations that we see on a daily basis. These include things like waves, tides or specific flooding events, like hurricanes or other coastal storms.

There are longer-term variations as well. These occur on a monthly to several-year variation scale. We need monitoring systems to detect these changes, things like changes in coastal and ocean circulation, as well as vertical land motion.

Sea level is particularly influenced by changes in temperature. So as temperature rises, the ocean warms, and the water -- the volume of water expands.

Thermal expansion is the primarily source of sea level rise discussed in the fourth report of the IPCC.

Sea level be also be influenced by the addition of fresh water, such as the input from melting glaciers.

Next slide.

NOAA plays a vital role in measuring sea level change. In-situ gauges collect the actual water levels, and NOAA has over 150 years of tide and water level data. This helps us illustrate the trends both locally and globally at sea level.

Next slide.

This slide shows the sea level trends for North America. Worldwide sea level has risen about 20 centimeters during the past century.

The rate of sea level rise during the 20th century has been nearly two millimeters per year.

This is an order of magnitude higher than the average over the last several millennia.

Next slide.

And this is a specific sea level trend for

here in Providence. The Providence trend is based on monthly sea level data from 1938 until 2006. And observations show that Providence has seen the equivalent of .64 feet in 100 years.

This is important to note. Providence has seen sea level rise. They've been adapting to it along the way.

Next slide.

This slide shows the historic and the projected rate of sea level rise. On the left, you see that sea level was relatively stable during the development of modern society.

In the mid 1800s -- oh, actually, this one has multiple parts. Can you just click a few? Maybe a couple more. I'll just get them all out of the way.

VIRGINIA DENTLER: Okay. One more?

ADRIANNE HARRISON: Yes. I think that's it. Okay.

So on the left you can see relatively stable. In the mid 1800s, NOAA began measuring with the in situ gauges and then in the late 1900s with satellite data.

On the right you see the familiar projections from the IPCC reports. Sea level is currently tracking at the upper level projection.

Again, current satellite observations show that sea level rise is rising at a rate nearly twice as fast as the tide gauge measured rate.

Next slide.

So I just described some of the information and products and services that NOAA uses to estimate current and projected sea level rise.

It may look fairly straightforward. Sea levels are trending upwards in the Northeast region, and that's based on a variety of observations, models and factors

But when we try to translate this into the planning world, it becomes a little more challenging.

In the next few slides, I will outline a few challenges faced by coastal states and the local communities. They are an uncertain future, of course, an overwhelming sense of vulnerability and financial constraints.

Before I leave this slide, though, this is a picture of Cape Cod or a barrier beach off Cape Cod.

Cape Cod is really on the front lines of sea level rise. This was recently separated into two when currents pushed through the sandbar. And believe it or not, homes were once located on this barrier beach.

So this is just one example of the types of uncertainty and vulnerabilities coastal communities are facing in Massachusetts.

Next slide.

Okay. Uncertain future. There are really three primary sources of uncertainty when we're talking about climate data and information.

The first is future emissions. Greenhouse gas emission scenarios are directly linked to human choices, and we do not know that human behavior -- if it will change in the future and how it will change, and therefore we don't know what level of emissions to expect in the future.

Second, we can use models to help us understand how natural ecosystems will respond

to climate change. But much like in Cape Cod, we don't -- we're having a tough time predicting when the ecosystems will reach a point of no return.

And third, it's difficult to quantify the impacts to the natural and human systems, and so this uncertainty is an area of rapidly growing research. And socioeconomic information in particular is a top need for know NOAA customers.

Next slide.

Vulnerabilities cities and states face from sea level rise are not really that different from the vulnerabilities that they're assessing on a regular basis to coastal storms like hurricanes and Nor'easters.

The vulnerability from a human and economic standpoint is the highly developed and densely populated coastline that characterizes the Northeast.

What is different about the vulnerabilities related to sea level rise is the substantial increase in the extent and frequency of coastal flooding, as well as the

increased risk from severe storm-related damage.

Rhode Island is another good example. We here recently experienced an extreme flooding event. And what's significant about this past flooding event is that it affected areas that had literally never seen flooding before.

So the challenge now becomes how to prepare for flooding and associated impacts in places with no historic record of flooding, and that's what we're trying to get across with an increase in sea level.

I will talk in detail about some of the tools and approaches NOAA is facilitating to assist states with sea level rise planning in a few minutes.

Next.

So I just wanted to quickly touch on financial constraints. We all know that budgets are falling short across the spectrum of government. This makes it difficult for decision-makers to provide funding to climate change mitigation or adaptation activities when they're facing cuts to essential services like

education and healthcare.

So it's really important to provide data that supports the idea that costs of inaction are more expensive than those of adaptation or mitigation.

This is an important economic factor to express when you're communicating with decision-makers.

In addition to the avoided cost information, information on avoided consequences is needed to support the kind of precautionary decisions that we're asking of states and local communities.

Next slide.

Okay. So this is the first of four short examples of states and communities using NOAA programs and services to plan for sea level rise.

This is a sea level rise policy adopted by Rhode Island's Coastal Resource Management Council in 2008. CRMC is the NOAA-approved coastal management program for Rhode Island.

And Rhode Island policy states that for planning and management purposes, it will

accommodate a base rate of an expected three-to five-foot rise in sea level by 2100.

This is pretty progressive. This is tracking with the upper-level projections of the IPCC report. And to implement this policy, CRMC is working with the state building commissioner to adopt freeboard calculations that account for a sea level rise of three to five feet.

Freeboard is the additional base height of a structure above the FEMA that flood level.

So here you see the draft freeboard design recommendations. You can see that for public infrastructure, they require the maximum amount of freeboard, the maximum amount of protection.

This is because of the relatively long lifespan of this infrastructure, as well as the public investment that's represented.

Private property, residences, homes, they fall in the middle, somewhere around three feet of additional freeboard.

And accessory structures, like sheds and garages, those are the least protected because of their relatively short lifespan.

So this represents one opportunity to use coastal policy to build in added protection for anticipated sea level rise and its impacts.

Next slide.

This example is an image of Boston that visualizes the inland extent of sea level rise scenarios.

Boston can expect the coastal flooding equivalent to today's 100-year flood event every two to four years by mid-century and annually by the end of the century.

So these images are showing up in cities across the country to communicate the increased flood risk associated with sea level rise.

The blue hatched area is the current FEMA 100-year flood plan, and the lighter blue area is the 100-year flood zone under a higher emission scenario.

Next slide.

Delaware is also using NOAA services to help visualize sea level rise impacts and develop a statewide sea level rise adaptation plan. This project is in partnership with NOAA, the Delaware Department of Natural

Resources and USGS.

The dark blue represents current rivers in the Wilmington, Delaware area, and the light blue area represents areas that are expected to be inundated under four feet of sea level rise.

The yellow place marks, those represent local stories about impacts of inundation.

Next slide.

The place marks feature is something new, and that makes the impacts more relatable for people who might not understand or appreciate the implications of data shown on a map.

This example shows an area that habitually floods today just south of the Christina River, and this type of disruptive flooding can be expected to become more common in low-lying areas as sea level rises.

Next slide.

This is the final example. It's another visualization tool. I guess it's kind of telling visualization is kind of the thing right now. This tool is developed in partnership by USDA and NOAA.

Our CanVis assists with visualization of

changes to existing environment. The University of Rhode Island has used CanVis to show the new high tide marks under a three-foot rise scenario for various landmarks throughout Rhode Island.

And this is a picture of Providence Waterfront Park near Providence Place Mall.

Next slide.

And you can see using the CanVis software, they have been able to model a three-foot sea level rise at a high tide and then also at the highest spring tide event.

You'll notice that the pedestrian bridge becomes wet under spring high tide at three feet of sea level rise.

Next slide.

So I hope this presentation has highlighted the various ways that NOAA is enhancing our ability to understand and plan for sea level rise.

It was a brief introduction to the data, the tools that we have available, and I'm happy to take any questions at this time.

ED WELCH: Okay, thanks.

Comments or questions from -- Gary Jeffress.

GARY JEFFRESS: Thanks, Ed. Gary Jeffress.

This freeboard height you mentioned is freeboard above what?

ADRIANNE HARRISON: The base FEMA flood elevation.

GARY JEFFRESS: Which we all know is completely wrong.

ADRIANNE HARRISON: Yes.

Well, we always have to make decisions with the best information we have available. It's -- it's something that FEMA is definitely working to remedy, but you're right.

And so when we're adding on to the base level, maybe we shouldn't necessarily use the IPCC projections. Maybe we should be a little more progressive in thinking.

GARY JEFFRESS: I'd just like to point out that a lot of the topography used for these inundation maps is probably coming from USGS quad sheets.

If you look at the vertical datums for

those quad sheets, it was established in 1929, which makes -- you know, mean sea level back in 1929 was substantially lower than what it is now. And coupled with the fact if you had a more modern tide gauge where the latest datums were computed for the EPOC ending in 2001, and that was a 19-year average, right, if you have an increasing sea level, it's a -- a linear increase.

Over that 19-year period, you're taking the mean, which is going to be eight and a half years before the 2001.

So you're continuously using a datum that's lower than the actual sea level.

ADRIANNE HARRISON: You're right.

You've hit on a significant issue with the types of mapping that's being done now.

The vertical datums don't match up. It's something we're working, I think, with USGS and other agencies to rectify.

But right now, again, it's the best available information, and that's what we're trying to showcase to our states and local communities.

But you're right, that is a significant technical issue.

ED WELCH: Juliana.

JULIANA BLACKWELL: Adrianne, I'm the director of National Geodetic Survey. I know that we're working with CSC to highlight a lot of these issues related to the datums where these products are being derived from.

So the NG-29, the work with FEMA and the USGS, all of our offices are trying to make as much progress as possible to alert individuals about, you know, what's the accuracy of the data that they're currently using and the fact that the datums may be older; but in addition to that, really getting new information and making sure that the heights are current and relating them to the National Spatial Reference System are things that we need to do and communicate to all of the individuals that are putting together these types of products and visualization tools.

So I know we're going to continue to work together in doing that not only internally at NOAA but also at USGS and FEMA. So just

continue to keep that in mind, and you'll hear more about this later when I talk about the tools like CORS and GRAV-D and new ways of measuring and providing accurate heights for these types of efforts.

Thank you.

ADRIANNE HARRISON: In addition to heights, you know, another issue is coastal erosion.

I know in Maine they just completed a unified shoreline data layer for the Portland Casco Bay area, and they found that their high tide line was several feet off because of the erosion that has occurred over the years.

And so in addition to knowing the right height, you also have to know where the shoreline actually is, which is different than a lot of our older pictures.

