U.S. DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

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PUBLIC MEETING

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TUESDAY
AUGUST 30, 2016

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The Hydrographic Services Review Panel met in the City Club of Cleveland, Conference Room 200, 850 Euclid Avenue, Cleveland, Ohio, at 8:30 a.m., Bill Hanson, Chair, presiding.

MEMBERS PRESENT

BILL HANSON, HSRP Chair
JOYCE E. MILLER, HSRP Vice Chair
DR. LAWSON W. BRIGHAM
KIM HALL
EDWARD J. KELLY
CAROL LOCKHART
DR. DAVID MAUNE
CAPTAIN ANNE MCINTYRE
SCOTT R. PERKINS
EDWARD J. SAADE
SUSAN SHINGLEDECKER
GARY THOMPSON

NON-VOTING MEMBERS

ANDY ARMSTRONG, Co-Director, NOAA/University of New Hampshire Joint Hydrographic Center
RICH EDWING, Director, CO-OPS, NOAA
DR. LARRY MAYER, Co-Director, NOAA/University of New Hampshire Joint Hydrographic Center

STAFF PRESENT

REAR ADMIRAL SHEP SMITH, HSRP Designated Federal Official
DAVE HOLST, Chief of Staff, NOAA/NOS
MIKE ASLASKEN, NOAA/NGS
GLENN BOLEDOVICH, NOAA/NOS
CHRISTA JOHNSTON, NOAA/NOS
GARY MAGNUSON, NOAA/OCS
RACHEL MEDLEY, NOAA Customer Affairs Branch
LYNNE MERSFELDER-LEWIS, HSRP Coordinator
RUSS PROCTOR, Chief, Navigation Services Division, NOAA/OCS

ALSO PRESENT

CAPTAIN PAUL D.J. ARNETT, Chief, Preventive Division, 9th Coast Guard District for the Great Lakes and Saint Lawrence Seaway, U.S. Coast Guard
MARVOURNEEN DOLOR, PhD, St. Lawrence Seaway Development Corporation
JOSH FELDMAN, Chief of Operations, Buffalo District, Great Lakes and Ohio River Division, U.S. Army Corps of Engineers
CAPTAIN GEORGE P. HAYNES, Vice President, Lakes Pilots Association, Inc.
GLEN G. NEKVASIL, Vice President, Lake Carriers Association
MIKE PISKUR, Program Manager, Conference of Great Lakes and St. Lawrence Governors and Premiers
BETTY SUTTON, Administrator, Saint Lawrence Seaway Development Corporation, U.S. Department of Transportation

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

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

(8:31 a.m.)

CHAIR HANSON: Good morning. My name is Bill Hanson. I'm a chair of the Hydrographic Services Review Panel. I'm going to call this meeting to order and welcome everyone to Cleveland and to the Great Lakes.

It's been a while since we've met here, but it's -- as the fourth coast of the United States, it needs a lot of attention and also just one of the conversations that we're going to have over the next few days to talk about some maritime and coastal heritage as well as its future.

My day job, I work for Great Lakes Dredge and Dock Company, a 126 year old company based in Chicago, but we don't work in the Great Lakes anymore because it's all small business set aside because of lack of investment and lack of care. And those are things we'd like to see changed over the years.

But certainly there's a great heritage as I mentioned, and Cleveland is the -- it's a great place for us to be meeting. I want to thank the panel members and the staff who've worked very hard the last several months putting together the agenda.

We've got a very robust program that's not just to listen to presentations and conversations about what's going on in the local community but also engage panel members a little more vigorously than we have in the past, perhaps, to get some of our thoughts on paper and as we seek to advise the Under Secretary.

A special thanks to Glen Nekvasil, Vice President of the Lake Carriers Association. Thanks for being there, sir, and Deborah Lee, Director of NOAA's Great Lakes Environmental Research Laboratory, for agreeing to serve as panel moderators.

This is my first meeting as chair. I've obviously got very big shoes to fill. Scott Perkins sitting on the sideline on this one, but we have Joyce Miller as Vice Chair as well and thank you, Joyce, for all your hard work putting this together.

We'll do our best to keep everything on schedule, but we want to make sure people have

-- both the panel members and moderators and audience also have an opportunity to participate as appropriate.

So let me go ahead and begin by introducing Rear Admiral Shep Smith, our new Federal Designated Officer. As many of you may know, Admiral Smith just a few days ago assumed the position of Director of NOAA's Office of Coast Survey.

This recent position follows a remarkable number of accomplishments during his 23-year NOAA career, including leading advances in state of the art hydrography and cartography and commanding several NOAA vessels.

A full biography on Admiral Smith is in your meeting materials. Admiral Smith, it is an honor to have you with us and to be our Designated Federal Officer. Please share with us any opening comments you may have.

RADM SMITH: Thanks, Bill. I am brand new. This is my second day on the job, and I've not yet been -- this is also my second HSRP and I sat in the back the last time, so I will ask for your humoring me along and advising me on what my appropriate role should be during this week.

I do see that HSRP is a really important part of our strategic thinking process though for Coast Survey and the navigation services and NOAA overall.

What I hope for our relationship is to -- is for you to ask us the questions and ask the questions of us or in general that we're not asking, to get us out of the ruts of thought patterns and to take us up to the next level of strategic thinking, the more over-the-horizon stuff leaving the day-to-day bureaucratic battles of working within the government more in our lane.

So I don't -- that's all I have to share for now, but welcome and, again, thank you all and again thank you all to our staff and the hosts who have put this all together.

CHAIR HANSON: Well, thank you, Admiral Smith. Next we'd like to go ahead and do the introductions and we'll start with the panel members, but we'd also like to engage with the audience as well.

I know we have staff and other

visitors and with that thought, it might be helpful to know a little bit about you guys as well as you know about us.

So if we can start with the panel to my right, Joyce. We'll go around and end up with Mr. Holst, and then we'll get the audience up. Okay? So thank you.

VICE CHAIR MILLER: I'm Joyce Miller. I'm a certified hydrographer. I retired last year. I semi-retired last year, I guess I would say, but I worked with NOAA both directly and as a commercial contractor and also through academia. So it's a pleasure to be here.

MR. ARMSTRONG: I'm Andy Armstrong. I'm the NOAA Co-Director of the Joint Hydrographic Center and a non-voting member of the panel.

DR. MAYER: Larry Mayer. I am the UNH Co-Director of the Joint Hydrographic Center, the Director of the Center for Coastal and Ocean Mapping and a non-voting member of the panel.

MEMBER PERKINS: Good morning. I'm Scott Perkins. I'm with Surveying and Mapping. I'm the Director of Federal Programs responsible for our federal line of business that includes land surveying, aerial imagery, remote sensing and hydrographic surveying.

MEMBER MAUNE: My name is Dave Maune. I work for Dewberry in Fairfax, Virginia. I manage projects dealing with photogrammetry, topographic LIDAR, bathymetric LIDAR. I've written books on those subjects as well as accuracy standards. By the way, books include Sonar written by Guy Noll.

MEMBER LOCKHART: My name is Carol Lockhart. I own a small business called Geomatics Data Solutions, also doing survey like these guys. I'm a hydrographer. My expertise is in sonar and LIDAR. Thanks.

MEMBER THOMPSON: Good morning. My name is Gary Thompson. I'm the Chief of the North Carolina Geodetic Survey in the Division of Emergency Management, State of North Carolina.

MEMBER SHINGLEDECKER: I am Susan Shingledecker. I'm Vice President of the BoatUS Foundation. That is the non-profit arm of BoatUS, the Boat Owners Association of the United

States and a recreational boater, grew up boating on Lakes Erie and Ontario.

MEMBER HALL: Hi. I'm Kim Hall. I'm with the Cruise Lines International Association, which is the global trade association for the cruise industry. And I am the Director of Nautical Operations and Security there.

MEMBER KELLY: Good morning. I'm Ed Kelly. I'm the Executive Director of the Maritime Association, the Port of New York and New Jersey. My expertise and background is in international ship management operations and port operations.

MEMBER MCINTYRE: Good morning, Anne McIntyre. I'm a maritime pilot with the Columbia River Pilots, and I'm an end user of a lot of the NOAA products.

MEMBER BRIGHAM: Good morning. I'm Lawson Brigham from the University of Alaska, Fairbanks. I do climate change and arctic policy work up at the university, also a retired Coast Guard officer and did a lot of icebreaking out here on the lakes.

MEMBER SAADE: I'm Ed Saade. I'm President of Fugro USA, and I'm the regional director for everything that we do in the Americas, both North and South America. We have a number of support contracts with NOAA for mapping, whether its hydrographic or geospatial or coastal or multiple other items.

MR. ASLASKEN: Good morning. I'm Mike Aslasken. I'm here representing Ms. Juliana Blackwell, the Director of the National Geodetic Survey, also a non-voting member. She wishes her well wishes to all of you here.

In my day job at NGS, I'm Chief of the Remote Sensing Division, and of interest to the panel, we provide the shoreline and nearshore bathymetry, the nautical charts as well as have an emergency response imaging program.

MR. EDWING: Good morning. I'm Richard Edwing. I'm the Director of the Center for Operational Oceanographic Products and Services. My office acquires oceanographic information along the coast, primarily physical, tides and currents and turns those into products and services for the mariner and other users.

MR. HOLST: Good morning. I'm Dave

Holst. I am the Chief of Staff of NOAA's National Ocean Service.

CHAIR HANSON: All right. And if we can get back to the audience. Glenn? I'm sorry.

MR. BOLEDOVICH: Glenn Boledovich. I am not a panel member. I'm the Policy Director of NOAA's National Ocean Service.

MR. NEKVASIL: I'm George Nevkasil from Lake Carriers Association. We represent the US-flag vessel operators on the Great Lakes.

MR. LOEPER: Good morning. I'm Tom Loeper. My day job is running the publications branch for NOAA, and I'm also the Great Lakes -- the Acting Great Lakes Navigation Manager.

CAPT. HAYNES: Hi. Good morning. My name is George Haynes. I'm a pilot with Lakes Pilots Association, based in Port Huron, Michigan. Our district covers Lake Erie, Detroit and Saint Clair Rivers.

MR. CHAPPELL: Hi. Ashley Chappell, NOAA's Integrated Ocean and Coastal Mapping Coordinator.

MR. DEBOW: Hi. Sam DeBow. I'm a contractor working back at NOAA. Thank you.

MR. CONNER: Hi. I'm David Conner. I work for National Geodetic Survey as a regional geodetic advisor based here in Ohio, and I've represented NGS on the Great Lakes Coordinating Committee for about 20 years. So I've got a lot of history here in the lakes and thank you.

MS. MEDLEY: Good morning. I'm Rachel Medley. I'm the Chief of the Customer Affairs Branch in the Office of Coast Survey at NOAA. I manage all the navigation managers around the country.

MR. WRIGHT: Good morning. I'm Darren Wright. I'm the Maritime Services Program Manager for CO-OPS with Rich Edwing.

CAPT SMITH: Hi. Good morning. I'm Scott Smith. I'm the Chief of Office of Navigation Systems at Coast Guard Headquarters. I'm also the Designated Federal Official for our Navigation Safety Advisory Committee, FACA.

MS. DOLOR: Good morning. I'm Marvoureen Dolor. I'm a contractor working as an environmental policy advisor to the Saint Lawrence Seaway Development Corporation, and that's the U.S. side.

MR. RAMOS: Morning. John Ramos. I'm an industry trainee working with the Lake Carriers Association. I'm just kind of absorbing all the information.

MS. DAY: Good morning. I'm Jennifer Day, and I'm also the Great Lakes Regional Coordinator for NOAA from Ann Arbor.

MR. CHU: Morning. Philip Chu, Great Lakes Environmental Research Lab. Our team develop and implement the Great Lake hydrodynamic forecasting system and also ecological models for the Great Lakes Region.

MS. BRUCE: Good morning. I'm Samantha Bruce with QPS. That's a software company. We specialize in hydrographic data acquisition and processing. Our softwares are QINSy for acquisition, Qimera for processing, Fledermaus for visualization and analysis and Qastor for precise navigation, piloting and docking.

MR. KRUMWIEDE: Good morning. My name is Brandon Krumwiede. I work with NOAA's Office for Coastal Management serving as the Remote Sensing Specialist and Great Lakes Geospatial Coordinator.

CDR MAFFIA: Good morning. Tony Maffia, District 9 Waterways Management. We manage the AtoN, DOMICE and cutters for the district.

MR. THOMAS: Good morning. Lorne Thomas, Chief of External Affairs, the 9th Coast Guard District. One of my principal duties is liaison with the many federal and state agencies that are here on the Great Lakes.

MR. MERSEK: Good morning. My name's Lee Mersek. I'm just a graduate student observing the panel. Thank you.

MS. MERSFELDER-LEWIS: Hey. Good morning. I'm Lynne Mersfelder-Lewis. I'm the HSRP Program Manager. If you have questions, complaints, talk to somebody else. I'm just kidding.

MR. PROCTOR: Good morning. I'm Russ Proctor. I work for Admiral Smith as his Navigation Services Division Chief, and I'm also the Alternate Designated Federal Officer.

MR. MAGNUSON: Good morning, and welcome to the land of Cleve. My name is Gary

Magnuson, and I'm advisor to CO-OPS and Office of Coast Survey. Good to see you all.

MS. JOHNSTON: Christa Johnston, Navigation Services Policy Liaison for NOS.

CAPT ARNETT: I'm Paul Arnett, Chief of Provision for the 9th District here on behalf of Admiral Ryan, the 9th District Commander.

MR. FELDMAN: And I'm Josh Feldman. I'm Chief of Operations for Buffalo District, the Army Corps of Engineers. I'm here representing the Great Lakes and Ohio River Division.

CHAIR HANSON: Well, thank you. That's quite helpful for all of us to do those introductions, so I appreciate that. At this point, we actually have some HSRP business to take care of.

We have some members who are going to take the oath of office officially, and we have here representing NOAA leadership and Chief of Staff for NOAA Ocean Service, Dave Holst, who's going to administer the oath of office for our newest members, Anne McIntyre and Gary Thompson.

(Oath of office administered)

CHAIR HANSON: Well, thank you, Dave, and congratulations, Anne and Gary, a lot of contributions, high expectations for you guys, so appreciate the work you've already put into HSRP and though we've got a lot more to tap into there.

As we've noticed with the new members we brought on last time, last meeting as well as this one, we think HSRP has a very broad and diverse representation for the industry. And we definitely look forward to the challenging and vigorous debates and discussions. So thanks for making the panel as diverse as it is.

All right. We'll go ahead and get started with our agenda. Next is a presentation by Captain Paul Arnett. Thank you, sir, for being here, Prevention Division for the U.S. Coast Guard's 9th District, which includes the Great Lakes and the Saint Lawrence Seaway.

His duties include overseeing regional Coast Guard icebreaking, aids to navigation, waterways management, port security and boating safety. We have Captain Arnett's biography in your meeting materials again. Sir, it's great to have you with us. We look forward to your

remarks.

CAPT ARNETT: Well, thank you very much. Admiral, again congratulations. Welcome to Cleveland. I'm glad you had the opportunity to meet with Admiral Ryan yesterday. She sends her regrets to the panel. We have her spread very thin throughout the District, so she sent me in her stead.

Just a broad overview of the 9th District and what we do here. The 9th District is responsible for all Coast Guard operational activities in the Great Lakes region, the bi-national area. In fact, we do a great deal of collaboration with the Canadians to that end.

The Great Lakes, just some statistical information to provide some reference, approximately $1.3 trillion in business is done commercially on the waterways here.

To put it into context, if you were to cull out the eight states and the two provinces of the Great Lakes region as an economy in and of itself, it would be the fourth largest in the world.

Primary products being transported are bulk products: steel, coal, grain, lime. They work in a compressed season because we do get ice, as Dr. Brigham certainly is well aware of. That's an issue that we certainly have to contend with here, and I believe it will be a topic of discussion.

In addition, the waters of the Great Lakes represent 21 percent of the world's fresh water on the planet's surface. The 9th District has the complete complement of eleven statutory missions that the Coast Guard is obligated to perform: ports and waterway safety, drug interdiction, search and rescue, marine safety just to name a few of them.

The organization at the 9th District is broken down as administrative oversight to the operational command centers distributed throughout the region. We have -- I'm Chief of Prevention. We've already gone over what those topics cover.

We have the response side. We have External Affairs, Legal, Chaplain Corps as well as the logistical support staff. Those divisions are External Affairs, Legal, Prevention Response

and Resources and Planning.

There are four sectors within the 9th District. They're located in Buffalo, Detroit, Sault Ste. Marie and in Wisconsin as Sector Lake Michigan. Within those sectors there are over 75 command -- source site commands comprised of stations and Aids to Navigation Teams.

There are ten cutters. All but one of them are either icebreakers or have an icebreaking capability. The Might Mackinaw is the queen of the fleet. She is the one red hull that we have here, the large buoy tending icebreaker.

Next we have two, 225-foot icebreaking-capable buoy tenders, six 140-foot icebreaking tugs, two of which are outfitted with barges that are capable of handling aids to navigation work as well.

There's two air stations as well within the region. Currently, they're configured to operate the 65s. These are the smaller Dolphin helicopters. Air Station Traverse City is currently in the process of swapping those 65s out for the more durable, long range 60s, which are more suitable to the environment we have here.

I left out one of our cutters. That's the Buckthorn. She is not icebreaking-capable. She's a very old, 100-foot blue-belt class buoy tender, generally does nearshore buoy operations.