ED WELCH: Adrianne, it sounds like to me that your work and your people's work are basically taking the data that's compiled by other folks, Juliana's and other sources, and then modeling it and manipulating it and that kind of thing, but you all are not data

collectors -- primary data collectors yourself.

Is that an accurate statement?

ADRIANNE HARRISON: The Coastal Services Center is not a data collector, but there are other parts of the National Ocean Service, including NGS, that is a data collector. And CO-OPS, they are a data collector. They're the ones responsible for --

ED WELCH: So we mentioned a couple of types of the data that you use, the material that's produced by the National Geodetic Service and the FEMA maps, to what extent they're useful or not.

But what are the other primary data sources that you all use?

ADRIANNE HARRISON: Well, for a lot of the mapping products we also use LiDAR.

LiDAR is kind of a -- is a satellite or an imagery, a photographic imagery source of data that states are really clamoring for high-resolution LiDAR.

And this is used as kind of the base information for a lot of our mapping efforts to get elevations, change in elevations.

ED WELCH: Okay, good.

Dr. Dionne, I know you wanted to ask a question. If you hold off just a second, let's just make sure the panelists have their chances, and then time permitting, we'll acknowledge you.

DR. MICHELE DIONNE: Thank you.

ED WELCH: John.

JONATHAN DASLER: Jon Dasler.

Adrianne, I guess what's a little concerning was the tables where you're actually setting heights above the base where people should be designing to, so is there metadata that's provided with that, any kind of uncertainties, so they know where the source of that information is coming from?

ADRIANNE HARRISON: Where the source of their recommended freeboard design?

Well, in their policy, they have stated that they want to accommodate three to five feet. So they're using, you know, recommended resources like IPCC, the backup, that estimate.

As far as metadata, they're -- it's not something that metadata really applies to as

far as designing these calculations.

If you want to put it into a mapping context to begin to showing what this height looks like relative to existing buildings, then maybe metadata would come into that play, but I don't believe they've gone down that road of actually visualizing what the freeboard looks like.

JONATHAN DASLER: It even seems like visualization maps should have some link to metadata and what's supporting that visualization.

ADRIANNE HARRISON: Yes.

And those maps, yes, there is metadata associated with them. And, you know, the process of how they arrived at that particular image at that time is available so that can be replicated by other organizations.

ED WELCH: Other comments? Questions?

Juliana.

JULIANA BLACKWELL: Just a comment on -- having the metadata is important. I think it's also important to have disclaimers about the metadata, especially if it's something that's

been collected to a previous -- an older datum or collected 50 years ago, because people that are using this information don't necessarily assume that the --

They don't know. They don't know about those older datums. They don't understand where they came from.

So I think we, NOAA, could do a better job of making sure the disclaimers are put on this just to alert users of it.

The other thing I wanted to mention in respect to the LiDAR and use of that technology is also -- it's fantastic technology, but the use of that for higher-resolution should also be coupled with the use of it and use for accurate positioning of the aircraft, as well as ground control so that the data that are collected are collected to an updated datum.

And that metadata and that information about the accuracy of that is also part of that dataset.

So having the standards, the specifications and the need for the ground, the geodetic control, are very important aspects of

the LiDAR collect, not just the use of the technology without perspective.

Thank you.

ED WELCH: Gary Jeffress.

GARY JEFFRESS: I'd just like to add a little bit about the LiDAR technology.

LiDAR is an really cool topographic mapping tool; but again, problems Juliana just pointed out with using the correct vertical control to manage that data in the vertical sense.

There is no federal standard for LiDAR mapping. It's fairly new technology, and there's no set standard like there was a standard for the USDA flood sheets which have been in place a long time. There's no federal standard for LiDAR mapping.

And this is something the Corps of Engineers is concerned about. They've had meetings with the American Society of Photogrammetry and Remote Sensing.

And various agencies that conduct LiDAR mapping and one of the leading ones is at the University of Texas in Austin, Bureau of

Economic Geology.

And they cannot -- well, we have not yet arrived at a standard for LiDAR mapping. And my understanding is that that mapping is unable to -- if you do everything correctly and have very good control, it's about accurate to about a foot.

And so that's a third of what we're looking at as the, you know, one century of sea level rise, which is really not accurate enough to, like, dictate a floor level relative to sea level.

So you really need an on-the-ground leveling survey to get those sorts of accuracies. But we do not have the infrastructure for that anymore because it's so old and has not been maintained. We're relying on GPS now. That has problems as well.

So we have a bit of a dilemma moving from the old technology of using accurate benchmarks on the ground which have disappeared and using the new technology of GPS. Okay?

And we're in this gray area, and the accuracies aren't what we would like.

I'm just pointing that out as a warning. Again, vertical measurement is critical, but it's not accurate enough right now.

ED WELCH: Thanks, Gary. Other panel members?

Okay. We may have a couple of situations as the day wears on where some of our guests would like to make a comment or react to something one of our speakers has said, and unless the panel tells me otherwise, what I'll do is acknowledge those folks if time permits.

Is that all right? Okay. Dr. Dionne, you're on, but come up to the mike, please.

DR. MICHELE DIONNE: Okay.

I just wanted to make a quick comment about the information you presented about flooding and the recent flood in Providence. And I think up in Maine we're having similar situations every other year or so.

This is from extreme precipitation events. And one thing that we try to stress -- because we think about not just the tidal areas but the entire coastal watershed -- that the way we've changed the physical features of our landscape

really exacerbate any kind of extreme precipitation.

So that's just another thing that people should be aware of, that the problem isn't all on the coast, but it's how we're clearing the land and making it much less receptive to rainfall.

And then just a comment that occurred to me while we're talking about the vertical control issues and averages of sea level, sea level actually varies annually. So even though there's a nice linear trend that you can -- just another level of variation that we all have to be thinking about in dealing with. It can go up or down from year to year.

So just something else we need to think about. Thanks.

ADRIANNE HARRISON: Yes.

We tend to smooth the curve to make it look pretty, but most of the pictures actually look like you were mentioning.

DR. MICHELE DIONNE: Yes.

ED WELCH: Okay. Thanks.

Any other comments?

I was interested in the way you inserted the last slides of Providence and the changes at Providence.

We're scheduled to run to about 5:00 in this hotel. Are we going to be okay?

ADRIANNE HARRISON: You should be okay. It's pretty clear outside. Thank you.

ED WELCH: Adrianne, do you have any concluding remarks?

ADRIANNE HARRISON: No.

I think, you know, a lot of the comments have pointed out some of the continued challenges on -- on the NOAA side of providing the most accurate data and information and improving the technology to improve the information.

But we also with our interactions with coastal managers are trying to stress that this is the best we have now. Let's, you know, continue to push forward; and as we get new data, we'll revisit the decisions we have made today.

ED WELCH: Thanks very much for your presentation.

ADRIANNE HARRISON: Thank you.

ED WELCH: Okay.

I'm going to turn to Tom Skinner -- whoops, wait a minute.

Kathy?

KATHY WATSON: Excuse me, Ed.

Could I make a quick suggestion for the speakers? Please try to speak into the microphone so the court reporter can hear what you're saying.

Thank you.

ED WELCH: Thanks, Kathy. I guess that goes for panelists, too.

KATHY WATSON: Yes, yes.

ED WELCH: Okay.

Tom, I will recognize you if you promise to speak into the mike.

TOM SKINNER: Thank you, Mr. Chair.

One thing, a few minutes to introduce Mark Borrelli. First of all, make the panel aware that both Admiral West and I are on the board of directors of the Provincetown Center for Coastal Studies where Mark works.

We had the good fortune at our January

board meeting to see this presentation or something similar, and I think the entire -- our entire board was very impressed with it.

And I want to thank both Admiral West and Kathy for making sure that -- and Mark for making sure that he could be with this panel today.

I mentioned this in passing yesterday. Mark started working about ten years ago at the Massachusetts Office of Coastal Zone Management, and he was the coastal geologist and had the unenviable task of going out and explaining to homeowners why they couldn't built in the Meloski [phonetic] zone, why dunes were not compatible with in-ground swimming pools and so forth.

And I think he found very quickly that he had to be very creative, that science and logic didn't always carry the day.

He subsequently went on to the National Park Service, did some work for them, and about a year ago started working at the Provincetown Center for Coastal Studies where he has used that same creative thinking and thinking

outside the box to tackle an issue of doing some mapping in some shallow water areas.

Welcome, Mark.

MARK BORRELLI: Thank you. And I'd like to thank the panel for the opportunity to come and present today.

I will try and talk slowly, because when I get going, I start going fast. And I'll try to stay near the microphone.

Okay. Just sort of dive right in. Talk a little bit about the product that we're working on, the field setting, some preliminary results.

We -- I started, again, as Tom says, June 1, last year. By the time we got the equipment in house and on the boat and working, it was about April -- no, I'm sorry, October 20th. So we had about ten days on the water last fall before we had to close shop.

But we do have some preliminary results, and then we'll talk about the overall -- our research goals.

Okay. Some background. This was ready, aim, shoot self in foot. This is the story

that was told to me. I don't know if it's thoughtful or not. Maybe Tom can verify this or not.

In the mid to late '90s, more and more private organizations were trying to or proposing to put more infrastructure on seafloor in Massachusetts. It was becoming more and more prevalent

And at some of these meetings, the proponents would say things like, well, you say we're going to negatively impact the seafloor. How do you know? You don't have maps.

And then some clever person says you're right, and you're going to help us pay to get them.

So what Massachusetts did, it set up a fund wherein every time there's a project done on seafloor, a certain percentage of those funds would go into this larger fund to develop seafloor maps.

And thus was born the Massachusetts Seafloor Mapping Cooperative. And it's a partnership that started formally in 2003, and it was a partnership between the Coastal Zone

Management Office in Massachusetts and the USGS primarily, but NOAA has been a contributor.

There are many other contributors, and now part of the funding for this project came directly from that fund, the Provincetown Center for Coastal Studies.

And what we're charged with doing is collecting the bathymetric data, and with sufficient geology, you can do this in a number of different ways. And this is done in state waters up to three nautical miles.

We use geophysical techniques. USGS has been the primary -- they've been doing most of the work up until now and continuing into the present day. These -- this suite of geophysical techniques, including the swath bathymetry, side scan sonar. There are days you can do some seismic reflection work for the subbottom, lots of sediment sampling photographs and video.

From 2003, the beginning of the project, to 2008, they've mapped over 1300 square kilometers of the seafloor in Massachusetts state waters, which is about 75 to 80 percent.

They've done more in 2009. And primarily, they're -- they work within about 5 to 90 meters of water depth.

And for the most part, it's more than 10 meters out. They have come in swallower and shallower as the technology and the need has become more available.

So for the product that we're working on, it's a three-year pilot project that the center is working on. I'm the project manager. And we are charged with developing methods to collect data and produce the nearshore resource characterization maps. We're moving away from the benthic habitat mapping title, and we're just mapping the nearshore resources.

We -- and part of this project, we want to develop seamless onshore/offshore maps. And typically, I'm really happy to hear that vertical datum comment, because it is an issue, particularly when we're doing the seamless onshore/offshore maps.

Typically when you do seamless onshore/offshore maps, the LiDAR data -- you usually get the -- when the water is cold --

you try to get the clearest water you can, and the vessel-based data is usually in the summer, June, July, August.

So what you're trying to do is map one of the dynamic environments, this coastal zone, and you're spreading it four or five months apart, and it's not really useful to scientists and modelers, people who are going use these data in general.

So what we're proposing to do with this particular project is to -- we're -- actually, we're going to map the marine-terrestrial interface. Rather than just say seafloor mapping or terrestrial mapping, we're going to map that marine-terrestrial interface.

Cape Cod Bay is a wonderful place to do it. We have a three-meter tidal range, so what we're proposing to do is we're going to map -- start in very shallow waters, in 10 meters, and go all the way up to the shoreline. And we're going to map the beach dune system with the LiDAR.

But with that intertidal range, what we're going to do is introduce this concept of tide

coincident. What we want to do is we have LiDAR flights at low tide. And then at the next high tide or previous high tide, we come in with the boat and we map that same area. The same intertidal area will be mapped six hours apart.

So rather than having it weeks or months apart, we're going to have it -- we're going to shoot for trying to do this six hours apart, either previous or the next time, very shallow waters. With the tidal range we have in Cape Cod Bay, we think it's doable.

Part of what makes this whole project work is this latest technology, interferometric sonar system. I'll talk a little bit more about that.

We have the C3D system from Teledyne Benthos in Falmouth, Massachusetts just developing in the last few years this technology. We collect coincident swath bathymetry and side scan sonar. It's a fantastic system.

Darren Moss and Charlie Chong [phonetic] at Teledyne Benthos have been fantastic

supporters they're really working with us to help us make it work, and they're only an hour away, which is nice.

There's only literally three or four places in the world that makes this, so it's nice to have somebody in the neighborhood.

Now, USGS data products, again, they have been doing this. They are the leaders. They are a production shop. They're -- some of the world's best people are at the USGS.

These are the typical data products you see that they put out. On bottom here you have all the different datasets, whether it's bathymetry, side scan, sediment sampling, video and photographic capture, things like that, and then they produce this map above.

But one of the things when you look at the raw data -- this is the bathymetry. This is Plum Island. This is the Massachusetts-New Hampshire border up here, and that's the bathymetry.

And basically what this project is, the project that we're working on, is coloring in that white space.

When you have these bathymetry maps, they just don't go up to the shoreline, and it actually has -- in the industry, we call it the white space. It's this area on the map that is rarely colored in because there's just no data there.

And the data that is there, within the last five, ten years, they have been using personal watercraft with a GPS unit on it to sort of go in and out of the surf zone. High levels of uncertainty or errant data. While it's useful and it does serve a purpose, getting a swath bathymetry system in there with the equipment that we have is going to increase or decrease the uncertainty to very, very low levels, I think.

So for this particular map, we would be filling in that area. Overlap the existing data and then come into the very shallow waters, using the vessel that we're building with the equipment that we have to map that area.

Little bit about Provincetown Center for Coastal Studies, we are a private nonprofit.

Our primary or our initial role was the study of right whales, the North Atlantic right whale.

We -- part of -- a large part of the program is the disentanglement program. We go out and we disentangle these if we get reports. We actually just disentangled a right whale Saturday that we first saw with string on it, some fishing gear on it in 2008, March 2008. And last Saturday we just disentangled this particular right whale in the Great South Channel.

So that was a great thing. There's only about 350 to 450 right whales left. They're a native species. So these guys just do great work and can't say enough about that.

But we do the large programs, we do water quality monitoring. We have a land scanner action program, which is where my product is housed.

And we're in a great location. We're right at the tip of Cape Cod. We do a lot of work in Cape Cod Bay, the southern Gulf of Maine, and the program is expanding.

We have a new facility, about 11,000 square feet, just totally done over in 2007. This is actually an old Catholic school. The Catholic Church is right off shot here, and my office space -- people who have been in the town their whole lives come into my office and reminisce about the times when the nuns used to take them in there and whack their wrists with the ruler but...

So it's fun to have that interaction with the town that we have.

This is the boat. This is a dedicated research vessel. This is -- it's a Winninghoff. Before I came to the center, I didn't know what a Winninghoff was. It's a 26-foot all-aluminum boat, three airtight compartments. Draws about a foot and a half.

This thing is a tank. It's great for what we want to do, shallow water, very little draft, but it doesn't move around that much in the wind. It's -- it's just a great, great research vessel.

These pictures were taken last fall when we just started to develop the mounting gear.

That is little A-frame that we have. You mount the pod onto this A-frame, and you lower it into the water.

We've since installed a hoist here, so this is all automated, and then we just lock it into place and you lower it down. And we can -- we have set this up so we can be -- this pod is a fit of one foot -- goes from one to three feet below the water level, so we can --

Last fall we had a couple -- about a week before Thanksgiving we had two flat, calm days out there. It was beautiful. And we were in a meter of water surveying. So we can get that far or that shallow, and it's just a phenomenal system.

Really quickly, there's -- just to show you all the parts of system, there's the sonar unit that is below the water. Again, that's the C3D unit. We have a CTD sensor. It's a conductivity-temperature-depth sensor, because we need really high-accuracy, high-resolution information about sound velocity, how fast sound travels through water, because that's, in essence, what we're measuring.

We know exactly when the sound leaves the sonar unit and when it comes back. We have to know exactly how long that was and how fast sound is traveling in that particular area through water.

We have a motion reference unit, gives you the pitch and roll of the ship, which is critical. All those data go into the onboard -- one of the onboard computers.

We have a vector sensor that are -- these tho GPS antennas are spread out on two years [phonetic], so, you know, the yaw, if the both starts to crab, you know exactly what that is.

We have an RTK GPS system. I love this thing. This is -- RTK GPS. We don't have to worry about -- correct for tides because it takes realtime data, saves another step.

And the other thing about this system -- I'll get into that in the next slide. But the last piece is that this desktop computer -- second onboard computer incorporates all this data. You have one dataset when you get out.

You don't have to worry about having a bathymetric set and a side scan sonar and

putting it all together. You have one dataset.

We're using Hypack software on this, and the functionality of the software with the power of the equipment is just a -- a great -- is a great form -- it's a great match.

But this RTK GPS system, I'm excited about this, because I did a lot of this when I was doing my master's and Ph.D. work, and you always had to set up that bay station. You always had to go out and set up that bay station, and then you always had to have somebody watch it.

And it's a real pain because -- especially when you're on a boat. You have to set up a crew, you have to set people, put it in a place where it's safe.

Keystone Precision, which is the dealer for Trimble hardware in Massachusetts and Rhode Island, has a cellular network that they've set up. And all these bay stations from southern Maine down to Virginia act as virtual bay stations.

So I get on my boat or I use this on the beach, and I initialize literally in less than

five minutes, and I'm collecting realtime data with an accuracy of two or three centimeters vertical -- it's fantastic -- without a bay station.

So we're very excited about this. It cuts down -- it's just fantastic. I love this system.

And when we initially started this, zoom in here, we had a bay station here and a bay station here, but there was nothing out here, so there would be a significant degradation of the data in Cape Cod Bay, because triangulation is the name of the game when you're doing these kinds of things.

So we proposed to the company to put a bay station on our roof of our building, and so we have really high accuracy measurements for that RTX GPS. So the verticals numbers we're getting are really tight.

We're going to do some uncertainty analysis this spring, but we're very confident that we're going to get favorable results.

Let me see if I can click on this video. Can you just click in that square?

And this is just for those who aren't that familiar with how this -- I just want to show this video.

This is actually from the NOAA Ocean Explorer site. Just a quick little video that I'm not sure is going to work.

And it just shows basically an AUV of an autonomous underwater vehicle moving through the --

VIRGINIA DENTLER: Do you want me to pull it up?

MARK BORRELLI: Did you click on --

VIRGINIA DENTLER: Yes, it's not...

MARK BORRELLI: It just shows basically how the sound bounces off the seafloor and comes back to the fish, and it's not -- it wasn't critical.

VIRGINIA DENTLER: I'm pulling it up.

MARK BORRELLI: Okay. It's just for those who aren't too familiar with -- okay, here we go.

It's a real quick video. And again, it is an AUV. It's not what we're using. We're using -- the fish is mounted to the boat, but

it does show you how you have that little space directly below the fish, it has no data in it, and then you have the sound coming down off the fish, bouncing back off the seafloor and coming back up.

And it's just a real interesting video. Most videos that I've seen don't have that little space directly relating to where there's no data. You see this nice...

But this has to do also with the next slide, which has to do with the swath width-to-depth ratio, which is critical for the work we're doing. You can stop it there. Yeah.

Okay.

So a big -- a big drawback in the past has been the swath width-to-depth ratio. Traditionally, multibeam, it's three to one. If you're in five meters of water, you get a 15-meter swath. And this was part of the reason why when organizations like NOAA and the USGS do their mapping, they do it in deep water first, because it's much more efficient to get out there in deep water, get a wider swath and

collect more data for the same period of time.

But in the last few years, interferometric technology has been around for a long time, but it's only in the last few years has it become predictable enough, efficient enough. They've worked out the kinks, basically, and it's really fantastic.

So now when we're in the shallow water using our gear, we're getting -- you can get up to ten-to-one swath width-to-depth ratio.

So it becomes much more efficient. We can do it in a third of the time. The data collection is fantastic. And when you're in shallow water, you're in hazardous area, there's a lot of gear. It's much more efficient and much safer to use this kind of technology.

And now the USGS is again beginning to do it. I'm sure NOAA is beginning to do it in shallow water areas.

Quickly, the field setting, as I mentioned, Cape Cod Bay. We are partnering with Cape Cod National Seashore.

We have two grad students coming on board

in the summer to work full-time for two years on this project. They'll be housed for the summers, anyway, in the park housing, which is a big help for us, because getting a room on Cape Cod in the summertime is tricky.

This is our study area, as laid out in the project description, and we're not going to be mapping this whole area -- well, it's unlikely that we will, but we're going to be trying to develop these methods within this study area. And basically, this outer age is the ten-year isobath.

This is the extent -- there's more data here that USGS has collected up to the north -- for Cape Cod Bay, this is all they've collected to this point. So it's a nice, you know, wide swath, but there's a lot of area, obviously, they haven't done in Cape Cod Bay.