Moving on, the Coast Guard's an extremely small service. As such, we're dependent upon the assistance of other agencies partnering up with NOAA, with the Army Corps, federal, state, local agencies as well as our Canadian counterparts.

In doing so, we're able to leverage their assets and be more effective in performing our missions. The Coast Guard and NOAA Cooperative Maritime Strategies establishes three strategic priorities for that joint collaboration: to promote the safe, sustainable environment, enhance regional collaboration and foster innovation and science, technology and youth education. And we're achieving all of those here in the 9th.

It's a little difficult for the Coast Guard to parse out each of the specific offices

within NOAA because there's such broad overlap between each of them, and we look at NOAA as a complete package in that collaborative effort.

For instance, the Scientific Support Coordinators are a tremendous asset to our ability to manage and respond to environmental situations. Most recently, the Barge Argo, a petroleum barge that went down around the 1930s thought to have been in the Canadian side, during some work by NOAA, and other sources, identified it on the U.S. side.

Shortly thereafter, it began burping up product and at that point it became more of an issue that required immediate response, so we did so.

Heading into the rough winter months, we leaned upon NOAA to provide us with the scientific background information to safely and effectively do that. And we were able to offload the product in time before the ice set in and the weather got too nasty.

But the support provided by NOAA to that end was absolutely essential in making sure that it was done safely and effectively and provided us with the support necessary.

Likewise, I've already mentioned how rough the weather is up here. The lakes are tremendous. If you've never seen them before, there's nothing quite like them. They are oceans unto themselves, and the weather can get to you very quickly.

NOAA is absolutely essential in providing us that information. In fact, every morning, the admiral's brief starts with the NOAA reports on weather, so we can attempt to anticipate what kind of day we're going to have, whether it's our own cutters or responding to other folks that are caught up in the environment.

Fisheries is another area that we work closely with NOAA in, and sometimes there's even serendipitous benefits gained from some of the services NOAA provides to the Coast Guard, unintended but in the end they're incredibly valuable.

VMS is a system where a transponder is put on a fishing vessel to determine whether or not it's operating within a closed fishing area.

That same technology, however, is available to the Coast Guard, and we use it to determine the location of vessels that are in jeopardy and to help us initiate our search and rescue operations. It'll give a ping and a location every half hour, hour depending upon the fishery.

So these tools are critically important to us. Even if their initial intention wasn't that, we're able to take advantage of the work already done by NOAA and leverage that.

Just looking through the recent report and the number of items that are listed as being up for address, and I just wanted to touch on those and mention the Coast Guard's interest in them and support for them.

MIST, the Mobile Integrated Survey Team, is available for performing hydrographic work here on the Great Lakes as conditions warrant, and availability of that service is very important.

Argo is an example of an occasion where having that capability to be deployed to the Great Lakes. I know we don't have an indigenous service here. Perhaps the workload doesn't warrant that, but having the viability for the mobile team to deploy is very valuable.

Recapitalization of the fleet, well, we're personally sensitive to that issue. We're undergoing a complete renovation of our 140-foot buoy tender fleet to make sure that they're up to snuff with the latest technology and capable of performing the mission that we require of them. A recapitalization of NOAA's fleet to do likewise is equally as important to us.

Charts database consolidation, being able to -- the project moving forward to consolidate the database for the raster charts as well as the electronic charts just makes sense. That way, you're going to make sure that you have perfect synchronicity across the board and we're not going to have any conflicts.

Certainly we would look forward to that as well as the completion of the new surveys establishing the future datum. Coast Pilot, Coast Guard can't live without the Coast Pilot.

In its electronic form, its -- I reference it on my desk. It's accessible, easy

to understand and the ability to link to other documents is extremely valuable.

In some areas we do provide feedback to NOAA where we feel that there's areas for charts to be improved, revised. One of the issues, if I can make this request, is to maybe establish a turnaround time on -- or at least a return receipt that the recommendations have been received and that they're being considered.

Right now, we send them on up and it's kind of hit or miss as to whether or not we get a return on the recommendation as being something taking for action or in error or any feedback. So that would be extremely valuable to us.

Of course the data buoys: we service those. That's an example of our collaborative effort. IATONIS is a shared database and ensuring that that system maintains its integrity, is up and running is incredibly valuable to the Coast Guard.

We're currently -- and Captain Smith is here. We're currently in the process of testing electronic aids to navigation. That's another technology that, as we start to play with it and experiment, we're finding greater and greater value.

But in the same course of business, we're finding some challenges. One of the challenges we had -- what the electronic aids to navigation does is take an AIS signal, identifies the location in the waterway where a buoy should be or at least currently is.

There's a physical aid there. Then we project it on there. Then we call it a synthetic aid, so you get both the physical aid as charted as well as an overlay of electronic.

There's no aid there. It's called synthetic -- I'm sorry, virtual. And in that case we can use those if we've lost the buoy to weather. It's sunk or been dragged away, ice damage, or in an emergency situation where now we have an obstruction that wasn't necessarily charted.

But we can at least project an electronic AIS representation on electronic charting so that mariners know that this is a hazard area. We can avoid that.

We're also looking at opportunities to

expand that into our icebreaking operation, to set down bread crumbs for track lines that have been cut into the ice and then project that onto the charts for the shipping that's going through so they can make sure that they're staying within the channel that was cut by the icebreakers.

So it's a very interesting opportunity. One of the challenges we've had though is clutter. The labeling of the electronic aids as displayed on the vessels on the electronic charting tend to get all bunched up, especially when you start compounding AIS signals from other vessels, it just becomes a big mess. So we need to figure out a way to more concisely identify the electronic aids so that they don't clutter up the screen.

We have worked closely with NOAA in our icebreaking operations and our understanding of ice on the Great Lakes. Last fall, we sent up some drones, or NOAA sent drones. We were the platform that provided the access, attempting to see if there's a technology capable of looking down at the ice, sending light through and getting a determination as to its thickness, its configuration and makeup.

Also working with satellite imagery on understanding the ice as well as the University of Alaska has come aboard on an initiative that was begun by Admiral Ryan.

She wanted to figure out a predicting model on ice on the Great Lakes, what are we facing, something that's a forecast, maybe more like a hurricane condition type of chart but something that would be a good planning tool, able to fairly well predict where ice is going to be and what type of ice we should face during a certain period of time.

That's gained some traction. It's left the 9th District. It's now in academia and on the coast as well to expand to arctic research. The hope is to be able to identify the conditions that would indicate a certain type of ice developing and would help us plan where we're going to make sure our icebreakers are, how we're going to queue vessels through a particular waterway, whether or not we should or just wait until conditions improve rather than put vessels at risk, taking them where we probably shouldn't.

Offshore energy, a lot of folks are looking to put windmills up in the lakes. This is certainly going to be an obstruction and potential hazard to navigation, so we need to be absolutely certain where these things are and whether they're being put in the appropriate place so as to ensure that marine transportation isn't impacted and they're appropriately located.

Waterfront development, the lakes are being rediscovered. People are coming to the water. That means more and more people are competing with the waterway, so the accuracy of navigation on the waterway is an absolutely essential safety feature. We need to know where everyone is, and we need to know where everyone else is.

Marine sanctuaries, the marine sanctuaries is, we have one in Thunder Bay, another being looked at over towards Wisconsin and Lake Michigan. The lakes have claimed a tremendous number of vessels, and those vessels on the bottom are an archeological treasure, but they're also a tremendous attraction to divers.

Many of them are proximate to the shipping lanes. This conversion of people and commercial activity is a recipe for potential disaster. We need to make sure that we're not having a clash of cultures coming together here.

There is a move to mark the vessels that are on the bottom with buoys. These would be seasonal buoys permanently placed, provide a mooring location so that those folks that are going out there doing the recreational diving don't drop down their anchors or grapnels down to the wrecks, ending up wrecking the wrecks and defeating the whole purpose of having the sanctuary itself.

But there's some concerns with that. Given the weather conditions, buoys get away. These would be private aids to navigation, not aids that are managed by or tended by the Coast Guard.

So there's a certain number of costs and certain provisions that have to be in place to make sure that these buoys, one, they're in a safe location outside of the main shipping channels and that there's sufficient monitoring in place to make sure that if they do get away,

they're retrieved quickly so they don't pose a navigation hazard in and of themselves.

Alien invasive species between ballast water and jumping carp trying to get up the Mississippi as well as what we already have is a particular challenge. And on the science side, we link up with NOAA as well to address those issues and head on particularly the invasion of the Asian carp into the lakes would be devastating. Soo Locks, I will leave that Army Corps.

Likewise, water diversion, that's a particularly sensitive issue, and I could certainly see NOAA's involvement there as well to make sure that we had the right people at the table.

And I will leave it at that as a broad overview of the Coast Guard's interest in collaborative overlap with NOAA. I thank you for the opportunity. I look forward to talking to you further about the future of shipping on the Great Lakes. Thank you.

(Applause.)

CHAIR HANSON: Thank you, Captain Arnett. I'd like to open up to panel members. Are there any questions? Susan, I think the thing that always -- when you start talking about recreational users and commercial users is how do you guys fit in, that is, how you engage with the Coast Guard particularly on the Great Lakes?

MEMBER SHINGLEDECKER: I could probably ask this question at the start of every panel meeting, but I would love to hear your thoughts on issues that you have with recreational boaters in the region and how that -- how you're working with that and working with NOAA on that.

CAPT ARNETT: Like you said, the lakes are a tremendous place. They're being rediscovered as a destination. In fact, I'm still sore from going kayaking out of Bramalea this weekend.

And kayakers in particular are a challenge. It doesn't take much to go to your newly opened Cabela's down the road, toss a $250 kayak on your boat and splash it down. No real obligation to have any understanding of the complexities of the waterway.

And the Cuyahoga is one, and the shipping canals of Chicago are another, where each of the cities are trying to reinvest in their waterway, make it a destination, bring people to the water.

But these waterways work for a living. These ships that go through here -- if you want some entertainment, take a walk down to the Cuyahoga and watch a laker thread this waterway up to the steel mill. It's absolutely amazing how they make 90, 102 degree turns. It's precision.

But these are huge, and they don't stop on a dime, and folks are out there without lights, without much knowledge of the waterway, the rules of the road and they're getting themselves in precarious situations. It's scary, to be honest with you.

That said, everyone has the right and should have an opportunity to enjoy the waterways. The question is how do we balance that. And quite frankly, it's something we're struggling with.

We're not going to shut down commerce for the benefit of recreational boaters when there are other opportunities. So we're looking to work through the Harbor Safety Committees, through the recreational communities, the marinas, and get the dialogue going.

First, just simply awareness that these things don't have a brake pedal. They don't stop, and there's other hazards that are invisible hazards, suction, being just brought in underneath the vessel and the constricted waterways.

NOAA's involvement with that would be to -- I don't want to box them in, but certainly it's making sure that charting is good so that the deep-draft vessels have good water to be in, allowing shallower water for those recreational boaters to escape outside of any kind of hazardous reach.

But it is, it's a constant pressure on the waterway and one that's expanding. Fortunately though, once you start the dialogue, people do listen and you explain the dynamics of large shipping. Generally, they get it. But the challenge is getting the word out.

CHAIR HANSON: Any other questions?
MEMBER PERKINS: Captain Arnett, you mentioned the marine sanctuaries and the wrecks and the diving sites. And if I heard you correctly, the proposal -- the plan is private buoys marking those sites.
And so my question is, why not electronic aids to navigation marking those sites?
CAPT ARNETT: These particular buoys, their placement is to serve as a mooring buoy. The first rationale is to keep people from dropping anchors and grapnels and securing themselves to the wreck themselves, furthering the damage. So that wouldn't work.
MEMBER PERKINS: Great. Thank you. That's the piece I was missing. It's the mooring piece that I missed. You had another comment about the Coast Guard's providing input on where charts need updated on the Great Lakes.
And you said you need a commitment from NOAA. And can you add more color to that on what that commitment is that you're asking for?
CAPT ARNETT: Yes. I'm just simply looking for a return receipt type of arrangement. Whenever we identify an error or discrepancy on a chart, we submit that in. And it's not necessarily our discovery.
It could be coming from -- and more often than not, it's coming from mariners. And we go out and verify. But we provide the information on up to NOAA.
We'd just like to make sure that it has been received. It's been queued for consideration and have some sort of tracking opportunity to see where it stands in the process of consideration.
MEMBER SHINGLEDECKER: I just want to --
MEMBER PERKINS: Seems like a logical and reasonable request.
MEMBER SHINGLEDECKER: Scott, I just wanted to follow up on the e-Aids to Navigation or virtual AtoNs. Exciting technology when it comes to recreational boaters, if it's in recreational locations or you're trying to communicate information to recreational boaters.
The vast majority of them will not

have the technology onboard to access that information, so that's just an important thing to consider.

MEMBER PERKINS: Chairman, if I can make one more comment, I just want to share with you last month I did the MR340, the Kansas City to St. Louis endurance paddle event. It was a Coast Guard sanctioned event.

So I have personally encountered dredges, barges and large commercial traffic from the perspective of sitting in the canoe as these things come upstream.

So I know exactly what you're talking about, about the novice getting on a major maritime waterway for recreation and having no idea what you're about to encounter. So it is indeed a problem.

CHAIR HANSON: And of course you had your charts with you. Right? I think one of the things I always think about on the Great Lakes is the diversity of the environment.

You're talking all the way from Duluth to, I mean, to Buffalo. Do you have the same recreational issues throughout the lakes, or is it certain -- obviously near the major city, I suspect, is where the recreational issues are.

But taconite coming out of Minnesota and all the other commerce, just curious if you can comment a little bit on the diversity of the environment.

CAPT ARNETT: Right now, it is in the major population centers. It's going to be on the Cuyahoga, Chicago. I haven't heard so much around Toledo. Detroit has a different story.

There's an annual float-down there that's an unsanctioned event, and if you watch the news, the United States invaded Canada last month with about 1500 inebriated individuals that the wind blew over there and the Canadians were good enough to return them.

So it is primarily in the major population areas, and this isn't just in the Great Lakes. We had similar issues in Boston and other cities as well, certainly around New York.

The waterways are interesting. People are rediscovering them. Now you don't just have a bicycle. You have a kayak and then it's making it accessible to folks.

So potentially Duluth, I don't know. It's probably a short season up there. But for the Great Lakes, it is our region here in Cleveland and over in Chicago. But I would expect it'll grow. This is a national issue, not simply a Great Lakes issue.

DR. MAYER: Coming back to the question of sanctuaries and wrecks, are there survey requirements before establishing a sanctuary? And if there are, have those been all fulfilled?

CAPT ARNETT: NOAA is managing the sanctuaries. They make the declaration and then it goes through a process. And I would refer you to their website for great detail.

The proposals are online, and you can see where they're looking at. And they actually provide a couple different alternatives to the proposals as well. So that process is entirely in NOAA's hands.

But there is an opportunity for feedback, both public comment as well as interagency comment. The wrecks are already charted. Not all of them are eligible for the buoys to be affixed to them. Some of them are sitting right in the middle of a channel. That's not going to work.

But there are clusters that are outside the channel. I believe the closest to a primary channel of the latest iteration is the one that's up on Lake Michigan that's being proposed. It's about a mile and a half from a channel. But I'd have to look into the proposal again.

So it's not every wreck in the Great Lakes. You wouldn't be able to go out on the Great Lakes if that were the case, but there are definitely areas that are set-asides for the proposed sanctuaries.

VICE CHAIR MILLER: In terms of the sanctuary area, in Hawaii the -- a lot of the wrecks, they don't want to tell the exact location. Is that different in the Great Lakes?

CAPT ARNETT: There's probably gold on those, but ours was grain that fed the fish long ago. Not that I'm aware of, as far as I know all the -- there's hundreds and hundreds of wrecks. I think the highest concentration of wrecks

anywhere in our Great Lakes, and they're on charts.

With the exception of Erie, a lot of the lakes are very deep. Erie is almost like a floodplain more than a lake compared to the others. But the ones we know of are charted. I don't know if there's anything out there that is yet to be discovered.

MEMBER KELLY: Captain Ed Kelly here. Question, you mentioned Canada. Obviously they are joint waterways and there's joint responsibilities. Is there anything you want to bring to the attention of this panel regarding navigational issues, survey issues, et cetera for how you interplay with the Canadian entities?

CAPT ARNETT: I do understand the current effort underway to -- for the new datum, it's International Great Lakes Datum, and it's going to be a collaborative effort between NOAA and their Canadian counterparts.

For our part, we work very closely with the Canadian Coast Guard in planning and executing the icebreaking season. In fact, we have an icebreaking conference coming up shortly where last year we hosted it here in Cleveland. This year it will be in Canada.

They have two icebreakers that they contribute that are approximately the same size as the Mackinaw. They're good size. If it appears through forecasting that it's going to be a particularly rough winter in terms of ice, they'll also shuttle in a couple additional icebreakers to support us. That's what they had to do in '15 and '14.

So we work very closely with them. In the morning we have an ice teleconference where we go ahead and identify what the tactical operation is going to be for that particular day.

And it doesn't matter if it's a Canadian cutter or a U.S. cutter, we operate as one fleet during the icebreaking season. It's just based upon the capabilities of the particular vessel and where they are and where the vessels are that are in the queue to be moving.

So it's almost as one entity when it comes to working the winter ice season. Throughout the regular season we support one

another for search and rescue operations.