NOAA has done some. There was a realignment of the channel because of whale strikes that they did down in here. They've done other realignment of channels for that -- for those reasons.

And just really quickly for those who

aren't familiar with the area, we'll just take you all on fly-by. Could not get the Google video to work so I'm just going to cheat and just show little figures.

So this is the area, the southern extent of where we're going to be. Lots of bed forms, lots of sediment transport in the area. This is Wellfleet, moving up into Truro, Pamet River.

This area is dredged every two, three, four years, depending on need. Again, lots of -- you see all this dark vegetation. This aerial photograph was taken in July. These areas are all eelgrass beds or some kind of seagrass.

And this is the tip of Provincetown. Again, this is where the center is, and this is where we put the boat, so this is -- it's a nice setup. It's a quick response.

We can get out, we can get half day. If the weather turns, we don't have to -- mobilization costs are negligible.

Okay. So we'll look at some of the data. This is a side scan sonar. Side scan sonar is

basically imagery. It's an image of the bottom captured using sound as opposed to light.

So this is the -- that area, we're directly under the boat where there's no data, that we saw in the video. And this is -- these are eelgrass beds. This is all vegetation.

And how do we know this is eelgrass? Well, we were about in three meters of water, so we just looked over the side.

When we do this on large scale, we start -- because the field season will start in earnest any day now, quite early; but when we do do this, we'll do a lot of ground trooping to make sure the signature we're seeing on the side scan sonar is what we think it is when we take sediment samples, things like that.

So this is really nice. Geologists like to see this kind of stuff. We can see the eelgrass, we can see these bed forms. We'll zoom in on this picture now. It gets a little grainy here, but that's because we're blowing up to such an extent.

But these bed forms -- someone mentioned yesterday that one of the things we need to do

when we do mapping is provide modelers with some good idea of sediment transform. They want to sea bed forms, they want to see slides of bed forms. They want to understand --

Hydrogenetic modelers, when they want to get a handle on [unintelligible], they want to know what the sand grain size is, what the bed forms are like.

Of course a geologist looks at this and they look at the bed forms, they want to know water depth. I can tell the current velocities that form these bed forms just by looking at them.

Again, this is just the side scan. The bathymetry will give you even more quantitative data.

Another image here, again, really nice area. And I like this picture because yes, you have a lot of eelgrass here. But on this side, you see -- you see these nice bed forms here and here, and they sort of go away.

So one of the questions we're going to ask when you start to see things like this is are we approaching the -- the extent of the

resolution of this equipment or are these bed forms actually going away, which happens in places,

And my guess here is that there are bed forms there, and we're getting close to that resolution boundary.

Let's see. Here's another shot. As this area gets whiter, the water is getting deeper. So this is a nice little sort of safety precaution, because if this water column starts getting narrower and narrower and narrower, you're in trouble, because you're getting shallower and shallower and shallower.

Here this is off of Truro, which is the town adjacent to Provincetown, and we saw in this area where we were doing it last fall, that as soon as we got into about four meters of water, the eelgrass beds were much thicker.

Here you can see it's very sparse, and here it's just so thick you can't even see the bottom anymore.

And this is very anecdotal. This is us just going out and trying to get the equipment to work, so we haven't really done research on

this particular area, but we will be as we -- as we move forward.

So it's a lot of opportunities yes, to do mapping, yes to provide modelers with information, but also to do a lot of good science.

Aquaculture is very big out here. The nature conservancy is planting eelgrass anywhere they can. So we have -- if we're going to have information -- quantitative information about patchiness in terms of eelgrass, locations where it has been doing well and where it hasn't in terms of aquaculture.

This is, again, more eelgrass here. You can see this patchiness; it's just starting to take hold here. Another one -- another image, bed forms, patchiness, the eelgrass.

I like this one. This is -- this is an instance, I believe, of where the bed forms just go away. There's some downwellings, a change in currents. And something is flattening out this plain beds here or some other function, process that's going on that's

just removing these bed forms. They just stop too abruptly. Could be grain size difference, could be a number of different things.

But this equipment will allow us to look at these things, take some [inaudible] to figure out what's actually going on. This is probably a manmade object here, human-made.

Anthropogenic alterations. Here you see the mooring. These are little mooring -- looking at that telltale mark in the sand. We see scars in the eelgrass with this equipment. They just jump right out at you.

More gear on the bottom, mushroom anchor. We can see this gear, little debris field here. This is really important for the disentanglement program. They want to know where this gear is. If it's derelict and it's been here for a while and we have the opportunity to go get it --

This is -- just looking at this water column, knowing that the range here is about 50 meters, this is probably about four meters of water. It's not much. So we could -- we may be able to go out and get this stuff. A

lot of different uses.

Hazardous navigation, this boat -- ship is in Provincetown Harbor. It's well marked on the NOAA charts, but we found another one that wasn't on the NOAA charts.

And you can see the shadow. Again, we're using sound, so the shadow is not a shadow of light, it's a shadow of sound. There's no sound hitting the seafloor here, because it's blocked by this boat.

And this is the same boat, but it's taken from a different angle. And you can see the detail here. Again, it's grainy because I've blown it up, but you can really the detail here.

Preliminary results, we've done about 100 kilometers of tracks last fall in about one to five meters. We're sticking to the shallow water because we really want to see what kind of results we're getting and we're seeing a ten-to-one swath-to-depth ratio.

And when you narrow it down seven to eight or ten or seven to one or eight to one, it gets really, really tight. Very little processing

So the questions now we're asking is do we want to keep it at seven to one or eight to one and do very little processing, spend more time on the boat, less time in front of the computer? Or do we want to get a ten to one, increase our coverage, and do a little bit more processing on the other end?

Bed forms that we're seeing, the resolution, you can easily see bed form space 10 centimeters apart, which is really pretty good.

This sonar unit runs as 200 kilohertz. When I look at the side scan, I think 500 kilohertz. It's really pretty good. Interferometric sonar to my mind is a step above the existing technologies.

And the uncertainty analysis. We's going to do a lot of this. Straud Armstrong from Teledyne Benthos is going to help us with the uncertainty analysis, and we're going to have [inaudible] myself -- this is a big deal for us.

One of the things that we're really concerned with when we do these seamless maps

is the datums. LiDAR is going to give us one datum. Our work is going to give us another datum. And how you match those things?

Because we're doing this constantly, because we're doing this hours apart, what we want to do is get some structures in the intertidal, whether they're lobster pots that are big enough, maybe coupled together, or we go survey -- there's a lot of growings in the area.

At low tide we survey some of these growings, and then we can see them in the LiDAR and see them in the vessel-based bathymetry and overlap those, and we'll know exactly where those points are that overlap in those datasets.

And a lot of datum issues go away, and we can actually overlap things six hours apart. Things like rocks on the ground that don't shift, things like anchoring those lobster pots on the bottom. It will remove a lot of problems.

So the LiDAR missions. We've been worried about this. In 2005, Cape Cod National

Seashore was due to have a LiDAR mission done along its whole shoreline, and then Hurricane Katrina happened and every piece of equipment obviously went down there.

So we were worried about that happening and wanted to develop sort of in-house capabilities to collect some data.

We can mount that GPS onto an ATV, go out, drive to the beach and do it that way and get those data; but what we found is -- and this should be May 2010 -- the US Army Corps of Engineers is going to be flying a survey in this area, and they're going to start in Rhode Island and work their way to the Cape.

And it says April because it was scheduled in April, but then we had the floods in Rhode Island, postponed it. And then the gear got stuck in Europe and the volcano postponed it, so they're a little behind schedule.

And that's bathymetric LiDAR.

USGS is also planning a survey -- we don't have the dates yet -- in the same area, and we wrote a grant, because we were worried about it, with Jeff Rogers, who is a. Ph.D. candidate

who is at the center, adjunct capacity, to collect some terrestrial data with the National Center for Airborne LiDAR Mapping.

And we got that grant, so that's at our disposal. We tell them when we want it. Jeff is interested in salt marsh and LiDAR, so we're probably going to fly in August when the vegetation is at its fullest.

And I just found out yesterday or a couple of days ago that NOAA has contracted to fly a fly in the area. I just got this in my email the other day. These are the projected flight lines. So your mind starts to explode as to the possibility of how much LiDAR data, how many things --

I mean, people are starting to do this, use the LiDAR data and the mapping. Nobody has ever done a seasonal look at this. Nobody has ever looked in May and again in August with LiDAR and a seamless map

So there's a lot of different things we can do here, and we are excited about the opportunity to -- to get down there and do some mapping, produce these maps and do some good

science.

And these are just acknowledgments. As a private nonprofit, we don't have -- we have low overhead, but we don't have a funds, so the partnerships are really important to us, and particularly the private partnerships.

Hypack has provided us with the opportunity to fund a graduate student through a loan agreement with them, so that's been a real huge feature for us.

Again, I mentioned Straud Armstrong before. Teledyne Benthos is helping work with us. Some of these organizations have been really great helping us out, and we'd just like to thank them.

Thank you.

ED WELCH: Okay, Mark, thanks very much. Comments, questions from the panelists?

Yes, Matt.

MATT WELLSLAGER: Mark, that's great stuff. I manage a realtime network down in South Carolina. I was curious what you were dealing with here.

Initially when you're working with

Keystone's network, is a single baseline or are you getting a model solution from the reference network itself?

MARK BORRELLI: As far as I know, we're getting the model solution, but -- I think that's what we're getting.

MATT WELLSLAGER: Are you working with depths to the ellipsoid or are you applying a geoid model? And if so, which geoid are you working with?

MARK BORRELLI: That I don't know. I could put you in contact with the person, but I don't know. I'm just scientist.

MATT WELLSLAGER: Got you.

Well, in addition to that, you had mentioned datums.

It would go would be interesting to know what datum Keystone is providing corrections on.

And when you work with the LiDAR data, that will be adjusted to a datum as well, and you mentioned that issue there.

MARK BORRELLI: Yes.

MATT WELLSLAGER: Are you familiar with

the possibility of getting Ortho-Imagery at the same time the LiDAR is being flown and then you can have rectified very large-scale imagery that could be overlaid with LiDAR so you could have some seamless modeling capabilities.

MARK BORRELLI: I'm aware of the georeference there, not the Ortho rectifier. But they were at such a scale, it was difficult to get Ortho verification; but if it's possible, then I'd be interested.

MATT WELLSLAGER: We're getting it in South Carolina.

MARK BORRELLI: That's great.

MATT WELLSLAGER: And the Hypack is good stuff. We do the same thing. We've done that done there. Thank you.

MARK BORRELLI: Sure.

ED WELCH: Are there comments or questions? Jon, Jon Dasler.

JONATHAN DASLER: Again, great presentation. Fascinating work.

MARK BORRELLI: Thank you.

JONATHAN DASLER: I was just curious on some of the GPS work -- some of the same areas

where the LiDAR might be done and they'll be used on a virtual base and some bay stations will be put out.

But is there going to be other confirmations, I guess, of the virtual network in doing that? And do you have the capability of doing post-processing with the systems you have on board?

Some combine GPS and an inertial system, you can do a post-processing, which will kind of improve motion artifacts and positioning--

MARK BORRELLI: Yes.

Again, I'm told you don't need to do post-processing given the system we have. There's uncertainty analysis where you --

We were told that we don't need to do post-processing giving the system that we have, but there is an uncertainty analysis where you can kind of occupy a known point for a period of time, three minutes, and you collect enough data points and you do that kind of thing.

Again, it's not my area of expertise. But I know we'll will be trying to nail down that uncertainty.

JONATHAN DASLER: I don't know about if that -- that's something maybe Juliana knows, but I know some of the state networks aren't all cooperative sites for NGS and we've seen that in other networks where even just taking the bay station data and running it through, say, like a NOVA Solutions to kind of verify a position --

So if the data -- I guess what I'm getting to is if this data is going to get cross-referenced to NOAA surveys and other surveys that may be going on, just doing some confirmations like that and maybe looking at what NOAA is doing also in terms of horizontal and vertical control.

MARK BORRELLI: Mm-hmm.

There is a GIS specialist at the seashore, Mark Adams, who has reoccupied some of the NGS benchmarks out there, and we're going to compare data with him and probably go out and occupy it ourselves for a while to help -- help with that.

ED WELCH: Juliana.

JULIANA BLACKWELL: Mark, thank you very

much for that presentation.

I think we have several -- the National Geodetic Survey has several products and services that are available that we would like to make sure that you're aware of, and the folks that are processing data are aware of it.

Jon mentioned one of them, our tool that's available for people to submit GPS data and have that data then return an answer to you based on our CORS, Continuously Operating Reference Station that we have, and be able to provide a position to you online through email that will tell you what the latitude and longitude and elevations are and give you accuracies for that position as well.

So that's one example.

We also have the three offices here, Coast Survey, CO-OPS and NGS have VDatum, which is something that may not be of -- I don't think it's available in your area, and that's what I was checking just a minute ago.

I don't believe VDatum is available in your area yet, but it is a transformation tool that will allow the water datums and the

geodetic datums to be connected through our modeling efforts.

And we're going to touch on that later on this afternoon when I give my update; but certainly Doug Brown, who's here in the audience, is our VDatum project manager, he can give you a little more information about that.

But that and items such as our integrated ocean and coastal mapping efforts that's not just NOAA, it's several different agencies, and you mentioned ERL and you mentioned USGS and Army Corps of Engineers and things that are happening.

There are a lot of -- a lot of opportunities, I think, to learn and to integrate what -- what we're doing federally to help tie these together.

So I just want to invite you to keep looking and to search some of our webpages, as well as talk to folks here, get some more ideas of how to -- how to pull all this information together.

I did have one quick question. You mentioned NCALM, that was an acronym that I --

that I didn't get where that's -- it was and where that's from.

MARK BORRELLI: Yes. It's the National Center for Airborne Laser Mapping, or maybe LiDAR Mapping.

It's a grant that Jeff Rogers wrote with me, and it's geared toward providing students with LiDAR data. And it's done at their discretion.

You can give them flight lines, and if you win the grant, they'll fly the lines for you. And we got -- we won the grant. So in August of this year, we'll fly those lines. That's terrestrial. And I think it's NSF, but I'm not sure what the parent agency is.

JULIANA BLACKWELL: Great. Thank you, Mark.

MARK BORRELLI: Sure.

JULIANA BLACKWELL: And just one other thing I forgot to mention.

What Jon was referring to also -- Jon Dasler was referring to, is these realtime networks that private companies are putting up, at the National Geodetic Survey we want to

ensure that those networks are positioned relative to the National Spatial Reference system, and so making sure that they are -- they're accurate to the national system is something that we are very engaged with and want to ensure.

And so one way of doing that is to take data, see what your network -- your local network solution is, and then also again submitting it to this opus is as a good check for the user to determine if those numbers are matching up.

That's -- if they're not, then it's time to contact some folks and find out why not.

MARK BORRELLI: Yes. That's going to be critical for us as we go forward this summer.

ED WELCH: Other panel members?

Adam, did you -- Tom Skinner.

TOM SKINNER: When Mark was at CZM, it was almost impossible for anyone to get a word in edgewise, so if you had something to say, you had to say it quickly.

One of the things about Cape Cod is about 15 years ago, it -- I think it was about 15

years ago, it started becoming harder and harder for homeowners to get homeowner's issuance. It's a very dynamic area.

And the issue has gotten to the stage where the state has had to step in with a special program for homeowners.

One of the interesting things about this project is that one of the companies -- one of the private companies that is still writing homeowner's policies on Cape Cod is the Narragansett Bay Insurance Company.

I don't know if there's anyone here from Narragansett Bay. I think it would be very interesting -- this is the type of information -- and they're very interested in this type of data in terms of improving their models for homeowner's insurance, and it might be very interesting.

I don't think we've heard from the insurance industry in terms of how this data is used for coastal areas, and it may be interesting at a future meeting it hear from representatives, so...

ED WELCH: Thanks, Tom.

Other panel members? Mark, I've got a couple of questions.

At your center, is Mason Weinrich one of your folks, the right whale guy.

MARK BORRELLI: I beg your pardon?

ED WELCH: Mason Weinrich?

MARK BORRELLI: He was, but he's not there anymore.

TOM SKINNER: He's the director of the Whale Center, which is in Gloucester, Massachusetts.

ED WELCH: I thought at one point he might have had some connection.

Your slide about the white spaces sort of in the shallow zones. Is there a typical width, how much area those white spaces are? And can you say that or does it vary too much to make that generalization?

MARK BORRELLI: It does vary. It's not -- let's see. If I wanted to give you sort of an envelope -- it's probably -- it's -- it does vary.

You know, it can be, you know, a kilometer; it can be hundreds of meters. It

depends on the slope of the beach and --

ED WELCH: Okay. All right.

MARK BORRELLI: And also the hazard -- if you're on a rocky coast, you're not going to get anywhere near that.

If you're on a sandy beach, you know, you'll get closer.

ED WELCH: Okay.

Within Cape Cod Bay and within the area you're working, how dynamic an area is the bottom?

How much -- how frequently does it change?

I guess what I'm getting at is -- is the data that you generate relatively short-lived because of changes in storms and that type of thing or does it --

I mean, I guess for eelgrass beds, you pretty much know generally where they're going to be and they can persist, but I was just wondering how -- how long-lived your products are.

MARK BORRELLI: Part of the reason why Cape Cod Bay was chosen, as I understand, is because you're protected -- you don't want to

development methods like this on the open ocean because it's too dynamic.

There is a fair amount of sediment transport on the bay, but not that much. So it's not nearly as dynamic as the outer Cape Cod beaches.

So the data products will be useful for I think a longer period than they would be on the ocean side, so there is some sediment transport but not a whole lot.

Having said that, they just had the worst winter on the bay side that they've had in about 10 or 15 years, lots of erosion, lots of concern, lot of failures, things like that this winter.

So it's very episodic, but it's not nearly as dynamic as the open ocean.

ED WELCH: Okay, good.

One thing that your presentation reminded me of is the interface of work between NOAA and USGS.

And Juliana or other NOAA folks, can we -- can you make a statement or a comment as to, you know, where NOAA's responsibilities begin

and end and USGS's begin or how they overlap or what different types of data they're collecting?

JULIANA BLACKWELL: Thanks, Ed.

ED WELCH: Maybe you're not the right person to answer that question.

JULIANA BLACKWELL: Well, I can put my two cents in, but I don't know that I can speak broadly about all the different confines of it.

I know that we do work collaboratively on many of the projects regarding shoreline mapping and trying to coordinate the efforts of who's flying what where.

And part of, again, this integrated ocean and coastal mapping effort is to be able to map once, use many times. And so that is a coordination effort as well as an operational effort, so that's one example of how not only NOAA but USGS and Army Corps of Engineers and a variety of other federal agencies are working hard to do this in a more coordinated, efficient fashion, and then be able to take that data and provide it to users so that they can use it for their purposes as well.

So things that maybe we're not focusing on, somebody else can pick that up and use that data for their -- for their needs.

And so Roger Parsons, who is our IOCM program manager, who is often at these meetings -- he's not here today, but he's also somebody else that can help with those types of questions and answers as to where things are being done or how they could be done together if people are aware of our projects.

From the geodetics side, the National Geodetic Survey is working with USGS, but USGS is a key organization also, and so regionally and nationally and very locally, there are different levels of success in trying to get those coordination efforts of who's doing what where.

USGS certainly does do mapping and uses control are efforts of trying to ensure that they're using control that's tied to the National Spatial Reference System of which NGS is the keeper of, the provider of, and can show that their data links to national datums, as well as ensuring they're -- they're providing

accurate information that is -- or providing the metadata for their -- their control work is something that we're working, you know, on many levels trying to improve.

As far as what's happening nearshore and in the water, I'm not sure what USGS is doing inside Cape Cod in the bay area there as far as, you know, hydrographic survey or anything like that. That I -- I will not be able to comment on.

ED WELCH: Okay.

Rich Edwing.

RICHARD EDWING: Let me just answer that -- Rich Edwing.

The USGS operates thousands of stream gauges all across the country, and some of those gauges probably in the hundreds are in coastal zone.

And we've been working with them, and of course they're pulling a different set of products out of their gauges than we are, but we're working with them.

We've actually just formed a working group between us and the Corps of Engineers and USGS

to look at common standards and things so that we can start to compute tidal datums out of their -- the gauges that are, you know, they have out there.

We've actually already been working closely with the Corps with their gauging network, and that made a lot of progress, and that's put some pressure on USGS to kind of sit down and come to the table and start moving in the same direction.

So I think there's a lot of progress been made between us and the Corps, and I think we're going to be starting to see a lot of progress between us and USGS and getting these three observing system networks somewhat integrated.

ED WELCH: Okay.

Mark, you indicated all of this effort sort of came about by a variety of requests from people to put things on the bottom in Cape Cod Bay.

And give us some examples of what those types of things are.

MARK BORRELLI: It was more in

Massachusetts state waters, and a lot of it is LNG -- one of the ones is LNG pipelines. That's one of the driving ones. Cape Wind, also the wind farms in Nantucket Sound.

Mid to late '90s, it was seen that these products were coming, and they need to have more of a feel of what's actually out there, try to manage what you don't have data on.

So it wasn't really Cape Cod Bay necessary, but it was Massachusetts state waters.