We have primarily a helicopter fleet. They have C-130 capability, so they're able to go up and do reconnaissance and stay in the air for a great deal of time and identify an individual. And then we can go in with the helicopters or the vessels and extract them.

We also work with each other for border protection. They sent back our illegal immigrants a couple weeks ago, so it's pretty effective. So it is a particularly close relationship here on the lakes.

Admiral Ryan works very closely with her Canadian counterpart, Commissioner Gascon. They have an outstanding relationship. For example, the Blough went aground just outside of Whitefish Bay.

The forward, let's see, port quarter was in Canadian water, which was the damaged portion which the Canadians noted and appreciated. And the rest was in the U.S. The ship was right down the middle sitting on a reef.

It's our ship. It went aground starting in U.S. water, so we had the response, but we immediately reached out to the Canadians and then had them fully engaged in each and every brief along the way as a unified command.

A few weeks later, they were able to return the favor when one of their vessels went aground on their side, and that was outside of the Buffalo region. So we have very close relationships with the Canadians and we've come to depend upon them.

CHAIR HANSON: All right, Captain Arnett, thank you very much. Thank you for taking all the questions. You can probably tell we can keep pummeling you with questions for a while here, but thanks again for speaking to us.

(Off microphone comment)

CHAIR HANSON: It's typically the other way around, but that's okay, appreciate you being here. And Josh, before you get started, I neglected to mention a couple housekeeping notes if you'll permit me.

First off, restrooms are outside if you guys haven't found those yet, appreciate keeping the traffic to a minimum. As you can see the room here and like to keep the focus on the

speakers and the conversation, so appreciate your honoring that.

Cell phones silent, please. I think I'm going to double check mine now even though I triple checked it already, but the speakers certainly do appreciate the lack of interruption.

And then finally from a safety perspective, the exits. Obviously we came up the elevators some of you. There's also a stair just to the right in case the elevators are out of commission and in case of emergency, let's go down the steps and meet outside.

It is late August, early September. If it was a different part of the year, we might not want to spend that much time outside, but it should be a nice day outside. So hopefully that won't be necessary, but I did want to mention that.

All right. Josh Feldman is here from the Buffalo District, Great Lakes Division's Chief of Operation. Thanks for joining us. We do like to have the Corps at these meetings, important partner in all these issues.

And last time we met in Galveston we had Chris Frabotta come speak to us as well, so your colleague from a different part of the country. So welcome and look forward to your comments, Josh. Thank you.

MR. FELDMAN: Thank you, Chairman. As the chairman mentioned, my name is Josh Feldman. I'm here representing the Great Lakes and Ohio River Division.

My outgoing commander, Colonel Bigelow and my incoming commander -- it's happening this week, the change of command -- Brigadier General Toy send their regrets.

But I'm happy to be here, and I'd like to take the time allotted to me to talk a little bit about what the Corps does on the lakes, how they do it and why they do it. So I guess the why is upfront. The economic value of the Great Lakes to the region and to the nation really can't be overstated.

The Great Lakes navigation system is a little bit unique, especially compared to the port navigation or the coastal navigation system where all 140 of our ports, or primarily the commercial ones, are heavily interdependent on

each other.

We can't focus our efforts on only those high-use harbors and expect that the traffic will move there. Cargo is shipped out of the areas where the raw material is mined or harvested, and it's pushed to the end user.

Oftentimes that end user is at the harbor facility or at the port facility without any other way to receive that material. So it isn't a matter of, well, everybody has port facilities or 60 of them on the Great Lakes. We can push it wherever.

We have to maintain the system as a system in order to keep it healthy. It moves 145 million tons a year. Twenty percent of that is exported. The real bottom line here and the reason why we're in business doing what we're doing is that the Great Lakes navigation system saves the nation $3.6 billion each year over the next least-cost mode of transportation.

And that has a big asterisk on it because that assumes that the next least costly mode of transportation is available and that it has capacity. And in fact, it probably does not.

So this just gives you a sense. It's a graphical depiction of where our U.S. harbors and ports -- our federally maintained ports and harbors are on the Great Lakes. The red are the commercial, 60 of those, and 80 of them are federally maintained in theory and authorization.

In practice it's a different story, but 80 of them are recreational harbors. But this gives you a sense of the proximity and the geographic disparity of them.

Great Lakes navigation for us, the Army Corps of Engineers, really it requires four components. The bread and butter of what we do is dredging. In a very related matter and a very hot topic as of late is managing the material that we dredge out of those channels.

We have the onus to maintain the navigation structures, those piers, breakwaters, jetties that form in a lot of cases these non-natural harbors and really the lynchpin of the system, the Soo Locks connecting the upper lakes with the lower lakes.

And again, the interdependency of the system requires that system approach, and

recently Congress has started to recognize that, that although Corps of Engineers is funded and appropriated and authorized on a harbor by harbor by harbor basis, to do that, to isolate those harbors and try and fund or try and direct funding towards a specific harbor does an inservice to the -- or disservice to the system as a whole.

So dredging. Most of the dredging on the Great Lakes, actually all now, is done by contract, and most is down by clamshell. So you see -- you can see a depiction of it there. It seems to be a relatively low-tech operation, but we have a handful of contractors that make it their living to do this dredging and do a very good job of it.

And this again, it's just another graphical depiction. I won't go through each harbor, but it just gives you a sense. The green dots and triangles are those harbors that we're funded at in FY '16, in fiscal year '16. And the red are where we're not.

And those dots will move around from year to year, but some of the higher use or some of the more -- those harbors that require a greater need or have a greater dredging need will be funding year in and year on. But we do try and address all the harbors that see commercial traffic on the lakes.

The reason I put this slide -- it's a list of harbors that are funded but this tells a little bit of a story. I just mentioned a little while ago that Congress has started to recognize the Great Lakes as a system.

But the other thing they're starting to do, and it started with the Water Resource and Development Act, is they're starting to fund us better. The President's budget provided the funding for the harbors that are listed there in black.

And then each year over the last handful of years that Congress has set aside -- we call them pots of funds, additional appropriations, whatever you want to call them.

But it gives the Corps a little bit more discretionary authority to go after some harbors that may not be addressed through the President's budget. And those are those red

harbors. The pluses indicate that we just have additional quantity, but we also picked up harbors that weren't at all funded. And that's a very, very, very positive sign.

So FY '17, this is our President's budget. It gives you a sense of the order of magnitude of funding. As I said, we're getting a $3.6 billion return on this investment, $100 million investment each year. You see it's about 40 percent goes towards dredging.

We have another ten or so in dredge management and six focused on the Soo and the balance of that is hydrographic surveys, a lot of different support activities that keep the system moving.

Again, sensing of where those harbors are, and you can see there's a lot fewer green dots on this map. Again, this is just the President's budget, so we expect or hope, I suppose, to see additional funding when the Congress signs their appropriations bill, if they sign an appropriations bill.

In this slide I won't bore you with the numbers, but it's the trend that's interesting. The days of the year mark are long gone, and that used to be the greatest way that we could address -- the Corps could address the maintenance needs at our recreational harbors is that the members would go to the Hill and bring home the bacon for whatever recreational harbor they had in their district.

Once that ended in about 2010, you see our funding ended. There was a little anomaly in 2014. There was a regional provision that was given to the state of Michigan, but generally speaking, it's dried up and we don't see the forecast changing anytime soon.

So we often get calls from concerned citizens, from the Coast Guard, of different issues that show up in those harbors but we don't have two nickels to rub together to address them.

Dredge material management, I'll briefly touch on this. This is probably our greatest challenge. Dredging is something we -- I said it. It's our bread and butter. We do it, and I think we do it fairly well and fairly economically.

Dredge material management's the 800

pound gorilla. It is something that we're having a very difficult time coming up with long-term, large scale sustainable ways to manage the dredge material other than putting it in the open lake.

And I'll tell the story here quickly. The short of it is prior to the Clean Water Act passing in the 70s, it was -- the dredge material management was placed in the open lake.

Then after the passage of the Clean Water Act, the Corps said all right. Let's figure out a way to get this legacy material out now that there's regulation in place to prevent the continuation of the pollution. Let's figure out a way to just get it out of the system, set it aside.

So we built confined disposal facilities. A lot of them were in the water or are in the water, just dike structures that we're filling up and essentially creating fastland. And we're at that point now where most of it is fastland, that there isn't a lot of capacity left.

So rather than return to the typical solution of putting it in the open lake, although we have been doing that at a vast majority of our harbors, we're looking at other ideas of how do we take this material, in some cases 3 million yards or in some years 3 million yards in the Great Lakes and find something useful to do with it and sustainable.

There's always really good ideas for 10, 20, 30,000 cubic yards at some harbor, but it's a matter of finding something that we can do year-in and year-out on that type of volume. That's been our biggest challenge.

Navigation structures. This is the third of the four categories of work that I mentioned. Of course they provide the safe and predictable wave climate for commercial navigation and recreational navigation.

A lot of times the recreational kayakers and fishermen will be behind them either fishing off them or enjoying the water there. It also prevents shoaling within our harbor to an extent.

And there's some additional benefits. They originally authorized the navigation project, but of course they -- a lot of the

cities, these were built 100 years ago. A lot of cities have grown up behind them because of the storm and wave protection that they afford.

They also protect some of our confined disposal facilities and again, a lot of critical infrastructure, municipal infrastructure.

This is our challenge though. Fifty percent of them were -- are 100 years old. They were designed for a 50-year service life. Eighty percent of them have exceeded that, and we really just haven't addressed the greatest needs.

We've done recently quite a bit of work through the Sandy Supplemental as I think a lot of folks in the room are aware. The Great Lakes took a huge blow from Superstorm Sandy, and so did our breakwaters.

And there was quite a bit of funding set aside from the Congress to address that, and we used that. So we actually have some real costs, and we're talking for a lot of these it's $10,000 a foot to repair, to completely rehabilitate some of these breakwaters.

So the funding requirements to renew and recapitalize these structures that as I said before, a lot of them form -- physically provide the safe harbor for these ports, is very, very difficult.

And 30 percent -- the recent low water, although I guess that's kind of an old thing, but they did see quite a bit of advanced deterioration once those timber cribs were exposed to atmosphere.

And this is just a graphical depiction of the condition. It's a typical stoplight system, red, green, amber. Well, I guess it's a few colors on there, but you can kind of get a sense of -- there's not a lot of green.

There's a few places that are. There's a few places we've been able to get after or been able to maintain or just have weathered the storms better. But a lot are in that yellow, orange and red category.

And you can see some of the magnitude of costs along that left column to restore those breakwaters and navigation structures.

And then the fourth area that we're most concerned with and draws probably the greatest attention, maybe second only to

dredging, from the shipping industry is Soo Lock reliability.

There are three locks on the Great Lakes. There's the Soo. There's Black Rock Lock and there's the Chicago Lock. But the Soo Locks are the ones that see 70 percent of the commercial commodities on lakes.

I'm sorry. Seventy percent are limited to Poe Lock. That's important because there's actually two locks, of course the Soo Lock, the MacArthur and the Poe. The Poe is the largest, so 70 percent of the commodity transitioning the Soo is limited to the Poe Locks.

Poe Locks are aged. There's no redundancy, and you can see that they have a huge consequence if and when there's an outage at the lock. The 30-day estimate of impact to industry is about $160 million.

So we're not blind to that. We've done what we can within the authorization appropriations that we have, so there's two things that we're doing. Through our O&M program, we're implementing an asset renewal plan.

It's a very deliberate and well planned approach to address the most critical needs of the Soo at the Soo Locks and start to recapitalize the existing lock. We were authorized the construction of a redundant Poe Lock at 100 percent federal expense, which is a huge win.

Unfortunately, it just hasn't gotten off top dead center, and the primary reason is -- well, of course it's always funding, but right now we have a benefit-to-cost ratio that -- well, when it was first looked at was less than one.

So there's been quite a bit of work to relook at that because there's been quite a bit of founded allegation that the benefits weren't properly captured.

So our economists out of our Detroit district have gone back and relooked at that, and there's quite a bit of indication that the benefit-to-cost ratio will be far more favorable.

And again, for us it always comes -- I guess everything comes down to money, but this just gives a sense. And again, this is only up

here, not for the pure impact of the numbers but the trend.

You can see in the late 2000s we had considerable funding. We were in the green, sustainable funding range. That's what we think we need to maintain year-in and year-out, not to lose traction or lose ground against the changing condition on the lakes.

We had a huge drop off in 2011, 2012. Our President's budget shrank. Congressional adds went away, but now you're starting to see that trend reverse.

And really the catalyst for that was that Water Resources Development Act that I mentioned, that renewed the focus, directed the Congress to renew focus on the Great Lakes and direct more of the Harbor Maintenance Trust Fund to these harbor projects.

And you can see that. That green band in '14, '15 and there is one for '16 -- it's just depicted on the slide -- is those additional provisions that Congress gave us.

So the takeaway here is for us, the Great Lakes navigation system as I mentioned, it's a huge asset to the region and the nation. It's the cornerstone for our American steel industry.

It provides great cost energy -- great energy at a low cost. You see quite a bit of construction materials go through that spur construction throughout at a low cost, that spur construction throughout the Great Lakes region.

Our grain is competitive, and of course, we try to tout the environmental sustainability implications for using water to transport goods. So with that, questions?

CHAIR HANSON: Thanks, Josh. I'll start off with the first question in terms of the funding and the capabilities. One of the things that the ARRA funding exposed throughout the country was Corps' ability to execute and given the money.

So you've got a record $100 million, $109 million present when everybody else is going down, so congratulations. The question is, we talk about in terms of shovel-ready, research-ready, survey-ready with this group.

How much money -- what's the

capability on an annual basis? If -- it's $109 million plus what?

MR. FELDMAN: Much of what we do, 90 percent is done by contract. So really it's the contractor's capability more than anything. We've estimated, to give you a hard number, somewhere in the 160 to $170 million range.

It should be well and above anything we can reasonably expect, so we think we're well positioned no matter what happens, good or bad that we can execute.

CHAIR HANSON: Okay. And as the largest dredging company in the U.S., Great Lakes Dredge and Dock, we'd love to come back to the lakes if that funding ever gets to that level. Right?

MR. FELDMAN: Yes, sir. I would love to have you back, too. Competition's a good thing.

VICE CHAIR MILLER: Yes. Can you kind of outline briefly what the most important NOAA services to you are?

MR. FELDMAN: I kind of glossed over it. We have a pretty robust hydrographic survey capability. It's really kind of an augmentation, a real time picture of the charting that NOAA does.

So of course, we -- well, what we do is both out of Buffalo and our Detroit district is we have, as I said, hydrographic survey capability that we do survey of the federal projects.

So we provide project condition surveys that are available to the public. Now a lot of those, of course, are based off NOAA gauges. We use the charting as kind of an underlay for our products.

And I know there's quite a bit of linkage between those two, both the charts and the project condition surveys that we provide. So I mean it's invaluable, the data and resources that NOAA provide that allow us to provide that hydrographic survey capability.

MEMBER PERKINS: Mr. Feldman, are you moving into remotely operated hydrographic survey vessels? What new technology is Army Corps embracing on the Great Lakes to bring more efficiency into that hydrographic surveying cost?

MR. FELDMAN: No, we're not moving -- we have some ROV capability. We're looking at unmanned aerial. We have some smaller vessels. I mean when I say small I meet three, 4 feet small, single beam, ROV type capabilities.

But where we've really made the greatest advances is we are staying on top of the state of the industry with our software and equipment that is vessel mounted. All of our crews now are multibeam survey capable.

We have vessel mounted LIDAR so we're able to take pictures both underwater and above water. We've just actually recapitalized our fleet, especially in Buffalo. And we're in the process of doing it in Detroit.

So we have a reliable fleet, one that can work in more difficult conditions, weather conditions and we're actually, because of all these kind of changes, we've actually gone to smaller crew sizes and we produce more data in a given year than we ever have.

FEMALE PARTICIPANT: The hydrographic data that you're collecting from those vessels, does that get submitted to NOAA somehow for charting, or are you charting that in some other way or giving that to the use and the needs in some other way?

MR. FELDMAN: We are not explicitly providing to NOAA. We make it available, but to answer your question, we post to our website. We post it both in just a PDF format so it's usable to the general public, but we also had MicroStation and AutoCAD, XYZ data points that can interface.

That's actually one of the suggestions that I came here with is to have on the charts, on the NOAA charts, some linkage. I don't know the right mechanism for it, but to where we store our data.

We update our data very frequently just because we're doing project condition surveys or just a general survey, but we're also doing predredge surveys, so there's tons of data.

So it's almost easier to have NOAA link to us than us to push to NOAA, I think, unless somebody's smarter and it says that's no way to go.

RADM SMITH: Josh, I'm very interested

in making that better. We have some very old fashioned ways of doing that. I could go back to channel tabs, which nobody loves, and some other very laborious ways of doing it. But I like the direction of your thinking and would like to follow with you on that.

MR. FELDMAN: Okay. Thank you, sir.

MEMBER MAUNE: You mentioned vessel-mounted LIDAR. I'm used to the aerial LIDAR. Can you explain how you use the vessel-mounted LIDAR?

MR. FELDMAN: It's very similar. It's just that. It is mounted. We have both stationary LIDAR capabilities where we take a 360 degree picture, but this is a relative -- well, it's new to us -- a relatively new technology.

So it has heat, pitch and roll compensating capabilities. So it just sits on the back of the boat, and it'll interface. There is actually some overlap if we're taking a multibeam.