ED WELCH: So there is a Massachusetts state statute or policy that when somebody is proposing some kind of a new use on the bottom within Massachusetts state waters of that type, that there is various types of assessments they have to pay for some of the, shall we say, infrastructure that helps support that?

MARK BORRELLI: Yes.

I would probably refer that to Tom, because he would probably have a better idea of whether it's a policy, regulation or that kind of thing

But I know that there is a mechanism in

place that when a project like that is proposed, yeah, there has to be some mitigation.

ED WELCH: Okay.

Tom?

TOM SKINNER: It's through the state's -- Massachusetts Environmental Policy Act, or MEPA, process a project will go through. And based on agency comments, the Secretary of Environmental Affairs will issue a mitigation package.

And it's a more tradition now that when there's a -- a significant ocean-based project, that some of it goes to completing the seafloor mapping project.

ED WELCH: So Massachusetts is out ahead of the federal in that respect.

Larry.

LARRY WHITING: Larry Whiting.

Are you aware, Mark, of -- if Teledyne has submitted their specs and equipment to NOAA to have them test it for their surveys?

MARK BORRELLI: You know, Straud Armstrong was here yesterday. He's not here today -- oh,

there he is.

Straud, do you know?

ED WELCH: Can you come up to the mike, please, sir?

MARK BORRELLI: I love putting people on the spot.

STRAUD ARMSTRONG: Thank you.

Straud Armstrong from Teledyne Benthos.

Yes, I think HSRP was evaluating the Benthos C3D last year. There may have been some issues with software or hardware at the time.

And we are in the process right now of doing some more evaluation also with Canadian Hydrographic Services in Vancouver.

LARRY WHITING: Okay, thanks.

I tested the system in the past, and it did not pass at that time. Made way too much noise.

MR. SUDDELSON: Okay.

It was --

LARRY WHITING: So it would have to have new software or be cleaned up on the -- on the receiver side in some way.

STRAUD ARMSTRONG: Yes, yes.

We have made very great improvements in the software handling, and some of it has been working with the software companies themselves, such as Hypack has new filter parameters that enable for interferometric sonar support.

In the past, the software was designed for handling multibeam data, and it's been recognized that interferometric, which is based on side scan pulse, not on multibeam beams, the data needed to be handled differently, and now we've seen great improvements.

And in the next two weeks, I'll be in San Diego doing research with Teledyne RDI. I also have our hydrographer here joining in this to understand more about what Mark Borrelli is doing, and we're trying to find ways we can use the data and the efforts that Mark has undertaken to help characterize the uncertainties and the datasets that he collects here.

We're located in Falmouth, in North Falmouth, right on the Cape. So we're only about an hour and a half drive.

ED WELCH: Thanks.

Andy Armstrong.

ANDY ARMSTRONG: Yes.

I was just kind of commenting, in addition to what Straud said, there are multiple fronts where people are looking at approaches to data processing for these interferometric sonars which generate sort of order of magnitude more individual soundings, but again, with an order of magnitude more noise in the sounding, each of soundings.

So there are a number of approaches that are being tested to working through that additional individual sounding level of uncertainty to try to improve the resulting uncertainty of the map.

And the Joint Hydrographic Center and NOAA Hydrographic Surveys Division and Coast Survey Development Lab are working with the manufacturers and among ourselves trying to sort out these issues in using these new sonars in shallow water.

ED WELCH: Thanks.

Jon, did you have a comment?

JONATHAN DASLER: Yes.

Getting back to your earlier comment, Ed, about the overlap, there's a lot of overlap in this.

This may be map many times use one once for analysis on all the systems. So I was surprised to hear that actually NOAA is doing some of the flights -- we're part of a team member on some of the core mapping or bathymetric [inaudible] in the same area, Bay station in Nantucket, supported that for our virtual base, but this may be an opportunity for allowing the overlap to evaluate some of these systems.

So again, I think stressing everybody kind of getting on the same page in terms of control and datums and that kind of thing will really help in that analysis. Turn that around a bit.

ED WELCH: I don't recall during my two years on the panel whether we've ever had anybody from USGS talk about some of their programs. Has that happened prior to my coming on the panel?

It might be something we want to consider

putting on the agenda at some point.

Okay. We are about at our time -- Dr. Dionne, I know you had a comment.

Can you come up to the mike and make a quick comment?

DR. MICHELE DIONNE: Thank you. I know you want to stay on schedule.

Just as a user, this seamless mapping is extremely useful to anyone who wants to model circulation in marsh-dominated estuaries.

What happens, we have a circulation model for our system. We don't have good bathymetry, so it's very limited. It only models the channels, because we don't have that mapping of the marsh surface.

So if you want to understand how marshes and other coastal habitats respond to sea level rise or precipitation events, we need those models. So this kind of mapping is very critical.

And over the past couple of decades, we have been ourselves very frustrated in the lack of overlap between what's available from NOAA and what's available from USGS.

There's going to be a new mapping effort of the entire Northeast that USGS just received funds for.

So I think your comment about trying to close that gap are very timely, and maybe the person who's going to be involved and in charge of that mapping effort --

And I wrote several letters of support for that, and in every one I stressed the need to do the LiDAR at low tide, but they -- they basically -- it's not -- it's not an agenda item for them, so we'll get what we get for our site.

But if we could do essentially what you're doing in a small scale for a larger scale, get that low tide LiDAR information, overlap it with shallow water, that would be excellent.

And I'm sorry to take so much time.

ED WELCH: Thank you very much.

Okay. Any last questions for Dr. Borrelli? We appreciate it. Thanks very much for your presentation.

MARK BORRELLI: Thank you.

ED WELCH: Jill, do you need a minute to

recover?

Listen, when I came north, nobody could understand what I had to say either. They said get on with it. Get on with it. So I guess there's had a happy medium.

Okay. Our next presenter is Howard Danley, and he's going to talk about product distribution systems.

Welcome.

HOWARD DANLEY: Thank you.

Thank you for the opportunity to be here this morning and to give this talk. I'll do the same disclaimer that a number of NOAA people did yesterday, that I am not the one who initiated this. The person who initiated this item that's on your agenda couldn't be here today.

I have -- or have been associated with chart distribution, the paper side, for about the last 25 years, so I can talk on that. And I do know that there are several letters that have been forwarded to the panel for inclusion in the minutes or the notes, and so I've tried to insert some slides of my own to maybe add a

little background and a little history maybe.

Again, my name is Howard Danley, and I'm chief of Navigation Services Division in the Office of Coast Survey.

VIRGINIA DENTLER: Do you want to run it or do you want me to?

HOWARD DANLEY: Why don't you run it.

Okay. Some working assumptions that we -- were made for this talk.

There are two broad markets that we look at, the commercial shipping and the recreational mariner market. They can both be subdivided more into niche markets or subdivisions of those markets, but for purposes of this discussion, that's fine.

The paper chart will probably continue for the next 15 years. We've heard this for the last 15 years -- I guess it's kind of a rolling 15 years for paper -- before we go all electronic.

Because charts are mandatory by federal regulation for carriage requirements, we feel that this is a NOAA responsibility. And we also have the responsibility to see that

they're distributed.

Dropping down to the one that says 44 USC, the pricing statute, in 1986, Congress enacted what's called the pricing statute for nautical charts.

It's said that NOAA shall recover all costs of printing and distribution and may recover some cost or costs of database management, which kind of is a nebulous term that means compilation, though not the actual data collection.

And the next bullet I think may be one of the most important ones on the top. Distribution has always been kind of an afterthought for the Office of Coast Survey.

We tend -- for a long time our distribution was taken care of internally for us. And in the last decade or so, some products that look at different ways of distribution, and some of those have caused us some problems, which is why we're talking this morning, and why we'll be asking for some help from the panel at the end.

The last bullet is about the United

Kingdom Hydrographic Office, or it's usually referred to as the Admiralty. They take our charts, copy them, directly reproduce them or use the data to compile their own charts. And then they sell them in US waters.

Products produced by the US Government are not copyrighted. Anyone can reproduce them, so that's really not the issue. The fact is, though, that they can do this and that they sell quite a number of charts in our waters.

Currently, our paper charts, what we refer to as lithographic charts, which just means the charts are run on a big press, are produced by the FAA. They print them and distribute them.

In the past -- I guess beginning in the mid '20s, aeronautical charting division was created in the Office of Coast and Geodetic Survey in -- I think it was inside the nautical charting division at that time, to produce aeronautical charts.

And they gradually became their own division, aeronautical charting division, within Coast and Geodetic Survey.

And eventually in the 1990s, the National

Ocean Service took an internal look at what it was doing, and it was decided that the aeronautical charting didn't really fit within NOS, and efforts were undertaken to move to a more logical fit, which at that time it was determined was the FAA.

When the aeronautical charting division moved to the FAA, they were given cost recovery, and they took also with them the printing and distribution of the nautical charts, which they've been doing for us for 60 or 70 years, and they print and distribute them at no cost to us.

They recover their costs from the price when we sell the charts, and any excess goes to the Treasury.

Dropping down to the third bullet just for a minute, these -- I'm getting some -- again, some of these are my slides and some aren't, so I'll change the order a little bit.

I think the next product we developed were the raster nautical charts, the RNCs, and that was in the mid '90s.

And we went outside to a private firm to

produce and distribute those and had some issues around that, but we straightened them out.

And then the ENCs were -- put them up on the Web for free, and the RNCs are up there now, too.

The next product that we developed was the print on demand, and that became a viable product in about the year 2000. And again, we looked at a private company on the outside to create and distribute the print-on-demand charts through a network agent system.

The FAA managed the network distribution system of nautical agents, and OceanGrafix, when they began looking at -- they were building their network agents -- of agents, they looked at the FAA agents, and they recruited from those ranks to build up their agents system. And a lot of the agents still have some dual overlap with FAA and OceanGrafix.

This one I had some of my folks do kind of a quick schematic to how the electronic charts are distributed.

The -- we put finals up on a server for the POD that OceanGrafix picks up and distributes to their agents. And on the electronic side, we put the files up, and they're picked up by either an individual who wants to download a raster chart or an ENC chart, or they go to value-added distributors who package and sell them.

One point I would like to make at this point -- one -- this will be probably the last time I talk about the electronic charts in this talk, as we'll be concentrating mostly on the paper side, the lithographic and the POD, but we've --

Based on some experience we had with the raster charts, a company that distributed for us a couple of years ago, we like to look for redundancy in our distribution efforts. That company went out of business, left us in the lurch for about three months until we could recover.

FAA product distribution, back in I think 2008-2009, the FAA was instructed to do an internal management study to look at

streamlining and efficiency and those kinds of things.

And beginning in FY10 they began implementing the results of that management study.