Probably the best example is a breakwater. So if we're running along the breakwater and taking multibeam survey you start to get refraction near the surface where the LIDAR can penetrate a little bit under the water, and it completes the picture above water.

So it's actually just an integrated XYZ-type survey. But the density of the data is so great that you actually get really kind of a topographic map, and a detailed one at that.

MEMBER LOCKHART: I want to clarify that you're talking about in-air LIDAR, so it's above the water line, not below the water line. Correct?

MR. FELDMAN: Well, there is -- yes. It is in-air.

MEMBER LOCKHART: Or are you using both?

MR. FELDMAN: There is a little bit. There is some overlap. I mean we're talking in the first foot of so, that we kind of -- we select the best data, but yes. It is in-air. Yes, it's not below water.

MEMBER LOCKHART: Okay. Thanks.

MEMBER BRIGHAM: I just wondered about the extension of the navigation season through the ice season and the impacts on the Soo Locks

and how is their relationship and maintenance and just whole operation.

I was here long ago when we actually had year-round navigation throughout the whole of at least the upper lakes, and it seemed like that was a controller, whether the locks would be operating through the winter.

MR. FELDMAN: Let me make sure I understand. Are you asking -- let me see if I can answer it this way, and you let me know if I answered it for you. Yes, so our closure season of course is well negotiated and well-coordinated, I guess, with the Lake Carriers, with the Coast Guard.

But of course it is primarily driven by the maintenance requirements in the off season. And there's -- like I said, there's a lot of push to keep as much outages -- or keep the outages as low as possible and cram as much work in and do as much work as we can while the locks are operating.

MEMBER BRIGHAM: Thanks.

MEMBER SHINGLEDECKER: You hinted at water level challenges with regard to the maintenance of the breakwaters. I was wondering -- this could be for either of you. Certainly the Great Lake water levels are very dynamic, and do you have the tools that you need to predict and manage to changing water levels?

MR. FELDMAN: I think I can answer that, too, if you want.

CAPT ARNETT: I was going to say from our point of view, we're relying upon their models for sourcing that. But I think the best predictor is whether or not we have ice. If we have ice, the water came back last year. We have a few more of that. The best way to manage the ice is not have it, but there's consequences.

MR. FELDMAN: Yes, I echo the captain's comments. Sure, we spend a lot of time and actually John Allis from our Detroit district who is head of our Hydraulics and Hydrology Department will be here tomorrow as part of a panel.

And he heads up that effort of modeling and predicting water levels, but again, for us we can only manage to what our authorizations are. Now there was when we had

the severe low water levels, there was a push. And we executed some dredging that instead of just being say 27 feet below low water datum, we actually were allowed to dredge 27 feet before water.

So there was some additional dredging that was allowed to be done to maintain those depths. But yes, a rising tide floats all boats, so the better and more water we have, the better we are. And Scott mentioned, it's ice that -- when we see ice, we get excited.

CHAIR HANSON: We're going to have to cut the questions off there because we could talk all day. Again Josh, appreciate you being here. There's so many important topics you guys are involved in.

The dredge material management is very important. You guys looked to privatization this last year and had some interesting conversations and interesting results.

You've also got involved in some state engagements, state of Michigan coming up with money for some of their dredging as well. And so you're seeing a more systemic approach to all this.

But both the Coast Guard and the Corps are very important partners for NOAA and for this effort, so we appreciate your being here.

MR. FELDMAN: Thank you.

CHAIR HANSON: Last speaker, Dave Holst. You're going to speak from here, Dave, or you going to --

MR. HOLST: I can speak from here.

CHAIR HANSON: As you wish. Chief of Staff of NOAA's Ocean Service. We introduced him before, and now without his right hand up --

MR. HOLST: Exactly.

CHAIR HANSON: -- welcome.

MR. HOLST: All right. Good morning, and thank you to the HSRP panel for having me as the NOAA representative today. I really appreciate the opportunity.

First I want to congratulate Anne, Gary and Lindsay Gee as the newest members. The panel now has a full complement of members, and I think there's diversity and a broad breadth of expertise and experience, which is great.

Vice Admiral Manson Brown, the NOAA

Deputy, and Dr. Russell Callender, the NOS Assistant Administrator, asked me to convey their greetings to all of you and their regrets for not being able to be here. But they did want me to pass along their great appreciation for your commitment and the expert advice you provide the NOAA administrator.

NOAA leadership certainly recognizes the importance of HSRP in providing innovative ideas on how NOAA can improve our navigation programs and products and services.

And your guidance also helps shape and define NOAA and industry roles in a thoughtful and effective manner for both independent and collaborative efforts, so we certainly share your commitment to the success of NOAA's hydrographic services today and into the future. And you all play a very important role in that.

So we're right down the street from the Rock n' Roll Hall of Fame, and the late, great David Bowie had a song called "Changes," and I think that's appropriate. There's a lot of changes here and into the future.

We have three new panel members. We have a new chair, a new vice chair. Rear Admiral Smith is the new Director of Co-Survey. We had a 3-in-1 ceremony last week with promotion, change of command and retirement.

And we certainly are going to miss Rear Admiral Glang, but we look forward to Shep's leadership in co-survey and his role as the Designated Federal Official for this panel.

But we're also upcoming -- there's a presidential election, which means we'll soon have a new administration and new political leadership within NOAA.

And for us within NOAA, that means we need to develop new relationships with the new political team and try to quickly educate them on the Ocean Service and the value and the importance of the products and services we provide.

We're in the process of planning for the transition, but it'll kick into high gear right after the election when the landing team from the winning party arrive at NOAA.

But also, there's -- many of our NOAA partners are starting to plan for the next

administration, the transition as well. And I encourage the HSRP to begin thinking about how to strategically message to the next administration the unique value of this panel and also the importance of NOAA's hydrographic products and services.

But with change comes opportunity as well, and there's also an opportunity to really advocate. And I know Dr. Callender in the past has talked to the panel about advancing the understanding the delivery of stakeholder needs.

And I know you've worked hard to identify and provide recommendations on technology and infrastructure through the three issue papers, the NOAA Hydrographic Survey Fleet, the Hampton Roads Regional Pilot Project as well as the U.S. Maritime in the Arctic, Charting the Arctic.

And these papers are really concise and compelling, and you've done a really nice job on these. And my understanding is there's more in development, and I look forward to reading those and also hearing from the panel on how best to maximize the impact of these papers, particularly with the upcoming transition.

I do want to note, I do and NOS and NOAA certainly share your concerns on the Hydrographic Survey Fleet. The hydrovessels are some of the oldest in the NOAA fleet, and we are seeing the impact of old aging vessels on execution.

And it is a priority for NOS and for NOAA to recapitalize the fleet. We're starting to get Congressional support. We have got a number of internal and external efforts to refine the requirements as well as what the make-up of the NOAA fleet should be in the future. So it is a big priority for us as we move forward.

Let me move on to budget, which always takes up a lot of our time. So the House and the Senate appropriations committees have passed the FY '17 NOAA funding measures. Unfortunately, they're both below the President's budget for the navigation, observation and positioning programs.

They are actually below the President's budget across the board for NOS. The House proposed $11.8 million below the President's budget. The Senate, 2.5. That's

generally how it goes. The Senate's much more favorable than the House.

But as you imagine, $11.8 million reduction would have significant impacts across the board on NOAA's hydrographic products and services. It will almost certainly be on a continuing resolution to start the year.

And so we'll be operating in FY '16 funds until a budget is passed. No idea when that's going to be, but based on the last couple presidential elections, that usually hasn't happened until the springtime.

So we will likely be operating under a CR until the spring. But we certainly are going to hope for -- much closer to the Senate than the House for sure.

So I think it's appropriate that this meeting takes place in Cleveland, to highlight the importance of the Great Lakes and not only the environmental, economic and social importance of the fourth coast.

And I grew up on the Great Lakes, just north on Lake Michigan, just north of Chicago, so the Great Lakes are near and dear to me. And it's my first time in Cleveland, but I'm looking forward to coming back here in late October when the Cubs play the Indians in the World Series. But I will not be rooting for your home team here.

CHAIR HANSON: I think there's another rock n' roll song called "Dream On."

MR. HOLST: So -- but I'm looking forward to this week. It should be a very productive meeting. We've got some really good topics and speakers, which you've already heard several today this morning.

I'm really looking forward to this afternoon's panel and the regional navigation issues. And NOAA is really interested in hearing the panel's perspective on the issues, the challenges and the opportunities here in the Great Lakes.

And I think that's one of the real benefits of having these regional meetings is hearing firsthand the issues and how NOAA can better provide the products and services to support these issues. So I'm looking forward to that.

But also partnerships are really the key to NOS. We are a partnership-based organization. We can't accomplish our mission without our partners, and we see that firsthand here in the Great Lakes.

And I'm pleased to join CO-OPS director, Rich Edwing, and the Lake Carriers Association in announcing a new partnership between CO-OPS and the Lake Carriers Association.

They maintain support for sensors on the Cuyahoga River for critical navigation. And before Jim Weakley and the Lake Carriers Association stepped forward with their support, we would likely have been unable to operate these sensors if there was a failure.

So it just -- and we're going to have a little plaque ceremony when I'm done here, but it just really highlights the importance of partnerships and working together, particularly in tough budget times but also highlights the importance of maintaining and strengthening these partnerships and reaching out to new partners and having us better understand what the needs are that we can provide, the products and services to meet these.

So we've got a lot going on in the Great Lakes in the Ocean Service and across NOAA that I want to kind of briefly highlight, the various activities that we have going on here in the region.

The first thing I want to mention, it's not necessarily an NOS program, but one we work very closely with and are partners within NOAA, the Great Lakes Environmental Research Laboratory, which is conducting really innovative research and products and tools for the Great Lakes and coastal ecosystems.

And Debbie Lee, the director, is going to be here. And I believe she's speaking tomorrow, but we have a really good partnership with GLERL. Also, we've got the NGS Geodetic Advisor, Dave Conner, and Tom Loeper, the Great Lakes Nav Manager, here as well.

And GLERL, CO-OPS and NGS provide tactical expertise to the U.S. -- the representatives to the coordinating committee, which is a bilateral committee charged with the responsibility to collect, compile and provide

technical advice on hydraulic vertical control and water levels for the Great Lakes, so it's a really good collaboration.

But as we briefly touched on this morning, NOS, we've got a lot going on besides just the navigation services. We have two estuarine research reserves in the Great Lakes, one in Lake Superior and one just down the road in Huron on Lake Erie, Old Woman Creek Estuarine Research Reserve, which I visited yesterday, which is really a beautiful area.

But these reserves are great federal/state partnerships where we conduct a lot of research, monitoring and education to address the key coastal issues that are facing not only that area but the whole region, whether it's invasive species, impacts to climate change, restoration. So it's a really good partnership.

Also sanctuaries. We touched on sanctuaries this morning. We've got Thunder Bay up in Lake Huron, but also the process is underway for a potential designation in Lake Michigan, and the sanctuaries designation, it's a public process.

The nomination was submitted from the community to NOAA, and we've held public meetings and now we're into the phase of developing draft management plans and potential boundary proposals.

And there will be another opportunity throughout this process for additional public input as well, but this will protect some important maritime heritage assets in the Great Lakes.

Also, the CO-OPS continues with the harmful algal bloom forecasts, and the good news is the forecast in Lake Erie is going to be less than in year's past when we had pretty significant impacts to Toledo's drinking water.

CO-OPS co-serving GLERL have established the Great Lakes Coastal Forecasting System, which developed models for predicting lake circulation and other physical processes in real time, nowcast and forecast mode.

And this is really important predictions for navigation, HABs and other various uses. Also, the Great Lakes Observing System provides real-time and historic data on a

variety of issues, hydrology, biology, cultural resources.

And GLOS also serves recreational boaters through ongoing support of the Great Lakes Boaters Tool and also funds and facilitates buoys that helps weather forecasts. So it's another really good partnership there.

We work closely with the Army Corps USGS and the Naval Oceanographic Office on LIDAR technology development to help support nearshore areas on our nautical charts.

The NGS, and you're going to hear more of this from the program updates, has completed the GRAV-D collection in the Great Lakes and is currently working with Canada and the coordinating committee in the Great Lakes towards a modern framework for both land and water measurements.

And CO-OPS and NGS are also working to update the International Great Lakes Datum, which is used by the United States and Canada as a reference system for water levels across the Great Lakes and Saint Lawrence River.

And this is a critical bilateral water management that supports power generation, navigation safety and a variety of uses. Also, there are electronic navigation charts. We're making good progress.

By the end of next year they should be completed for the Great Lakes region. And also last month Co-Survey launched the final phase of its Chart Tile Service, which provides users faster, more frequent updates.

So that just gives kind of a slice of the various activities going on in the Great Lakes. And you're going to hear more detail as the various programs give their updates. But also just the importance of the Great Lakes and the partnerships we have here.

And just in closing, I want to thank the panel for your personal and for your professional investment as you continue to make and support NOAA's navigation-related services.

I look to forward to having the opportunity to talk with you more and hearing your strategic recommendations and views of where NOAA should focus its priorities in the future.

And with Bill and Joyce as leading the

panel, combined with the new members and the expertise here, I believe the panel really is an opportunity to help NOAA advance our navigation products and services.

And we've got a real opportunity with the transition to the new administration to really help send that message as we move forward. So I will end there, and I appreciate again the time for being here and opportunity to speak.

CHAIR HANSON: Well, thank you. Okay. I think you have a presentation as well. Yes, do you want to do that? I had one question if I could before you started --

MR. HOLST: Sure.

CHAIR HANSON: -- because the transition is something that concerns all of us, not just the changes and the "ch-ch-ch-changes" --

MR. HOLST: Right.

CHAIR HANSON: -- on the committee, but also the changes in the administration and NOS moving and OCS moving forward. Maybe just a recap for some of us. Who is appointed to the position, and who is staff? Who stays?

MR. HOLST: Who stays and who goes?

CHAIR HANSON: Yes, who stays and who goes?

MR. HOLST: "Should I Stay or Should I Go?" All right. So within NOAA, the political leadership, I mean they're gone with the election and they --

MALE PARTICIPANT: Specifically, who is that?

MR. HOLST: Specifically, yes. So it's Dr. Sullivan. It's the two assistant secretaries, Vice Admiral Brown. And Chris Blackburn's in an acting role, Chief of Staff Renee Smith, the chief scientist Rick Spinrad.

There's a number of also staffers as well, but those are the main political leadership. Also the Fisheries Service is headed by a political appointee as well, Eileen Sobeck, so she will be replaced as well.

But NOAA has actually a small number of political appointees, but it's the core leadership team at NOAA. And from what we've heard is -- I mean you never know when they're going to leave. Everyone's looking for jobs.

They certainly know their time is coming to an end. But we've heard that Dr. Sullivan and her senior political leadership team are committed to staying until the end.

CHAIR HANSON: I know I speak for the panel because I know we've got a lot of work in queue we're working on, and I think we've got enough to keep us busy for the next few months, but we're going to be looking to make some things happen as soon as we can -- the new administration.

I know Glen's going to talk about that a little bit at lunchtime as well, so appreciate that.

(Simultaneous speaking.)

MR. EDWING: So it's traditional when we establish a new port system that we have some sort of event commemoration just noting that new system's in place. It's also traditional we provide a plaque to the partner, the sponsoring partner to the ports.

And here today I'm going to present this plaque to Glen Nekvasil, Vice President of the Lake Carriers Association --

MR. NEKVASIL: Thank you very much.

MR. EDWING: -- for the Cuyahoga River PORTS. This is a current meter. Actually, it's one of three current meters established about ten years ago with earmark funds, but the funds are no longer there to kind of keep these operating.

It was a demonstration project, so we've been looking for a home for these meters, and I think this meter in particular is very important for the Lake Carriers to be able to bring ore from the Cleveland waterfront up to the steel mills up river because of the currents.

MR. NEKVASIL: Yes, thank you very much. It's a pleasure for us to co-sponsor on this. As Captain Arnett said, that's a very challenging river, and sometimes the current is so strong in that river that we just won't try to enter. So it is critical that we know the current conditions in there.

MR. EDWING: Okay. Great.

MR. NEKVASIL: Thank you.

MR. EDWING: Did we get a picture?

(Simultaneous speaking.)

CHAIR HANSON: Lawson?

MEMBER BRIGHAM: Just a quick comment about what Dave told us, particularly ominous numbers for the stuff that we're dealing with here at this panel. And it just makes clear we got to redouble our efforts in all of NOAA in the economic security issues related to what we do and what services does for our country.

And let me just add a little point about the arctic. I think most of us are worried with the new administration and that the United States is no longer chair of this Arctic Council, but in fact, be less interest in arctic things, particularly arctic charting and hydrography.

And what many of us are concerned about is the individual agencies, but here whatever arctic strategy is developed within the new NOAA with its new administrator that there wouldn't be any loss in interest in the economic and national security issues related to hydrography and charting in the arctic.

So I just throw that in as public comment because I think there's great concern. I serve on a couple committees, one for the Council on Foreign Relations, and we're coming up with a list of infrastructure.

And right at the top of it with some pressure from me and others is the place isn't charted, so we don't have a safety net. So, in fact, we have a lot to do over the next century or so, but maybe -- but shorter than a century. So huge issue but kind of a side issue related to the economic security issues and how we argue those issues on the Hill.

CHAIR HANSON: Okay. Scott, following a tradition of not being on time, taught me well. But we would like to go ahead and take a short break here, if we can reconvene at 10:25. I would like to again thank our panelists. Thanks for kicking us off with great challenge and appreciate your time. Thank you.