The parts that really concern us today have to do with the chart agent system. One of them was to establish a larger minimum annual sales for the chart agents.

Since about the 19 -- early 1970s, late 1960s, somewhere in there, the minimum sales for a nautical agent has been $500, which given the price of a chart back then, which was about a dollar, dollar and a half, it meant that the agent was selling somewhere around 600 charts or so back then.

In FY10, which began last October, the requirement was moved up to $5,000, which at today's discount is maybe about 500 charts or a combination of charts and some other products that FAA distributes.

And there were some differences, some changes made to the discount. For most of my tenure, it's always been a 40 percent discount

with returns of obsolete product for credit. And another option has been added, a 50 percent discount with no obsolete return, which means the agent manages their inventory a little bit.

What this resulted in in proposing the $5,000 limit, it decreased the number of agents from 1100 to about 100 agents today.

Another change that was made is the agents were allowed to recruit subagent sales outlets, which really is kind of a mouthful of words to mean that an agent can now have subagents under them, some outlets that sell charges based upon the agent's license. Or some of the agents who aren't quite making the 5,000 limit individually, they could combine. One of them become the agent, the other subagents, and they work out the terms of the agreement of how they would divvy it up amongst themselves.

Some chart agent concerns regarding the FAA changes. And the -- the NGA chart's no longer available. That was on the last slide.

I think that's one of the biggest issues that we've encountered right now. It's very important to -- I think a lot of the

print-on-demand agents were no longer selling NOAA charts but were selling the print-on-demand version, and they were also selling NGA, which is the National Geospatial-Intelligence Agency, which some of us may know as DMA from 30 years or so ago. They became NIMA, and I think they had some other names in between.

That's where I began my career many years ago with them.

This is really not an issue for NOAA, but it is an issue for some of the agents because of making the $5,000 limit.

And also, again, there are some questions about what chart pricing -- and I think the FAA has floated a strawman, but chart pricing is a NOAA function, and NOAA has the authority based in legislation and statute, and NOAA will set the prices in conjunction with accounting data from FAA reflecting what the costs of presenting and distribution are.

Okay. One comment, just from my history in the last couple of decades, there have been -- Office of Coast Survey has caused many

or several -- maybe not many but several concerns what their agents are selling with the introduction products, such as the -- oh, the rasters, the PODs and the ENCs.

When we went to the ENCs, we'd put them up on the Internet for free. Free on the Internet is good. And then Captain Marx, who was one of our large agents and very good friend, we worked together for about 25 years, pointed out to me one day that we weren't giving him anything to sell and that he was answering all kinds of questions about them, which was costing him money.

So times we are -- we're really techies a the heart, and we don't think about the business side of the thing, which is really what this is about, the business side of the operation.

And Henry, Captain Marx, and I have done damage control on many of these, him working with the chart agent side and I'm working internally with Office of Coast Survey. Okay.

A similar schematic about how things work on the paper chart side with us and FAA, again,

we -- different files. They print them and they distribute them, the charts.

DoD is a huge buyer of NOAA lithographic charts for their operations, their ships, whatever, the agent structure, the 50 percent, 40 percent.

And FAA currently does what we call house sales. If you call the FAA and you buy a chart, you can buy it over the phone with a credit card. Again, just a summary of the agent agreement.

It's interesting to look at the location of the nautical chart agents around the country. This is -- I had my folks just go into the website and start plotting where -- the distribution of NOAA chart agents. I know there's a number that are in trouble, think there's no navigable water.

And I think the reason for this is because some of the aeronautical agents strictly have now decided that they will sell both thought call and aeronautical charts, and the reverse can be true as well.

Again, this is the FAA's international

chart agent locations. They sell to agents around the world who resell NOAA charts.

Location of the Admiralty chart agents, it's interesting to note that the Admiralty only has maybe a dozen chart agents around the country, and they sell -- some of the numbers are proprietary, so I'm not going to say them in public.

But if you add together the number of charts that we sell lithographically and POD, it's -- it doesn't exceed the Admiralty sales in our waters by a whole lot, so that's an interesting statistic.

And also just looking at paper sales of charts over the years, if you go back about 30 years ago where it was strictly all paper, we were selling about two million copies a year.

Now there's been a steady decline since about the mid '80s, which was really when the price and statute was enacted. And it's decreased maybe 10 to 15 percent at midyear, so right now we're selling -- I think last year it was about 110, 120,000 lithographic charts, and then the POD numbers are proprietary.

Okay. Next chart.

And this again shows the distribution of the print-on-demand agents. And there are about 80 or so print-on-demand agents around the country.

One of the things that I've asked my -- some of my folks to do is to start looking at really what is a generic distribution system. They came up with a kind of -- the information on the slide, manufacturer, wholesaler, retailer and the customer.

And to look at it from our perspective, we're the manufacturer, and either FAA or OceanGrafix is the wholesaler, and the retailer are the nautical chart agents, actual people.

And we as the manufacturer don't really have a direct link to the retailer. We know a lot of the people personally, as I know Henry and some of the other agents, but the -- it's kind of like there's a big gap out there, that we're working through the middleman and there's -- the feedback going both ways is sometimes limited until it gets strained. This is one of our big drawbacks.

So the reason this talk was originated was to bring some questions before the panel and ask for some help maybe to -- if you can ponder some of these questions, was the idea, such as what's the future of distribution, our responsibilities, what aren't our responsibilities, how the retail sales agents fit into all of this, what should our distribution relationship with FAA, NGA, the Corps of Engineers --

The reason the Corps of Engineers are up there is because they chart the inland rivers in this country, and there have been advocates over the years that the Army Corps of Engineers charts should be brought into the NOAA umbrella of distribution just to make things easy.

And public/private roles.

Next, please.

Hold these questions. This is not my slide, but I think I can talk about all of these points.

Should we be in the distribution business and we have our own thoughts there. Increase the distribution, use of charts,

responsibility.

The one there in the middle about the UK, we have looked at trying to compete head to head with the UKHO or the admiralty charts for a number of years.

We do an annual customer service survey, and we've asked our folks over the years why do you like Admiralty charts? And they come back, they say the size, the scale, the -- they're not cluttered, the colors and all kind of things like that.

So we try to emulate some of those charts, and we found out very quickly a lot of our customers didn't really like that.

So again, this is a -- there's a big question there as to why the Admiralty can sell the number of charts that they do at twice the price of a NOAA chart.

So we try to be -- possibly look at this, try to take it -- the market share back, and also what's usually referred to as the knockoff producers.

This is mostly in the recreational market because they don't have to meet carriage

requirements. People can take our charts, cut them up and rearrange the panels and so as book charts and things like that.

And a decision was made again back in the mid up 1980s that we wouldn't compete head to head with private industry on these types of charts.

And again, I think sometimes the pendulum is swinging the other way, and that was brought up again for should we look at that.

And the -- whether we should look at the discontinued transaction of NGA charts.

And let's go to the next slide, which is my last slide.

And really, it's to ask you guys as members of a panel, as an advisory panel, to -- what do you think about the questions that have been brought up in the last two or three slides.

And just based upon the information given you, which is really barely scratching the surface of -- we've been in the chart distribution business for probably 170, 180 years; but in the last few years, I guess as

the industry has changed, technology has changed, people are going from paper to chart plotters to ECDIS to whatever onboard a ship, the industry has to change with it, and the roles of people in the industry and what they're buying, selling and using are changing, too.

I've -- just in my career, I've seen the really rapid change since about the mid 1990s.

And at this point, I will stop.

ED WELCH: Okay. Thanks.

If I could -- if I could just start the questioning, some of the questions you posed about should we -- should we compete with some of these private sector folks or compete with the British system, isn't -- if you did and therefore ended up with increased purchases to the government instead of through these other sources, isn't it true the money wouldn't go to NOAA? It would just go in the general Treasury?

HOWARD DANLEY: Yes.

I think one of the things that we look at on that is the obligation that we feel that we

have to get the information and the data out there to as many people as we can.

Commercial shipping is pretty much in a case of have to because of carriage regulations -- carriage regulations.

However, the recreational community is one -- Elaine talked this morning, the recreational community is one of the areas that we see that we would like to really expand upon chart sales.

ED WELCH: Do you have any sense generally as to how much money comes into the government, say, on NOAA charts?

HOWARD DANLEY: I would be speculating at the moment. I can get that figure for you.

ED WELCH: And do you have any sense as to how much the British charts are -- the British systems are receiving as a result of their sales in the US?

HOWARD DANLEY: I do not have that number.

ED WELCH: I guess what I'm getting at, panel members, is, you know, depending on how much money or how little money we're talking about, and depending on assuming the money goes

into the general Treasury, maybe this is worth talking about or maybe this is a rounding era in terms of governmental budgets and that type of thing.

Maybe we can just not agonize about it too much.

Admiral West.

ADMIRAL WEST: Just a statement.

First of all, several years ago, the Brits told the UKHO that they had to make their own profit. They are no longer subsidized by the federal government, which you are, so they have to -- they survive on what they sell.

So they have a very aggressive marketing. And if you go there, it's impressive. And if you ever get to Taunton, you ought to go. It's a wonderful place to visit.

So that's the kind of the competition you have.

They also do some work for DoD, and they get money for that, so they have another source of funds.

So I'm not sure that you really can stack up competing with them. I agree with that. It

may not be in the weeds. So I'm not sure you want to try to do what they do, unless you want to try to be for-profit.

HOWARD DANLEY: Yes.

ADMIRAL WEST: Second question, I guess maybe for Elaine, too.

If you -- where do the everyday folks go get foreign charts now then if they don't go to the Admiralty?

HOWARD DANLEY: I think the chart agents are selling out the inventory that they have.

There are some agents who are dual agents with Canadian charts and you can get very -- foreign charts from some of our agents as well.

That I do know.

ED WELCH: Tom Jacobsen was putting his hand up first.

TOM JACOBSEN: How many charts a year did you say are sold?

HOWARD DANLEY: We're selling -- I think last year it was about 120,000 litho, and there was a bit more on the POD side.

TOM JACOBSEN: Okay.

And the Admiralty charts you said are

about double that?

HOWARD DANLEY: Not quite, but that's the ballpark.

TOM JACOBSEN: Okay.

Also, how about the electronic charts, do you feel like you compete also with the Admiralty electronic charts?

HOWARD DANLEY: Not really in that venue, because there are international agreements that countries will not sell ENCs in each other's waters. So that market is not open to the UK, unless they want to become a licensed distributor of our charts.

TOM JACOBSEN: Okay.

Well, with everything going electronic and only selling 120 charts a year, I don't see it's a big concern.

HOWARD DANLEY: Okay.

TOM JACOBSEN: That's all.

ED WELCH: Gary, and then go to Elaine.

GARY JEFFRESS: Gary Jeffress.

Howard, does the Admiralty give NOAA credit for the source of the data?

HOWARD DANLEY: Yes. The -- it uses a

credit line on chart with the source of the data, it's stated.

It's also for our protection. If you're using someone else's data, you state thereon where you got it.

ED WELCH: In real little print, I bet.

HOWARD DANLEY: Yes.

It's usually right up in what we would call the title block, under right underneath the title of the chart, start talking about datums and things like that.

GARY JEFFRESS: So in actual fact, the NOAA -- Admiralty charts are helping to satisfy Thomas Jefferson's original mandate.

HOWARD DANLEY: Yes, that's exactly right. That's one way to look at it. That's one way that we looked at it for a number of years inside the office, that if someone was buying an Admiralty chart based on our data, the work word was getting out there.

If someone is buying a knockoff chart because it's based upon our data, the work is getting out there.

One of the things with the knockoff might

be currency, current -- the edition of chart it was made from, whatever. But any chart that's based upon our data that gets out there is -- is really when -- serving that mandate.

ED WELCH: Elaine.

ELAINE DICKINSON: Thank you. Elaine Dickinson.

On the NGA charts, basically what you're saying is there is a source of US-Government-produced charts of foreign waters, but FAA is not going to carry them anymore, so no one can buy them.

So you're basically cutting the public off or FAA is cutting the public off from buying charts of foreign waters.

HOWARD DANLEY: Okay. Let me back up a little bit.

The NGA, or whatever they're called, in the early '90s and FAA, aeronautical charts at the time, entered into an agreement for them to distribute the NGA charts.

And they had a business relationship, and based on that business relationship, FAA decided that they could not -- no longer

distribute NGA charts and cover their costs, essentially.

I'm not going to go too much further than that, because it's really -- though I know some of it, I don't like to talk for other people.

And I do know, though, that NGA has been looking at other avenues for distribution, and they have not come up with one that I know of.

And really what's happening here, the reason this talk was originated was the crunch happened I think the first of this month. That's when FAA is really terminating the NGA distribution.

Mrs. Pat Banks is in the audience. She's with FAA.

Is that essentially correct, Pat

PATRICIA BANKS: Yes. And --

ED WELCH: Can you come up to the mike, please, and identify yourself?

PATRICIA BANKS: Good morning. I'm Patricia Banks. We just changed names, so you got to forgive me.

We're the National Aeronautical Navigation Services now. I manage the reproduction and

distribution team.

And NGA is still in negotiations right now with USGS to take over their chart distribution. And as Howard did say, back in 2008 when we underwent our internal management review, it decided that to be more efficient with the NGA program, that it was no longer viable for us to distribute their products, and we gave them notice back then.

And I think what people need to understand is, it is NGA's public sale program, and it's their mandate to get the data out to the -- to the public. And we felt that 18 months was sufficient enough time for them to find someone else to -- to distribute their products.

But they had a couple of interests from the government printing office and another organization within the Department of Commerce, the National Technical Information Service, and neither of them have panned out.

So they're now in negotiations with USGS. And the last conversation I remember hearing was that they're trying to -- USGS is trying to determine what charts they would initially

start out with offering for sale to the public, until they can build up their inventory to take over distribution.

ED WELCH: Okay, thanks. If you could stay there just a minute, we might have some questions.

But let me -- first let me confess that I didn't know anything about any of this until about last night. But it sounds like to me -- tell me if I'm being oversimplistic.

We're a NOAA advisory committee. We have a NOAA speaker. We're interested in NOAA charts. What we're talking about here is a product of a non-NOAA agency that up to now has been distributed through another non-NOAA agency, which NOAA also uses; but since some of the people that use NOAA charts also use these other charts, therefore we're interested in what users want, I guess, is -- is the scene.

But really NOAA is sort of a bit player in this.

Is this -- is this a correct characterization in this particular issue?

HOWARD DANLEY: Yes.

NOAA is on the sidelines of this one, other than the interest that the NOAA agents have in keeping their minimum sales to be an agent.

ED WELCH: Okay.

So not to -- not to make light of the problem or dismiss it, but I'm just wondering at least with this specific area, I think we're sort of getting towards the fringe of our panel's directive.

But that doesn't mean we can't talk about it.

So Elaine.

ELAINE DICKINSON: Yes, I have to disagree somewhat with your assessment, because think -- I mean, I just spoke earlier this morning on, you know, an effort that's being made just to get people to carry charts.

And here we have NOAA chart agents who are being basically cut off from a source of charts that there are people who want them.

And I -- it sounds to me like since this whole thing went to the FAA, basically the chart distribution system -- at least from the

agent's point of view -- has been decimated. And it's just going to be harder and harder for people to buy these products, which I think is not really in the public interest at all as far as safe navigation goes.

ED WELCH: Right.

But does NOAA really have any leverage over the other two agencies?

I mean, I suppose they do if they said, look, we're pulling out of the FAA system, maybe the FAA wants them to pull out. I don't know.

Other comments or questions?

Jon.

JONATHAN DASLER: Well, I think NOAA is moving in the right direction. I have to commend them for when they started putting a lot of the ENCs and RNCs online, because I think that's brought a lot of -- it made easier access to chart updates and moving that forward.

And I think that the other side of that is what Elaine is pointing out. You would go out sailing, you'd go to a chandlery and you could

easily get a chart.

The problem was, a lot of those charts were, you know, out of date. They didn't sell enough, so their inventory was kind of old.

So, I mean, that's sort of a -- an issue there.

I guess I had a question on the frequency of the update on the Admiralty charts.

I mean, do they -- are those updated -- I guess what we're talking about here is I guess still lithographic charts, and is that update --

HOWARD DANLEY: Yes, updated with those corrections. It would be similar to the print-on-demand charts. Similar to the sale on --

ED WELCH: Again, stupid question, how can -- if Admiralty charts use NOAA charts as their basis, how can they be updated anymore regularly than NOAA charts?

HOWARD DANLEY: Again, rather than kind of speaking for someone else, Admiralty agents are usually called correcting agents, so you have a stack of charts and someone will hand-correct

those charts before they're sold.

ED WELCH: Okay.

HOWARD DANLEY: Whereas the print-on-demand, we're using files and remote plotters to do the same thing.

ED WELCH: Okay.

PATRICIA BANKS: And the Admiralty are required to update their charts. I don't know the frequency.

Do you know the frequency?

ED WELCH: Yes.

Elaine, do you want -- yes, come on up and identify yourself, please.

CAPTAIN HENRY MARX: Captain Henry Marx, Landfall Navigation. I am a chart agent, and I've been making notes. The Admiralty agents are required to update the charts. I don't know how often they get their [inaudible], weekly or biweekly, but if I have an inventory -- I am not at the moment an Admiralty agent, but the Admiralty agents are required to update their inventory on a regular basis.

So when you come buy an Admiralty chart,

it's updated in the last week or two to mariners.

One thing, you're talking about charts, my customers do not differentiate between a NOAA chart of Boston Harbor and a DMA chart. They all think they're the same charts.

ED WELCH: Okay. Thank you.

Any other comments or questions on this particular issue? I would point out -- and it's been referenced -- we've had distributed to us letters from several -- several letters from chart agents, and in the public comment period I'll ask that they be formally included as part of the record.

But they raise this and a couple of other issues, and so we want to draw your attention to that. And I guess, Elaine, as far as NGA and FAA and NOAA, I understand -- I mean, I understand the public policy problem. I'm just not quite sure if -- what -- I mean, we can say we don't like it, I guess, but I'm not sure --

I mean, it sounds like to me you got other federal agencies that have been for whatever reason not able to establish a continuous

satisfactory relationship between one another.

Is that -- is that a fair characterization?

PATRICIA BANKS: I wouldn't say we haven't been able to. It just got to the point where we needed to discontinue our agreement for our reasons to, you know, just become a more efficient operation.

And --

ED WELCH: They might pay you more if you'd be more efficient, right?

PATRICIA BANKS: No, that wasn't part of the deal, so...

And it really wasn't about getting paid more, but we have an initiative with OMB that we're trying to follow within the next five years. By 2013 we have to meet these obligations.

So, you know, just -- we try to work with the NGA to even help them transfer the distribution, but it...

ED WELCH: Okay. It's OMB's fault.

PATRICIA BANKS: No, no --

ED WELCH: No, no, we can blame OMB. You

can't, but we can.

Admiral West.

ADMIRAL WEST: I don't think we blow them off. I think we get them out, because this is a mess. There's about 500 agencies that make charts. I mean, why in the hell does the Corps of Engineers do rivers?

It's a mess. And the CMTS, or whatever the hell they're called, why aren't they addressing this and saying this is where it ought to be, ought to be in one place.

ED WELCH: Okay, Gary, why not? Gary.

GARY JEFFRESS: They're oblivious, Admiral. That's why.

ED WELCH: You weren't listening to me? CMTS.

GARY JEFFRESS: Hit me again.

ED WELCH: CMTS.

ADMIRAL WEST: Is that you?

GARY JEFFRESS: Sometimes, yes.

ADMIRAL WEST: Like probably? Why aren't they addressing the different challenges of the federal government to put out a chart?

ED WELCH: You don't have to answer.

That's a rhetorical question.

ADMIRAL WEST: And we don't have more time but I do think we should not dismiss that as a minor thing. I think it's something we ought to look at as a Hydrographic Services Review Panel, maybe a couple look at it, see if we can't work with NOAA.

NGA will always make charts. They have the confidential problem where -- not problem but -- but task for DoD, and others, so they'll always be there. Those charts will always be there, not always accessible.

But then you got UDAT, you've the Corps of Engineers, there's some couple other folks that make charts, but it's a mess, and maybe we can help sort it out.

ED WELCH: And it certainly makes no sense at all for any particular government agency to be producing data in whatever form, charts, and not have it -- not have a decent public distribution system for it.

Gary.

GARY JEFFRESS: So how difficult is it for NOAA to distribute 120,000 nautical charts

directly to the agents?

HOWARD DANLEY: You know, well, Sandy said, no printing presses, and it would be -- it would be startup costs, things like that. Whereas if you can piggyback on something that's there, use it to -- to do that.

Plus, it's really not costing us anything to print the charts because of cost recovery there.

ED WELCH: Tom Jacobsen.

TOM JACOBSEN: Dick, you mentioned the Admiralty. They run it as a profit center, it's separate entity? How does that work?

ADMIRAL WEST: HO office in Taunton is now -- has to provide a business plan every year to break even, at least, you know, in selling charts. They're no longer part of the federal government, so they -- they market so they can survive.

TOM JACOBSEN: It might be something to look into as a model.

ED WELCH: But I assume that part of their model is they get to keep the money they generate.