(Whereupon, the above-entitled matter went off the record at 10:10 a.m. and resumed at 10:30 a.m.)

CHAIR HANSON: All right. Well, the canned line is, "Thanks for your punctual return," or maybe we should just say, "We'll get it right next time."

Our final speakers for this morning

are the directors of NOAA's navigation-related service programs and the co-directors of the NOAA/UNH Joint Hydrographic Center for Coastal and Ocean Mapping.

I'll introduce each followed by their presentation, but let's hold questions until after the last presentation. If panel members are compelled to ask questions after that, go ahead, as if I can control that anyway, right?

So our first speaker is Mr. Rich Edwing, Director of NOAA's Center for Operational Oceanographic Products and Services. Rich is no stranger to this panel, and he's held many positions of increasing responsibility within NOAA over many years.

As Director of CO-OPS, he oversees 24/7 operation, providing physical oceanographic information to mariners and other users. Rich also serves as an advisor to the American Association of Port Authorities' Harbors and Navigation Committee, where we see each other quite a bit as well, and we're both missing that meeting this week. So anyway, Rich, please proceed.

MR. EDWING: Okay. So this morning I'm going to just touch on some FY '16 accomplishments over the past year and in some areas I'll talk about where we're going in '17.

And you've heard mentioned earlier the update of the IGLD, and that's the slide I'm going to lead off here with for obvious reasons given the locale. This is a big deal. This is a seven year effort to update this datum.

It's within NOAA. It's NGS and CO-OPS primarily responsible for this, but we're getting a lot of support from GLERL, the Great Lakes Environmental Research Laboratory, in terms of helping us with the education, communication and outreach, helping identify stakeholders and connecting with them in this effort.

CO-OPS is responsible for title datings around the coast. NGS is for geodetic datum, horizontal and vertical reference frame, so I give these a little bit of a unique datum that we're both responsible for. It's kind of a blended datum, but both the geodetic and water level datum.

I always -- I really like this

graphic. You can see it shows the upper lakes, really pretty much at the same elevation but then you got the large drop off in elevation there at Niagara Falls down to Lake Ontario and then further down to the Saint Lawrence River. Most people don't realize that sort of elevation drop in the lakes.

So why do we need to update this datum? Well, it's because the Great Lakes are tilting. The western end is still rebounding from the glaciers retreating a millennia ago. The same thing's happening in parts of Alaska. The eastern end's is subsiding a bit, so it's tilting, so that the datum gets out of whack.

So this year, and I think the Coast Guard as some of you mentioned is also a bilateral effort. It's just not the U.S. working on this. It's Canada as well.

So this year our accomplishment was we got our plan in place. It took a lot of work between NOAA and Canada to get the plan in place, who's going to do what, when.

Those are some research questions that have to be answered, but that's going to be -- approve this at their fall -- the coordinating committee meeting is this fall, so that's kind of our accomplishment for '16.

So -- and then we'll actually begin the update in '17, but the other thing I'm going to mention is there's a large component of this that relies on seasonal gauging. We can update the IGLD just using the 53 NLWON stations that are up in the Great Lakes.

And in actually 1985 when the last update occurred, that's all that was used because they couldn't get the funding to do seasonal gauging. The seasonal gauging is short-term measurements at 140 other smaller ports and harbors, and that's what establishes that updated datum in those areas.

And we tried to get funding to good large effort. We were not successful. However, sort of taking a different approach. We're taking kind of a partnership, patchwork approach.

We got funded by the Coastal Storms program to do some initial gauging over the last year or two. I think six different locations, really just to kind of knock the rust off and

practice some seasonal gauging for some other applications. It will help this update.

But now that's positioned us, and again this was with help from GLERL, we were successful and got a little bit of funding through the Great Lakes Restoration Initiative for some seasonal gauging in '17.

And then in '18 and '19, we're going to be using VDatum funds. We're going to be doing our VDatum surveys to update the VDatum models in the Great Lakes in '18 and '19 but also do a lot of this, you know, it's killing two birds with one stone.

And then we're talking with the Corps. The Corps does some -- has some gauging funds that we're trying to talk them into helping put towards this problem. So I don't think we're going to get to 140, but we've prioritized locations. I'm hopeful we'll get to at least half over this seven-year frame and get the datum updated in those areas.

We've been continuing to work on enhancing the NLWON network. It's over -- it's about 210 stations. We're transitioning away from the acoustic sensor, which is our primary sensor, to the radar microwave water level sensor.

There's a lot of benefits to doing that. The microwave is a non-contact sensor. Nothing gets in the water, so even though the sensor itself is about the same cost as an acoustic sensor, about $2500, we eliminate all of the components that have to go down into the water with an acoustic sensor.

And it avoid biofouling, corrosion, getting banged up by boats, so a whole host of issues and avoids costly diving services to maintain that. So a microwave's a more cost effective sensor to operate.

Also, we had to change out the acoustic every year because of calibration. The microwave, we've really not detected any drift in it. We're going to change it out about once every four or five years to be conservative, but it's very cost effective that way as well.

But we're also excited about it because we're looking to dual purpose it. We're pretty confident we can actually get wave

information out of this sensor as well in environments where it's deployed in a wave environment and whether that information will be useful, that's a project we'll be starting to work on soon.

But in the meantime, we started in earnest to transition the network a couple of years ago. Right now, we've got 38 stations that have the microwave installed.

We actually installed that in addition to the acoustic, and we operate them in parallel for a year, do data comparisons. We want to make sure we have no surprises when we pull that acoustic out.

And we've got six stations at this point that have completed all the data comparisons, and we've either removed the acoustic stuff, or we'll do it during the next annual inspection.

Current surveys, I think in Galveston I kind of showed this same slide. We were kind of on the front end of these surveys. We hadn't done them yet. Now we've done them.

Puget Sound, we're in the mid portion of a three-year project, the largest probably survey we've done in decades over, I think it's 138 total meters that will have been deployed or are going to be deployed.

We did the middle section of the survey this year. We did the southern last year, and next year we'll be doing the northern portion. It kind of coincides nicely with the potential HSRP meeting out in Seattle I think was in the next year or so.

So -- but much needed in that area. There was a lot of places where predictions are out of date or some of these were new locations where predictions were identified to us by the community. We have a lot of community outreach.

Cape Fear River. We had reports from down there that predictions are out of date, so we did a survey down there. I think it was 15 or 18 locations, something like that. And you can see the locations here. That's been done.

So all the data from all these surveys will get into the prediction tables for next year, and this is just a picture from the Cape Fear survey. We used a small vessel for this

survey, and I'm going to say this one's being deployed because that bottom, that looks pretty clean. They look pretty filthy when you pull them up, so yes.

Okay. So I mentioned VDatum surveys before. We've been doing surveys for a number of years now, and it's to reduce the uncertainties in the VDatum models that transform between geodetic and title datums.

And this past year, we did some surveys up in the Pacific Northwest. It's about a total of 30 locations all together. Those have been completed, and that data will now go into the larger VDatum project to improve those models.

New PORTS. We just dedicated the Cuyahoga River here, but we also got a new one down in Savannah, Georgia, through the Port Authority there. It's an air gap sensor on a bridge. This is actually up and running. They just kind of asked us to hold off announcing it until they could kind of play with it, use it for a while, which is fine.

And that PORTS also incorporates the NLWON station at Fort Pulaski, which is at the entrance to the river that leads up to the PORTS. So that's number two. And number three is off of Cape Cod, Massachusetts, which is a wave buoy.

And this was kind of interesting because there's a lot of partners involved. The partner there is the Massachusetts Department of Transportation. They wanted a wave buoy out there.

I think they were concerned about some of the windfields that are going in out there, but interestingly enough in the legislation, the state of Massachusetts says any ocean observing systems that are funded by the state have to be PORTS systems through the PORTS program.

I think that's because it was an oil spill there a number of years ago and they put some sort of tax on oil revenue somehow, and that's kind of collecting for these sorts of purposes.

But regardless, so we worked with NERACOOS, which is the IOOS Regional Association up there because they're very interested in this. They're going to be kind of the operator of the

PORTS system. And they're hoping to grow it with more centers as time goes on.

But then USGS, we actually were able to accelerate this one for next year to this year because USGS happened to have a wave buoy on the shelf they'd purchased for another project, were done with it.

They loaned it to us to put out there. It's been deployed. It's operating. We're disseminating data, and we'll buy another wave buoy and kind of they'll get theirs back.

But again, we're kind of ready to announce that all the communications people with all the partners are working and wanting to do that, but these are in and operating and putting out data. So the system continues to grow.

So I talked about improving water level technology. Well, and directly related to PORTS, we're improving how we're doing current sensor measurements that are add, our AtoN deployments, our Aids to Navigation deployments.

We worked out a number of years ago, about ten years ago or more, how to put current meters on Coat Guard navigation buoys because that puts the measurement right along the ship channels right where the mariners need them.

But with the older technology, we had the sensor out on the buoy, and the data had to be slimmered in to a shore station, data collection platform, which would then go up through those and come back to us.

Now we're using the Iridium satellite. We can get more data through it, uses less power, so everything's out on the buoy now. And we eliminated that shore station, so that's really reduced the cost of these.

That's probably about $50,000 worth of equipment and installation costs by getting rid of that shore station. And one of our biggest issues with data reliability was kind of that radio link between the buoy and the shore station.

And that was eliminated, so that's really going to improve the data reliability. So again, we're always looking for ways to improve technology or use technology to improve effectiveness and reduce costs, so good success story here.

Modeling. You heard about this a little bit earlier. I think again in Galveston I said we were getting ready to launch the new Lake Erie model. This is a retrofitter upgrade of the former model.

The Great Lakes was actually the first locations where we launched the modeling program with the five Great Lakes models, which were developed by GLERL and transitioned over to NOS.

And now GLERL has delivered us the new regime of models, with significant improvements, much higher resolution. The forecasts go out now 120 hours into the future and other things as well.

So again, GLERL's been a big partner in this to help, and then we'll be going into the other lakes after this. This was the first one to be retrofitted.

And one of the reasons this was the first one was because we needed that to help drive the Harmful Algal Bloom Model. And again, CO-OPS is the operational home for Harmful Algal Bloom Models and NOOA, we've got -- kind of done the Gulf.

But you've been aware of the -- you've heard about the Harmful Algal Blooms up here in Lake Erie and the impacts on drinking water in Toledo over the last couple of years. Our sister office, the National Centers for Coastal Ocean Science developed a model, and they transitioned it over to us this year.

We kind of dove it in parallel and test it and try to break it. We've completed that testing in '16, so we've achieved what's called an initial operating capability. And then next year we're going to take it the whole way to full operations and go live with it.

And I'll mention again, GLERL's been a partner in this. They do a lot of monitoring that's needed for Harmful Algal Bloom models, so we've worked closely with them as well.

Inundation Dashboard. This is another big deal, another big project we've been working on for a couple of years. If you're familiar with our Storm QuickLook product, which is when a hurricane or a big nor'easter approaches the coast, it's a way of looking at all of the water level stations that are being impacted and kind

of being able to pull them all in at once.

And you can look at the data on different datums and there's some customizable things about it. This brings it into a GIS environment. It's going to do the same thing as QuickLook did but with a lot more features.

It's also going to be able to bring in data from other partner networks. It's going to be able to -- it's going to use some of the Weather Service to find local flooding thresholds.

Each WFO defines kind of a minor, moderate and major flooding threshold. It's going to use those thresholds to help communicate the flooding. You're going to be able to look at historic data for some of these stations.

Where it's a long-term station, you'll be able to go back and see what were some of the older flooding elevations to help inform what's going to be happening. And we're also kind of tying our landmark partnership into this.

That's where we work with different communities and we get -- where there's a tie gauge and using geodetic connections we tie local landmarks into the tie gauges, and then we get photographs of landmarks. And we can illustrate how different elevations of flooding is going to impact those landmarks.

It gets around the -- and hopefully it's going to get around the communication efforts. People don't understand title datums.

They don't understand geodetic datums, but they know what it means when the water is going to get above that first step of town hall or the statue of General Grant in the park or whatever the local landmark may be.

So we did a prototype. We delivered a prototype this last year for these three hours, and we're going to be going final with that in '17. Although it's not going to have all of the features, we'll continue to add features on next year.

Sea levels and coastal resilience. One thing we did this year was we actually implemented a formal assistance program. That's always been kind of done ad-hoc as people have looked for assistance in past years.

We've got an FTE dedicated to doing

this, and he's held several trainings already. People always want to know how to put in their own tie gauges to NOAA standards and how to process data or do things. And so now we kind of have a dedicated capability to do that.

And we're also continuing to enhance our sea level products. We're trying to now -- how do people get seal level trends if they don't have an NLWON station nearby or some sort of long-term tie gauge nearby.

So our researchers have been doing work on that. They developed some approaches and actually Department of Defense has picked us up as well to use overseas because they don't have NLWON stations overseas, and they may not have local, long-term tie gauges. So this methodology is being applied overseas as well to help protect military facilities.

And so my last slide is just about some of the partnerships we've developed. Dave mentioned how we're a partnership agency, and certainly through our PORTS program and we just have lots of different partnerships for different applications.

I know Lawson's going to be happy to hear we got another arctic station installed. We don't have enough of them, but knocks our gaps down from 21 to 20 up there. But the Weather Service funded the establishment of the station up in Unalakleet.

It's installed. It's still going through quality control but should be putting out -- going live here soon, so we're excited about that. We've been partnering with the National Park Service because they're interested in establishing long-term tie stations to NOAA standards in some of their national parks which are being threatened by sea level rise.

So we're working with them, and there's going to be actually another one going up in Alaska, West Coast of Cook Inlet, which is not in the arctic, but Alaska still needed more tie gauges, does fill an NLWON gap so lots of benefits there.

And they're going in other areas as well. And again, we were just down in Texas in TCOON, and I don't know. I forget how much we talked about this, but they had established for

these new platforms, these sentinel of the coast platforms, hadn't been instrumented yet.

But now two of these have been fully instrumented, and they're about to go live. The other two are in the process of being instrumented and will go live soon, but after Hurricanes Katrina and Rita, we got funding to design a new type of tie gauge that was going to provide data when it's most needed during a hurricane.

And we put in four of those off the coast of Louisiana and Mississippi. After Ike and Gustav, the Corps funded the establishment of two more off of Houston, Galveston and up in Sabine Pass. And now they got four more along the cost of southern Texas.

So there's ten of these total, and these are funded through a federal grant to the state, so I've only really directly established four of them.

Partners have established six of them, but it's a nice growing picket fence of sentinels along the Gulf Coast to help provide data during these extreme events, so I'm pretty excited about that.

So I think that -- yes -- I think. Are we going to hold questions for the end, Bill? Okay. I'm done.

CHAIR HANSON: Thanks, Rich. So Cook Inlet's not in the arctic, but you can see it from there.

MR. EDWING: It's not a song, Bill.

CHAIR HANSON: Our next speaker is Mike Aslasken, Chief of NOAA's Remote Sensing Division, presenting on behalf of Ms. Juliana Blackwell, Director of the National Geodetic Survey.

As Chief of Remote Sensing, Mr. Aslasken oversees field surveys, which are integral to nautical charting. Mike?

MR. ASLASKEN: Thank you, sir. So I have the great opportunity to give you all an update on what we've done this year for NGS and again on behalf of our director who couldn't be here this week.

First and foremost folks, new datums are coming. We've got to prepare for this. This is going to be mind-shattering to some, but a

better thing for everybody in most cases.

And I wanted to point to a lot of ongoing activities. Most notably is our international collaboration, both with the Canadians, the Mexicans and the Caribbean nations as far as ensuring that we have consistency and that we're all talking the same terminologies and approaches.

We have some experimental geoids out there. That's very important, especially when you're looking at GPS and getting accurate heights in trying to achieve the goal of getting similar accurate heights from GPS directly.

There is a quarterly National Spatial Reference System newsletter out from the NGS site. The website is down here at the bottom of the page. Please make that one of your quarterly readings if you can. It's very important to see what's going on and how we're doing.

In conjunction of the approach of updating the datums, we have to validate that approach. So a follow on to the 2014 as I look to my geodetic advisor, geodetic slope validation we're doing in 2017, again to look at validating the approach that we're doing to make sure we're doing the right things.

And then a highlight of the 2017 Geospatial Summit, which I think there's a slide in her eon that. Correct. Put this on your calendars. It'll be in Silver Spring at the Silver Spring Summit -- Silver Spring Civic Center downtown, a very nice venue, April 24th through the 25th.

Again, we will give an update from the last summit of our planned activities of the update to the datums as well as we use it as an opportunity to bring together our geodetic advisors and interests across the nation to talk geodesy and get on the same page. But please highlight that in your calendars. If you can attend and participate, it would be well welcomed.

GRAV-D. So we're over halfway. Over 53 percent of the U.S. has been collected with the airborne gravity. Again, this is critical to the update of the new vertical datum. This is how we are defining that.

It is one of the important components

of the gravity data we're using to get to that vertical reference. Alaska, 60 percent. We have also, in parallel to our operations with manned aircraft, we've had a successful SBIR with testing an optionally piloted unmanned aircraft.

If you all are familiar or want more information, I can provide that, but that's been an interesting test in SBIR that we got funded through SBIR process. And again, we have ongoing collections in Minnesota and Oregon as current activities.

We also hosted an international airborne gravity summer school, again at the Silver Spring -- that's actually the facility there in downtown Silver Spring that the county runs that we use quite a bit.

We had over 60 participants from over 14 nations. Again, the approach and this really validates not only our approach but internationally the approach used in airborne gravity to update your vertical datums.

They will be pulling together a textbook for this class, and I'll be able to share broadly. But again, great success, and we actually had a lot of folks waiting in line to get to this one.

Might not be in the top of a lot of folks' around the table's list of training, but we were very happy to see the international participation and interest in this activity.

Our regional advisor and state advisor and coordinator's activities. Again, we're well on our way as you can see to achieving that approach where again we have regional advisors that are NOAA funded.

We still have a few state advisors. They're highlighted there I think primarily in agreeing that the state help provide funds, too, and then we have our coordinators, like Mr. Gary Thompson here that we work with closely.

But again, a very active and important group not only from answering at the state level, geodetic questions that they may have or interests but also advocating for an enabling the new datums as we go forward with that.

Again, a focus with the new datums on increased customer engagement. Again, I kind of highlighted the regional geodetic advisor program

in providing -- and this group specifically is really responsible for over 50 percent of the states receiving training within the last year.

We also have a very active training center in Corbin, Virginia, that does not only monthly online offerings but targeted offerings to community interests through the webinars and such as you see there.

And highlighting this increased video library through the COMET and INCAR group. Maybe during the breaks we can play some of these videos.

We just recently -- I think it's on the next slide here, developed one for collecting coastal LIDAR elevation data, really putting information into layman's terms that people can put in their iPads or bring to those folks that they can talk to and that we can't.

But again, from an educational standpoint spans not only that LIDAR but also all types of topics of geodesy. Here, this is actually the video here. We won't have enough time to go through it now, but hopefully we can play it through the break to give you an idea.

But NGS has been working and we have a VDatum video coming out, about two minutes, enough to keep people's interest but really at a low level being able to educate folks on a very technical subject. I know you guys will agree with that.

VDatum. Rich touched on some of the highlights going on within CO-OPS participation. Again, the program management happens within my group for VDatum, but the highlights for '16 included the regional datum update for San Francisco.

We developed and released a web-based version of the tool. Previously, you'd have to download the software on your PC and run. This allows you to take a few select points, and if you want to just convert them online you can do that versus a lot of the applications or enablers are for large data sets like LIDAR and hydrography.

Again, along with that was a big release of the software. And as I mentioned, we have the COMET video in place. And just the key takeaway here, this is the real key enabler to

these new technologies, whether airborne, space-based or shipborne to really getting this data to the reference that we can actually make nautical charts and actually compare data over time.

Coastal mapping. So we delivered over 10,000 miles of shoreline this year, which was again, helps update over 285 nautical charts. We updated 37 ports with updated shoreline.

And then in addition, we also analyzed 35 ports for changes. Those changes, once they were identified, are then identified to be updated. You can see some of the activities of the collections we've done over the years since 2014. But again, a lot of activity both on the inventory and LIDAR activities.

This was a big win for us for -- well, four weeks we were able to go up to Alaska. And what you see there in the green we were able to collect about 1600 miles of oblique imagery. To your reference to oblique imagery, and that's an image there that you can see.

But -- and we also did a collection of over 19 ports. Again, the ports were identified based on rotation of where they are in the system, but a lot of them were special request because there's a lot of activity, a lot of building in the ports, especially for the cruise line industry that we needed to address based on requests from Office of Coast Survey.

This data is -- I thought I was going to be able to tell you it was released today, but we're having a little technical problems. Hopefully this week we'll have that imagery available on our viewer, again GIS-ready, download, take away.

And this data is very -- serves a lot of different purposes beyond navigation, but from a coastal intelligence, coastal resiliency we've addressed collecting the data of the lower 48 to really use as a baseline for event planning as well, whether it's El Nino hurricanes. This serves as the baseline data to do comparisons if we have impacts.

But also from a Coastal Zone Management or any use, these data can be used for different applications whether you're monitoring use or building or CZM applications. So we're very happy to get this data out there.

And not to leave the fourth coast behind, you notice we are currently in collection with the Great Lakes. We're attempting and trying to collect all the U.S. shores of the Great Lakes with this imagery in addition to 20 ports and some special request survey that we have that address some of the shoaling in the areas.

Again, once the data is collected and processed, it'll be available on that same website. That's the Brown's stadium for you all and to your left there's the Rock n' Roll Hall of Fame there. And this is the viewer for that website for your reference when you take this stuff home.

Topobathy. Collected over 700 square nautical miles of topobathy and LIDAR this year. That was 300 more than our metric again focusing on the finishing up Puerto Rico and the outer reef of the Florida Keys and the Florida Keys itself.

That image down there in the lower right is actually several vessels on top of the water, and you can actually see the returns from the coral underneath them. And then the upper, there's the Dry Tortugas.

Again, not only from a navigation standpoint, this is data important but also to our partners within both the USGS and NOAA and other interests for coral reef and coral reef mapping and habitat mapping.

Also, in addition we're delivering data or have collected data this year at the support survey requirements of Buzzards Bay. The red line there that you can make out is what we call the NALL line, the navigation limit line. That's 4 meters.

That line is where operations in shore that are restricted are not allowed for the safety of the launch, and if we can collect to that with airborne assets that makes the entire operation not only safer but also more efficient.

And as you can see from here in an area that we know has questionable water clarity and dark bottoms -- dark bottoms are bad for LIDARs. They like white, bright sand, but we did fairly well and hope to show that we can provide some increased efficiency and maybe add a few sea

days on to the NOAA assets when they come to these areas.

So this is a concept of operation that we're working with Coast Survey on that we come in, collect LIDAR and then within the next year we deliver it to them where they have hydrographic requirements that meet that shoreline.

Contracted projects for LIDAR this year. Again, a pretty effort there in South Carolina down to Georgia, almost 613 square nautical miles and then in and around Martha's Vineyard, Nantucket for another 225.

Response efforts. So responded to Joaquin. We responded to the U.S. floods of January and most recently this is the efforts we did in Louisiana.

More and more we're seeing the requests, and in fact, we're mission-assigned in both cases of the flooding because typically the weather does not support overhead satellite operations to collect data.

So the importance of this imagery in identifying impacts is becoming more and more important because the ability to fly underneath the clouds and collect the data, which doesn't always produce the best data, but having some data is better than none when the folks are trying to address impacts.

And especially with this event, the Weather Service was very concerned because a lot of their models do not take into effect the backflooding as they called it that came days after. So again, we're able to provide this data to those folks that are impacted there.

In fact, contract -- Dewberry had the contract. I think they threw the assessments on here, and I think it was briefed. It was 60 to 80,000 homes that used this imagery to help address.

Just the damage of Baton Rouge that I grabbed to show you the extent of the flooding. And that's it.

CHAIR HANSON: Thank you, Mike. Admiral Smith, we've introduced you once already, so I think we'll let you just get after it.

RADM SMITH: I'm going to do a time check here. It's sort of on for 20 minutes-ish.

All right.

So I have -- I didn't follow quite the assigned format for the Coast Survey Update. It's sort of a mix of retrospective last year and some of the things we're working on and some of the ideas that we've been tossing around for the direction that we're going. So bear with me as we sort of move from the past to the future here a little bit.

(Off microphone comments)

RADM SMITH: So I think we're at a really interesting time in navigation product history. We're really at sort of a cusp of a new era as we modernize not only the way we collect data but also the way that we turn it into navigation products and get it all the way to the user.

This is a theme that we sort of picked up more broadly through NOAA through the Weather Ready Nation as we're looking really at the decisions that our information is supporting and thinking about it all the way through to the end and outside of the context of our narrow way that we have traditionally done -- made products.

So I'm going to look at the drivers shaping NOAA's navigation products and how our partnerships with the commercial industry and other government agencies will help get us there. And I'll be trying to use some examples from the Great Lakes as we go along here.

I'm going to skip actually to the next slide on this. In the last 25 years or so, we have focused almost exclusively on deep draft traffic going into major ports. We called it the critical area. It was our main sort of performance measure. It defined 43,000 special square nautical miles that we concentrated all of our survey efforts on.

We're nearing the end of that story. The remaining work within that is less compelling than the first work that we did, and the work that we have not done for the last 25 years really have left us with a lot of our coastal charts pretty badly out of date.

And as we heard from the Coast Guard, there's been a new resurgence in small boat traffic and coastal -- small commercial traffic in these coastal areas that we have not been

keeping up with.

So there are over 2000 -- just one little example, there are over 2000 places on our charts where we have had a shoal reported. And that you might think, well, how many are we going to have next year? How many of these are we resolving?

Well, we've only measured our performance in square miles of critical area, not in resolving shoals that are reported. And that's just one example.

There are loads of places where fish nets -- if you look at the Great Lakes charts, it's all full of fish net stakes which have probably been on the chart for years but shoal wrecks PA, position approximate and that sort of thing.

So all of these things add up, not only to chart clutter but to mask the real dangers that are out there. If only 1 percent of the fish stakes are really fish stakes, then people -- we're training all of our users to ignore the hazards that we have on our charts.

This is particularly now a problem with ENCs because these are charted as isolated dangers. The systems are programmed to give you an alarm when you approach an isolated danger, particularly one without a lease depth.

Well, we have thousands and thousands of these, and what we're hearing from all of our ENC users is that there are way too many alarms. Heard from a pilot, oh, I don't even know what those pink things are. I just ignore them.

Well, they're isolated dangers, right? And some of them are real. So we really -- I'm really -- this is one of the things that keeps me up at night is that we have an imbalance in our approach to what we're surveying.

All right, next slide. So we've been -- we don't have a big program on how to solve this yet, but we've been trying to sort of work with some experimental ways of trying to do this.

We could justify a square nautical mile, a fairly extensive survey for large ships with tight under keel clearances going in with gajillion dollars per inch of extra draft and that sort of justification.

We can't really justify the same level

of care or expense for a lot of these smaller waterways and sort of less economically impactful users. So I sort of say we can't solve a $10,000 problem with $1 million solution, right.

We have to scale the solution to the problem, so we're looking at ways of using partnerships, remote sensing for satellite-derived bathymetry and other things to try to solve these problems in a more efficient way.

For instance, in the Yukon River in the middle slide there, this chart was last updated in the late 1800s, right. So this was a while ago, and we've actually been able to -- with Landsat imagery, we've been able to see if you sort of play back the Landsat imagery in an animation you can see these shoals moving around.

And so there's a certain sort of pattern to it. And so we sort of took it to the next level and said well we can't send a ship there. There's not that much traffic on the Yukon River.

We can't survey it every year. It's not justifiable, but we could use the satellite-derived bathymetry for instance to do an approximate shoreline. So on an annual basis we can update this at very low cost from cubicles in Silver Spring, and it gives them a starting place for the barge traffic that's heading up the river each year.

At the same time, the charts have been linked inextricably to the paper, and there's only so much detail you can show on paper. So until two years ago, we would not put anything on the ENC that could not go on the paper because it would make them out of sync with each other.

We got over that about two years ago and allow ourselves now to put more detail in the ENC and in fact have turned our production line around so that we are updating the ENC first with the new source data and whatever can go on the raster could go on the raster. But the ENC we're allowing to have more information and more detail.

As we've started to do this, we're starting to recognize just enormous demand for larger scale, more detail, right. That's the way the customers talk about it. We want more detail. Cartographers talk about scale.

Customers talk about detail.

So just one little example on the right there, the production facility off Long Island, we did a small area of larger scale coverage just on that production facility. And I think we did not actually worry too much about what was going to go on the paper chart for that one.

So I mentioned -- well, first of all, I just got to point out this picture. I did mention -- so what you're seeing here is -- that was off my old ship. That's a small, unmanned survey vessel that sort of launched from the launch.

So Mike mentioned how we could not get into really shallow water with those 30-foot launches and their millions of dollars of equipment, fragile equipment, bolted on the bottom.

And so we started using these little -- they're called Z-Boats, which can get into the shallow water. They're just single beam boats at this point because they pick up where the multibeam is no longer practicable, so there's really not much point in doing multibeam in the really shallow water.

They've also got sidescan on them, so we can get in there and get those wreck PAs and that sort of thing in the shallow water. It's the first year we've really gone operational with them, and we're really excited about the prospects of it.

I think our colleagues at UNH will probably talk about some larger versions that we hope will really allow us to reduce cost and extend our reach with bigger systems going forward.

iPad timed out. So on the left there is some satellite-derived bathymetry. I think we may now have some LIDAR in that same area, and this is off of -- between Martha's Vineyard and Nantucket.

But if you look carefully, you can see that the shoal has moved significantly with respect to the chart. And so we were able to estimate the depth from satellite-derived bathymetry and then groundtruth it with some single beam and multibeam from the ship.

And that allows us to sort of calibrate the satellite-derived bathymetry to make it more broadly applicable as well as understand the sort of failure modes and limitations of that approach.

Both -- as I mentioned, both we and our contractors are using unmanned surface vessels -- vehicles, increasingly getting close to the margin where they make efficiency sense.

We've been focusing more than they can do things that we can't do with manned boats. I think we're starting to see the point where they will start to be a real force multiplier for us in some areas.

In particular, we're looking in Alaska where we don't have to worry so much about collision avoidance and traffic because it's -- there's fewer boats around.

On the right there, crowdsourced bathymetry. This is another really big effort. There have been a number of sort of clubs of crowdsourcing from Olex and Navionics over the years. Those are -- they are sort of not as accessible to us as a chart provider, although we do have some agreements with them.

Worldwide there's a big demand for crowdsourced bathymetry particularly in places where hydrographic services are really limited in the Third World.

And so the IHO -- NOAA partnered with the IHO to stand up a publically accessible in and out crowdsourced bathymetry database for trackline bathymetry. And it's hosted at NOAA at NGDC -- what used to be NGDC in Boulder, and we're just starting it up in the past year.

We've got some early adopters. This is a system that doesn't necessarily require you to install a particular piece of hardware on your boat, a new piece of hardware because a lot of chart navigation systems can already log the depth data and GPS data as they go.

So there's no need to do something new. You just need that network connection. We have a great partnership with a company called RosePoint out of Washington state. They dominate the navigation systems on the western rivers and on all tow boats.

This is just a little screenshot of

after just a few weeks of having the system stood up, we already have quite a few tracklines in there.

At this point, we've not yet assessed how useful the data is that's in there, but it gives us some hope that we'll be able to use it at least for change detection and in some cases to update the chart with approximate contours and that sort of thing.

Here's one example. This is the -- we used a multibeam system that's already installed on one of the Great Lakes Environmental Laboratory boats and the National Marine Sanctuary to -- along with some hydrographers from Coast Survey to do a little survey during the summer season in Lake Huron.

And we expect that this is a model we can continue to sort of expand on as more vessels have -- I guess there may be more vessels that have multibeam vessels installed on them than have experts to run them.

And so the corps of experts that we have may be able to find boats that -- to run on that are already geographically dispersed. Not a very great slide, but we are updating the shoreline up here, too, lots of it, thousands and thousands of miles.

So the ECDIS is just one place, right. We've been talking about ECDIS for 20 years or so, and it's now rolled out. It's just basically about as good as we planned it to be 20 years ago in my opinion, and while everything else has much more nimble and short development cycles.

And a lot of these are American companies which have some of the best navigation software, mobile apps, chart plotters. Susan can probably give some figures on this. The U.S. really dominates the small navigation systems market.

Some of that is because our charts are free, and they're increasingly starting to take advantage of not only our -- the after-market charts from some of our downstream redistributors, but increasingly, the charts themselves directly from NOAA.

And the Chart Tile Service, which Dave mentioned earlier is essentially a bridge -- is essentially a new type of chart format that is

geared toward modern web services and mobile devices. And even the chart plotters are all using the same type of data.

I use this slide just to sort of -- again to motivate thinking about all of those other users. As we go down from the tens of thousands of SOLAS class ships worldwide to hundreds of thousands of light commercial and millions of recreational boats throughout the U.S.

And we heard a plea from the Coast Guard to get the small boats into the shallow water and out of the way, and this is one of the ways that we're hoping to support that.

We talked about the tile service. It's just a graph that's starting to take off. It's really just less than a year it's been out, and we're seeing millions and millions of hits and an exponential growth curve on it.

So the ENCs. So ENCs were built from the paper, right. They were digitized faithfully one-by-one from the paper and were originally thought of as standalone, individual chart products, sort of like the paper.

And they all look great if you look at them by themselves, but nobody looks at them by themselves because they're meant to be seamless. They're meant to be used as one. I don't even like to talk about ENCs as a -- in the plural. There's really one with different scales and should be seamless.

Well, if you -- this is one example nearby here, but it doesn't take long to find examples of massive discontinuities in the ENC suite. And so we're hearing about too many alarms, insufficient attribution, all these isolated hazards, inconsistent depth areas, which gives you the blockiness in the color shading.

If you look across Lake Erie, which I was just looking at a minute ago, these recommended routes will like come and go as you go along the lake at different scales. So we recognize this, and as we have now shifted our emphasis really toward the ENCs, we are -- we haven't quite named it, but the internal working name is sort of an ENC 2.0, which is designed from scratch to be used as an ENC and not just a faithful copying of the paper.

That's a pretty big effort because it means going back to source for a lot of these different -- to reattribute depth areas and to make these things consistent, but we're -- it's a crucial part of our long-term planning, medium-term planning I should say, for how to improve our chart products for the next generation.

We're making progress on Great Lakes ENCs now. I just undermined myself on this, but this is again the faithful digitization of the paper charts, which is necessary for all the rest of it. But I recognize it's also insufficient.

The recommended courses that go across the Great Lakes have been on there forever. They're not official IMO approved anything, but they are -- they do form an important base of understanding of how the traffic flows on the lakes.

And we don't have any intention of changing them or taking them off, but we do need to straighten them out because they don't line up and they're discontinuous and that sort of thing. So we're working with the Coast Guard and the Lake Carriers Association to sort of turn them into a consistent set.

Tom Loeper is our part-time nav manager here in the Great Lakes. We have not had a full-time nav manager since Brian Link retired about four years ago, and it's on our list of things that we would like to do.

But we -- again, you've heard about some budget uncertainty. That's the sort of thing that costs money, and we can't -- at this point we can't commit to things, that or many other things that we would like to do with the budget uncertainty that we have going forward.

But we -- this -- our navigation manager group, which Rachel Medley leads -- Rachel is here -- is a really strong part of our customer outreach program. We hear a whole lot from being on the ground with our nav managers.

Mr. Chairman, I think I've overstayed my time, but all right.

CHAIR HANSON: Thank you very much, Admiral Smith, and I'm sure we're all developing a long list of questions. So Dr. Mayer and Mr. Armstrong.

Our last speakers of the morning are

Dr. Larry Mayer and Andy Armstrong, co-directors of the Joint Hydrographic Center located on the beautiful campus of the University of New Hampshire. Those extensive bios are available, so please review them.

DR. MAYER: Forty pages.

CHAIR HANSON: Gentlemen, please proceed.

MR. ARMSTRONG: Thanks, Mr. Chairman. Larry's going to give the bulk of the presentation, but I just want to thank you and Admiral Smith for getting us on the program here.

And our intention today is to give you an overview of the center and then in future meetings, we'll try to present maybe in more detail some of the individual topics that we're engaged in. So Larry's going to take over from here and give you our presentation.

DR. MAYER: Yes, thank you. And again, I join Andy in thanking you all for this opportunity. I guess Andy and I have been around at these meetings for some time, but I guess somebody said maybe we should talk about where we're from and what we do.

And so I'm going to talk about two entities, the Center for Coastal and Ocean Mapping and the Joint Hydrographic Center. They're actually the same set of people for the most part, and hopefully by the end of this you'll have some idea of what those differences are.

We began in 2000 about. Andy was actually there a little earlier than that, but we began, and I'll have to say this publicly, as an earmark from Senator Gregg at the time. But I think we looked at this as an opportunity.

I always said the attitude is to take the pork and try to make it into prosciutto, and if it indeed works, then something good happens and you can maintain. And if not, it should be thrown out.

And I think in our case things did work out. Within a few years, we became a line item in the President's budget. We started with a building that was built special for us about 8,000 square feet, that little white addition there you can see, to an existing ocean engineering facility.

By October 2008, we had grown to the point that we actually needed to add another 10,000 square foot addition, and as I'll mention in a minute, we're growing again and building yet another addition.

In 2009, we became about as far away as you can from an earmark with the authorization of a joint hydrographic center, not our Joint Hydrographic Center, but the authorization of the existence of a joint hydrographic center.

And with that, there was competition for the center as there should be, and in 2010, we competed for -- to become the home of the Joint Hydrographic Center and we won that award and were granted a five-year -- five years of funding.

In 2013, there was a small reorganization of things at the university. A School of Marine Science and Ocean Engineering was formed, and our entity became part of that.

And in May 2015, there was a second call for five-year competition. A federal funding opportunity came out for a joint hydrographic center from 2016 to 2020. We competed for that and were awarded that in November. And so we're just starting that second iteration of these competitive grant processes.

And as I mentioned, we're building a new addition. It's kind of what you see the cars down there and the green grass. That'll add about nine new offices to -- for us. It'll add a lot of space for a new program, an undergraduate program in ocean engineering, a bachelor's in ocean engineering, which we're thrilled about.

But probably most importantly to you folks if you do come and meet with us, it'll add a large, 85-seat amphitheater type seminar room that we can fit you all very nicely.

And as our colleagues from OCS know, sometimes it gets a little crowded when the big crowds come. Since day one we've had several specific goals in terms of mission. Obviously, the statement, we want to be a world leader in the development.

You'll see just a little bit of schizophrenia at the time, and I think this is departed in hydrographic and ocean mapping technologies. And that's always been our idea

that the work we do in support of safe navigation has many, many other applications.

And we've always been a big proponent of that, and I think we've seen a broad acceptance of that. And I think the Integrated Ocean and Coastal Mapping initiative is one example of that.

The second one, again, to expand the scope of ocean mapping clients and constituencies due to the development of innovative applications and collaborative work with the private sector and government labs.

And that, in part, will explain the two hats that we wear. With respect to the interaction with the private sector, something we believe in very strongly, we have a number of industrial partners.

I count 46. They get fewer each year because if you see the long list of Teledyne there, these were all individual partners and now they're all being incorporated under one hat. So we keep listing them as individual, but soon it'll just say Teledyne there, but hopefully the others will maintain and continue.

And these are companies that we don't ask for a cash contribution but basically some sort of contribution in kind, and in return for that, they get access to the products, the tools we develop, which are typically software products, sometimes hardware, but for the most part software products.

And they get that for no cost basically except a small licensing fee they have to pay, but no royalties. And it's on a non-exclusive basis, and that's worked out very, very nicely over the years.

We've seen a number of the tools we've developed now become commercial products through a number of our partners. We also have an educational goal. I think it was Nancy Foster who said at the time, make baby hydrographers, when the center was created. And so we've tried to do that very hard, working at it.

We have both an M.Sc. and a Ph.D. program in a number of tracks, bringing students in, our engineering students, who were earth science students, computer science students, and we even have some of our first biological or

zoological -- zoology majors who come in and get a specialization then in ocean mapping.

We also have a graduate certificate program that was started in response to Nippon Foundation GEBCO program that I'll talk about in a minute. And we offer some non-degree programs, short courses and seminars, and we've had real fun hosting summer research fellows who are typically rising juniors and seniors at the undergraduate level and a few Hollings Scholars. And that's worked out very, very nicely.

Just to give you an idea of the number of graduates we've had, 138. And look at number one. You see number one? And I mentioned this at the change of command ceremony that there's nothing that makes you feel older than having one of your students become an admiral, actually except having one of your students who became an admiral retire.

And both of those happened to me last week, so I felt very, very good. But I think Rachel, you're on there too somewhere, and I don't know if you can see the color coding, but the color coding -- you can't make out the difference between the blue and white.

There are 15 of these students who came from NOAA. The ones we're even more proud of are the green ones who are students who were not from NOAA but after graduating have started to work for NOAA.

And I think if we track the rest of them, they're scattered amongst the industry. I don't think we've had a student who really has come out without being quickly scuffed up by somebody or another, so we're very proud of that, too.

We are a CAT A certified program, an IHO Category A certified program. That's thanks to lots of hard work on Andy's part when we first got there and then our renewal again ten years later and that we're up for renewal again next year.

So the effort starts again. It's very, very comprehensive process to get that certification. And as I mentioned, there is a new Bachelor's of Ocean Engineering program at the university which will become a greater feeder for us and for all of us. And I think we're very

excited about that and supporting that very, very strongly.

I mentioned this certificate program that was started in response to again a competition put out by GEBCO, the people who make the deep bathymetric maps, the general bathymetric charts of the ocean, to train bathymetrists as opposed to hydrographers. And we won that competition about -- well, 12 years ago.

And since that time, the Nippon Foundation has funded six students from somewhere around the world to come to UNH. You can see the coverage in terms of countries where they've come from, all those orange places.

And it adds a wonderful dynamic and builds beautiful networks of hydrographers and ocean mappers around the world for us and our students and our NOAA partners.

Just to highlight an event this year that the Nippon Foundation sponsored in Monaco, it was a reunion of I think 47 of our alumni came back to a program that was called a Forum on the Future of Ocean Mapping.

It was a very exciting program. Admiral Smith was there, and it really outlined a hope to see the deep ocean completely mapped by 2030. The Prince of Monaco, he's supportive of that. But probably more importantly, the director of the Nippon Foundation, Mr. Sasakawa, who can see there who could actually afford to pay for this if he wanted to. This is the richest foundation in the world.

Okay, but leading to these two complementary centers we have the Joint Hydrographic Center, which is really the result of the MOU between NOAA and the university.

And this is where the official interaction between NOAA and the university takes place, with our primary sponsor within that being the Office of Coast Survey, our primary customer I like to say.

But we also have support from OAR, another line in NOAA, particularly through their Ocean Exploration Program. We continue to work with NGS, all the NOAA labs, NCEI, IOOS, CO-OPS and so on, but we try to serve all of NOAA but with the recognition that it really is OCS that's

our primary customer.

The other name that you keep hearing referred to, the Center for Coastal and Ocean Mapping, is that body that is independent of NOAA in the sense that this is strictly a university entity.

And being at arm's length from NOAA there, we're free to then enter into contracts and grants with many, many organizations as many standard academic groups are.

And so you can see over the years a list of other people who have funded the organization and this year. To give you an idea, we have about $3.6 million of funding from non-NOAA sources.

So we try to maintain that balance between NOAA and non-NOAA sources, but hopefully always leveraging what we do from the non-NOAA sources for NOAA applications.

In terms of who we are, we have a large -- I'm not going to go through all the people, teaching and research faculty. Again the color coding, I'm not sure you can see the differences, but the ones in blue were NOAA people seconded there.

The light -- some of the light ones are basically adjunct folks, and if we look at a group of NOAA people that are seconded there, they really come from the IOCM office, OER and folks that have been picked up for the Superstorm Sandy Project.

We had a separate, two-year grant with respect to Superstorm Sandy, and the ones in italics -- at least you can see that -- are NOAA folks who are also in Ph.D. programs and one in an M.S. program so they can take advantage of their time there to also increase their education -- and CO-OPS, yes.

We also have a visiting scholar program. This is open to government employees, too, if you want where people come for between three months and a year and just spend time with us. And we pump them for all we can in terms of stuff that we need to know and hopefully we pass on a little stuff to them, too.

Just again, to give you the idea of numbers, we have about 22, 23 students at this time. And again, the ones that are lightly

colored here are NOAA students and our GEBCO scholars.

You can get an idea of the countries. This actually all changed last week as the new set of GEBCO students came in, but I don't have their names yet until we get back.

We have a range of wonderful facilities, as Bill mentioned. It is a pretty place, but we also have lovely facilities, particularly a lot of effort on visualization and in this case, telepresence, something we strongly believe in and a way to operate cruises remotely.

And hopefully at lunchtime -- so we'll actually, if Lindsay calls in who's on the ship that these guys are looking at now, the Nautilus. She's out there now with telepresence capability. We can show you what that looks like.

And again, focus a lot on visualization, advanced visualization techniques. We have a visualization lab looking at many, many aspects of it in terms of the kind of things that Admiral Smith was talking about but what that might look like in four or five years down the line and the tools we might be taking a look at.

And just as importantly, a series of really wonderful tank facilities that let us really get to the guts of what's going on with many of the sonar systems and LIDAR systems.

We've been doing a lot of LIDAR simulator work and trying to understand really what the limits and the constraints of these systems are with a series of very deep tanks, mostly for the acoustic testing and wave tanks that we can create different sea surface conditions and look at the behavior of LIDAR throughout those types of things.

We have a couple of vessels or have had a couple of vessels. We still do have a couple of vessels. The original one, again, a donation by one of our industrial partners.

That hull though was 50 years old. You see this wonderful boom on the front for mounting any kind of sonar, and that we have just decommissioned this year. It was really coming to the end of its life.

We have a vessel that is on loan from NOAA. This original vessel had no fantail and no ability to tow vehicles or tow anything or take

cores, no A-frame. So we had a second vessel on loan from NOAA that we were able to put an A-frame on so we can do those kinds of operations.

But we just this year, actually just a month or two ago, took the liberty of a brand new build vessel, a 48-foot vessel that eventually can take all of those tasks over in terms of both the coring and towing operations.

And it has, you can see towards the aft of the house there, a very, very large boom also that can retract, and again, the platform for mounting almost any kind of sonar we want. So we're very, very pleased with that and very appreciative of the funding that allowed us to do that.

We've also, in collaboration with Higgs Hydrographic, another one of our industrial sponsors, had been looking at approaches. We started off for many years with a jet ski and now a multibeam on a very, very small platform, a very maneuverable platform. We'll be looking at that.

So as Andy said, I just wanted to give you an overview of the structure and kind of who we were. We're not going to go into much detail about the actual research efforts, and hopefully we'll have lots of fun over the next sets of meetings. We'll dive into -- we'll kind of poll people and see what you want to hear about.

What's guided our research themes for the last ten years has been these seven themes, one focusing on sensors, sonar systems, LIDAR systems, data processing which has really always been a strong area of interest for us, sea floor habitat characterization and of late, water column mapping, always a visualization theme that runs through everything we do.

An effort that has been going on for ten years and I alluded to in terms of what the chart of the future might look like, we've had since 2002, I guess, strong effort in terms of actually collecting data in support of U.S. potential submission under the Law of the Sea Treaty and then finally IOCM efforts.

So these have been the themes. They are outlined in the federal funding opportunities for the earlier proposals. As we've evolved now into the latest proposal, there are a different

set of guidelines or programmatic priorities that were called for in the FFO for the new grant.

They're under four categories, innovate hydrography. And for those of you who follow the NOAA mission and the OCS mission, you'll see there's a linkage there. Transform charting and change navigation, explore and map the continental shelf. That's the ECS activities. Develop and advance hydrographic and nautical charting expertise.

Under each of those four programmatic priorities, three or four -- you can see four, three, three, four or a total of 14 research requirements were prescribed in the Federal Funding Opportunity.

We then responded with a proposal, and we actually took a little different approach than in the past. In the past, our sponsors have been broader and vaguer, but this time you're not going to be able to read this next slide.

But to give you an idea of what we did is actually from the programmatic priorities, you see the four of those on the left side, the 16 or 14 research requirements in the next column.

From those, we broke them down into themes, subthemes and finally to individual -- 60 individual projects, which each have an internal PI. And this is going to, I think, help us much better assure that we're on track.

And as we interact with sponsors and our customer, get much, much better feedback as we go along and just to pick one of them here. And I can hardly even read this from here, but if we look at the data processing one, we'll see that we have a subset of that, that is about algorithms and processing, something we've been doing for a long time, and a project that is specifically on data quality and survey validation tools, the next generation of tools to give us real time feedback for data quality and so on.

And so I just wanted to take the last couple of minutes and touch on a couple of things that we are doing under this new grant now, and again, we'll be able to go into much more detail.

And this is something that Admiral Smith mentioned. We have in the data collection on the innovate hydrography a data collection

theme, innovative platforms.

We have maintained for many years a look at autonomous underwater vehicles, and I think we concluded long ago that from a shallow water hydrographic perspective these may not be the most efficient way to help our mission.

But we are very excited about the possibility of autonomous surface vessels, and so we've been looking at this in a number of different ways, both from a theoretical perspective, building control software and things like that, feedback mechanisms.

But we've also, through our industrial partners, through some part of Teledyne, have the Z-Boat that Admiral Smith mentioned from NOAA from some early work they did.

These are just very small little platforms to what they call the Emily Boats, but the big effort we've focused on is something that's a quite a big larger. That vessel you see there is 4 meters in length, so it's a small, launch size vessel, totally autonomous.

And we're taking delivery of this on Thursday. It's coming over from the U.K. on Thursday, and I think we'll be looking at just how far we can push this in terms of hydrographic and other applications, too, and hopefully coordinate this with the efforts of NOAA and be able -- once we get it to a point we think things are ready actually try to get it on an operational platform and see how things go.

So that's just one example. Another example under the transform charting and navigation, the chart adequacy and computer-assisted cartography theme, we are looking at issues of resurvey priorities.

We're combining theoretical models using AIS information, best guess of about the stability of the sea floor, putting that all into a model and basically looking at real time and predictive decision aids for surveys and how it can be applied to resurvey priorities.

I should say within the cartography aspect, I always take advantage of any large group. It's an area that we've recognized from a real cartography, traditional cartography perspective, that we do not have the expertise in the lab.

And so part of the process for this new effort is an advertisement for a new faculty position, which is out now on the streets. It has a closing date of tomorrow, but we'll keep it open as long as necessary to try to bring in somebody with really digital cartographic experience that can coordinate with our visualization people and our computer people. So if anybody knows anybody like that, please let us know.

And finally, the last topic I want to touch on, which is something that is of grave concern to us and something that the FFO asked us to look into, both for us and for NOAA.

And this is the growing concern over the potential impact of sonar systems in general, but particularly the multibeam sonar systems that we use on marine mammals.

And we are very, very concerned that much of what we're being told in terms of regulation is based on anecdotes or lack of science. And so what we're trying to do here is to actually try to put the science behind it in terms of both a very sophisticated modeling effort to really understand what the radiation patterns of the multibeam sonars are and their source levels are in the water column.

But at the same time, a new hire, again under the new grant, a woman, Jennifer Miksis-Olds from Penn State who's a really top notch marine mammal bioacoustician.

And so she has both the acoustics background and the marine mammal background, and so we're going beyond just the modeling of the radiation patterns but looking at what the impact of that might be on a range of marine mammal species. And so that's part of this ongoing new effort.

And finally, last slide I think, I want to point that we do maintain a large outreach effort. This is part of it. I'm doing my outreach now, but we have a number of programs that bring schoolchildren in.

I think last year we had 900 schoolchildren through the course of the year from local schools. We have Ocean Discovery Day. It's a weekend where we get actually several thousand people in through the lab and hopefully

2018 -- is that the time -- you'll all be able to join us there and see what we're doing.

So I thank you. I think that's it. And I do have -- if there's -- it could just play silently in the background while questions are being asked, a short little video of a survey of the Cuyahoga River done by a local New Hampshire industrial partner, so just let that play. It might interesting for you to see.

CHAIR HANSON: Thank you, Dr. Mayer. While we're watching that, we'll go ahead and have a few questions. We're going to get short on time here, but we had some great discussions. And I'd like to see if we have some questions for the panel.

MEMBER SAADE: I have a couple.

CHAIR HANSON: I thought you might. Go ahead, Ed.

MEMBER SAADE: I'll be quick. Rich, on that Inundation Dashboard, is that active already? Is that functioning?

MR. EDWING: As a prototype yes, on the website.

(Off microphone comments)

MEMBER SAADE: But anybody can go in and kind of give it a test drive?

MR. EDWING: So it's active. We have it up on an internal website. I can see if I can get that URL for you if you want to go in and play around with it. Yes.

MEMBER SAADE: Okay. Then Mike, on that geodesy summer school, Everything You Wanted to Know about Airborne Gravimetry, is that textbook-ready? Is that accessible?

MR. ASLASKEN: No. It was such a success afterwards I think people really realized they needed to document that, so I think there's been assignments made.

And I don't know the date of delivery, but I can provide that to you. But yes, so they're going to put something together. I just don't know what the timeframe is right now.

MEMBER SAADE: Okay. And then Larry, on the mammals, so how soon can we access information and findings and use it in our defense?

DR. MAYER: That's a good question. We're actually going through our own NEPA process

right now. And so we have gone through this first iteration in support of the NEPA process.

We've turned this over to NOAA at this point. And NOAA then carries on the process. But I would assume that once that process is finished, we would certainly be happy to make at least what we found public. Certainly everything we do we try to make public as quick as possible.

MR. ARMSTRONG: That's right. So there's two pieces going on. One is the -- we're working through the regulatory process so that the researchers at the center can proceed with echosounding in the course of their research.

After we get through that, then we're going to be spending a little more time on the research goal, which is the more generalized modeling and understanding. And so in the regulatory process, we're in that process and not really able to share outside of the government deliberative process, but as soon as we get through that, I think we'll be, as with all our work, we'll be able to and want to share what we've got with the whole community.

So I guess it's probably six months to a year before we're able to start getting outside of sort of our internal regulatory issues.

MEMBER SAADE: Okay. Well, then from the industrial partner point of view I would just state that if you need to have access to vessels in different parts of the world, in different locations that may be a platform for you to do some testing on, I think you should talk to some of your industrial partners and ask if you can ride along.

DR. MAYER: That's a great offer and one we'll probably take you up on --

MEMBER SAADE: Okay.

DR. MAYER: -- because certainly that will ultimately be the final test. We're producing a lot of models, what we think the radiation patterns look like, but we need to actually then sit in an area on a vessel and make a measurement to see if we're close.

MEMBER SAADE: Thanks.

CHAIR HANSON: Lawson?

MEMBER BRIGHAM: Lawson Brigham. It's just to make maybe in our letter that we note the role of public/private partnerships and

federal/state partnerships and even interagency cooperation and all of what you said.

They were good examples. And particularly what Rich and Mike were saying, so I think it might be a topic to speak to and to note progress and to push forward.

CHAIR HANSON: Agree and also challenge maybe interacademic as well, other academic -- who else is doing what you're doing, and how can we leverage that for more attention.

I'm going to have to unfortunately cut it off. Fortunately, all five of these guys are going to be around for a couple days, so we still got them. And so we can catch up with you with the long list of questions I know we have.

Lunch, we're going to break for lunch. HSRP and NOS staff have a working lunch. For everyone else, it's on your own. We're going to reconvene at 1:00 p.m. promptly.

And we're going to hear from our navigation stakeholders, and I think that'll be a very interesting panel. I encourage everyone to be back here by 1:00.

Lynne, I think she might have gotten a little advertising out of this, but Heinen's Supermarket on the corner has gourmet sandwiches, 9th and Euclid, so just down the corner here. So we'll go ahead and adjourn and see you at 1 o'clock.

(Whereupon, the above-entitled matter went off the record at 11:51 a.m. and resumed at 1:01 p.m.)

CHAIR HANSON: All right. Thank you. We have one navigation stakeholders panel this afternoon, and I can see some very esteemed colleagues so appreciate you all being here and sharing your thoughts on what's going on in the lakes.

Moderating the panel is a guy we've met a couple times already, Glen Nekvasil, Vice President of Lake Carriers Association, a membership trade association representing U.S. flag vessel operators on the Great Lakes.

Mr. Nekvasil also has served -- also serves as secretary of the Great Lakes Maritime Task Force, a labor management coalition to promote Great Lakes shipping. Sir, I'll turn the floor over to you and let you introduce your

panelists.

MR. NEKVASIL: Thank you very much. Okay. I have a few slides here before I introduce my panelists. The reason why we talk about navigation challenges on the Great Lakes is because there's a lot of navigation.

We move a lot of cargo here on the Great Lakes, and I'd just like to take a couple of minutes to talk about those cargos and the importance of those cargos.

Actually though, one thing, I do want to apologize for my attire today, but I was told this was business casual. And frankly, after 40 years of white shirts and pinstripe suits, when somebody tells me I can skip it, I skip it, all right. Okay. I was not being disrespectful today, ladies and gentlemen.

But again, Great Lakes, there is an awful lot of cargo moving here on the Great Lakes. If you take a look at the last couple years, it's been between 135 million and 142 million tons of dry bulk cargos.

And on top of that total I should add the Seaway in addition to the grain that's in this table. They move five, 6 million tons of general cargo a year. And when the economy is really hitting on all cylinders, those totals will be much higher.

But just to take a look at the major trades here, the iron ore trade in recent years has been about 59 million tons. And there's really only one thing you can do with iron ore, and that's make steel.

There's only one other little application. They use some of the taconite dust basically, and they mix it in with cement as a strengthener.

The next big cargo on the lakes is coal. It's been about 25 million tons here in recent years. It wasn't all that long ago that the coal trade was about 35 million tons, but Ontario has phased out the use of coal for power generation.

That knocked seven, 8 million tons of coal off the lakes. And also, too, with the cheap price of natural gas and some of the new regulations coming in, we're seeing some of the older coal-fired power plants being retired. So

that has had a major impact.

So frankly, the coal trade is in a period of reinventing itself. It's not going to go away. We're always going to move coal on the lakes, but again, the numbers have been somewhat reduced here.

Limestone rounds out what we call the big three cargos, and about 65 percent of the limestone that moves on the lakes is aggregate for the construction industry, the base for highways and all the various building projects.

And we also move what's called flux stone, and that's a type of limestone that's used as a purifying agent in the steel mills. They charge it into the blast furnace, or in some instances, we hall the limestone up north.

Then they rail it up to the iron ore mines, and they mix it in while they're making the pellets. And then we get to bring it back down. That's actually getting to carry the same cargo twice, which is something ship guys like very much.

And then the other dry bulk cargo here on the lake is grain. It's one of the big ones. It's 10 to 12 million tons a year, at least recently. But George was telling me that this has been a very, very good year for grain, and they're expecting a big harvest in the fall. So that total should be higher, I think.

Another major cargo is salt. It will be about 10 million tons. It's -- basically, it's determined by the severity of the preceding winter. But again, if Mother Nature is tough on us, it'll be ten, 11 million tons.

We move about 5 million tons of cement, and then there's some other cargos, such as gypsum and pot ash. There are some liquid products, and we move some sand. Now, my members and the US-flag vessels -- and these are the Lake Carriers Association folks, we will move about 90 million tons a year in this market.

And if things got revved up again, that would go over 100 million tons. And again, as you can see, iron ore is our number one cargo. Limestone has now taken over from coal, and it's about 23 million tons.

That number -- the construction market in the Great Lakes Basin has never really shaken

off the recession yet. So if we ever get rebuilding all these bridges and highways and stuff, that limestone total will go up significantly.

I mean we have limestone here on the Great Lakes, The quarry at Rogers City is reportedly the largest in the world, and I'm told they have reserves to go for about another 400 years. So we're going to be moving limestone on the Great Lakes as long as the United States is an industrial power.

So again, that's the kind of cargo volumes that we have here on the lakes, and that's why NOAA is charged with providing so many of these services and why those services are so important.

So that's going to be it from me for now. I'd like to move on to the panelists. You all have biographies of the panelists in your packet, so I'm not going to add too much to that.

But our first speaker, Betty Sutton, who is administrator of the Saint Lawrence Seaway -- I do want to add one thing, is in my bio there you saw that I am secretary of the Great Lakes Maritime Task Force. In 2010, we presented her an award as Great Lakes Legislator of the Year, and it was our pleasure. So Betty?

MS. SUTTON: Thank you, and I was very honored to receive that award. Thank you very much, Glen, and thank you all for inviting me to join you here today.

So this is a little bit of a different presentation than the ones that I'm used to, so you'll have to be kind and gentle with me as I go through some of the more technical aspects and some of the innovation that we're doing on the Seaway.

I also have with me Marvourneen Dolor, who works with us. And should you have any questions at the end that she might be able to address, she's a little bit more of a technical expert than I.

With that said, though, I can tell you all about the Saint Lawrence Seaway. Over 2300 miles, as you can see, if you go down the system. You cross the international border 27 times, which makes it an imperative that we work closely with our Canadian counterparts because certainly

if people are going through the system, they don't want to feel like they're crossing the border 27 times.

So we work very carefully to make sure that we share not only operations with the Canadian Management Corporation. They are a little bit different than us. On the Canadian side, the Transport Canada has a contract with the Saint Lawrence Seaway Management Corporation, who manages their 13 locks on the system.

As for the U.S. side, of course the Saint Lawrence Seaway Development Corporation is a government-owned corporation that is housed within USDOT. We are a little bit different than most of the operating modes in USDOT.

We not only operate a transportation system, the locks, and maintain the infrastructure in the Seaway, but we also have a trade development mission and an economic activity mission.

The point of the Seaway in many ways, from where we sit, is economic activity in the Great Lakes Region, and as you can see, we are definitely in the thick of it on the economic impact side of things. Next slide will show us that.

We are an environmentally sensitive transportation route. I don't need to tell all of you in this room. You know that. Home to the world's largest source of freshwater, one-fifth of the world's freshwater.

Home to almost a quarter of the continent's population. Home to one-half of the Fortune 500 industrial companies. It's an amazing market in which we find ourselves.

If we were an economy as a region with the eight Great Lake states and the two Canadian provinces, we would represent the third largest economy in the world behind only the U.S. and China.

Now I like to say that when I started this job we were the fourth largest economy in the world, and now we're third. But I think it's just a coincidence, or maybe we're adding it up differently. But at any rate, we're the third largest economy in the world.

An economic impact study that was done not too long ago documented that the benefits of

the maritime activity in the Great Lakes Seaway System annually sustains 227,000 jobs, $33.6 billion in business revenue, $14.1 billion in wages and $4.6 billion in taxes. So it is a big deal.

We also see ourselves as an environmental gatekeeper, certainly on the Atlantic side. When the Seaway was built, it was a technological marvel of its day. In fact, in the year 2000, the American Public Works Association dedicated it as one of the top ten public works projects for the 20th century.

It does consist of the 15 locks, 13 Canadian locks, two U.S. locks. They are 57 years old. We are going through a major recapitalization on both sides of the border and all of the locks at this time.

Close to a billion dollars for both the U.S. and Canada is being spent on this major, not only rehabilitation, but modernization of the system, and I can talk a little bit more about that.

It was modeled on the Panama Canal. It's clearly nothing fancy, but it is extremely reliable, which is part of our mission to provide a safe, efficient, reliable waterway. And reliable it is, available 99.7 percent of the time.

At the Seaway, we have a tradition of innovation, and part of that is due to the necessity of things with the environment in which we work, certainly that fragile environmental component of our work along with some of the other challenges we face with weather and things like that.

Working with basic infrastructure, we have that strong culture of innovation. The future in our minds lies less in what we are going to build that is different in the Seaway than in making the most of the infrastructure that we have.

With the single lock system connecting the lakes to the Atlantic, safety of navigation and a state of good repair is of critical importance to us.

Since 1998, we've seen a series of investments bi-nationally, as I mentioned, and we're continuously working on R&D. Seaway users

were among the first to adopt the new technologies in vessel traffic management.

The Seaway Corporations, both on the U.S. and the Canadian side, supported the testing and the use of technology in the Seaway. The Canadian laker fleet actually led the development and the implementation of the Electronic Chart Display and Information System in the early 1990s.

The ECDIS depicts vital information, as you all know, for mariners within the display links to traffic management system, resources, provide information, such as wind data, wind levels and vessel order of turn for a given lock.

The automated -- Automatic Identification System, or AIS, was also developed in the 1990s. It was adopted in 2002 and implemented in 2003. AIS is a shipboard broadcasting transponder system operating in the VHF maritime band.

I know you all know this, so forgive me, that sends vital information such as ship identification, position, speed, heading from ship to shore, shore to shore and ship to ship.

We are committed to ongoing technology innovation. DIS, as I said, implemented in 2012 vessel spotting. Vessel self-spotting has already been implemented by the Canadian Seaway in 2013. And we are all in the process of implementing something called Hands-Free Mooring.

SLSMC is scheduled to have it completed on the Canadian side in 2017. We are scheduled to have that completed on the U.S. side in 2018. As you can see, as things have progressed from old to new, we literally had little pieces of cardboard that we moved.

And now we have moved a little bit further into the present, and this is our vessel traffic control center in Massena, New York. That is where our operations center is.

We started to explore the use of technology as a means to safely prevent or delay draft reductions and when possible to make better use of the available water column.

In doing so, we entered into agreements with other agencies to share water-level data on a real-time basis to provide mutual redundancy. We modified the AIS messages to

transmit and flag estimated water level readings.

In the Montreal-Lake Ontario section, we use water level gauges owned and operated by one of the two Seaway Corporations or several other organizations, Hydro-Quebec, Ontario Power Generation, New York Power Authority.

There is one NOAA gauge at the Port of Ogdensberg in New York. These additional gauges, though, in the waterway, provide redundancy. They're important to us, but not necessarily what we're relying on as primary information systems.

The system automatically detects when a gauge is not transmitting and transfers to a redundant gauge or calculates an estimated value. We transmit the minimum reading of the last hour via AIS.

There's a similar network -- DIS network for the Welland Canal, and it's critical that we know the water elevation but also that -- where the bottom of the channel is. We have a well-established sounding program that's developed over the last 50-plus years.

Soundings are conducted on a regular basis, especially in areas susceptible to silting. And in early 2000, the Transportation Development Center, in partnership with the Seaway entities and industry, we conducted a study to determine vessel squat using DGPS data collection with vessels underway.

So what are the benefits of this draft information system? We certainly have increased safety. The use of algorithm allows the masters to see up to ten miles ahead, offering time for the course change, a required reaction in transit, so while it's actually happening.

Increased efficiency, use of the technology allows vessels to utilize deeper drafts of up to 3 inches, meaning up to an additional 360 metric tons of cargo per voyage.

We have improved traffic and fleet management through this use. Climate change mitigation is impacted due to greater fluctuations in water levels. This tool allows more flexibility with less water, adjusts to variable water levels.

We have increased productivity and competitiveness for the Seaway, which is really a critical thing, given our constraints, our

natural constraints. We take pride in being ahead of the curve.

As such, the Seaway was one of the first inland waterways to deploy DIS technology, and we -- our -- the development of DIS has become a basis for developing an international standard for DIS technology.

So the little old Saint Lawrence Seaway has become a leader in this world. Draft information system -- oh, I think I might have missed a slide there. Sorry about that, guys.

Draft information system overview. So what exactly is it? It relies on real time water-level gauge networks along the vessel's route, which is communicated by the AIS network, it interpolates water levels between two points, displays the vessel's position and speed in real time and it provides a look-ahead future, minimum distance that it would take a vessel to come to a full stop.

It utilizes high-resolution bathymetric data, S-57 format, overlaid on an electronic navigation chart. It uses a set of squat equations developed to approximate the squat of a given ship type in the given navigation environment, whether it's a confined channel or a channel within the lake.

Now these screens that you're going to see on the next two slides are screenshots from the two different system developers of DIS technology. In both cases, the red indicates that if the vessel continues at its current speed and passes any of the red spots, it will have less than one foot of under-keel clearance, as is required in the Seaway.

The other items listed on these slides provide information about the transit status, like the time, the date, the heading position as well as information used to compute the vessel's under-keel clearance, which of course again is speed over ground, speed through water, depth with respect to the chart data, draft, squat, ship type, area type, et cetera.

Each developer chose to display items differently in different screens, but they both conform to the implementation specification. This is the other example.

There were no international standards

for this technology available at the time when it was developed. The two Seaway Corporations, in partnership with the shipping industry, worked with a third party to develop specs for use of the technology in the Seaway System.

We determined that the implementation of the draft information system needed to go through the rulemaking process, so we did put it through that process. The final rule became effective in July of 2012.

Some of the key dates and usage for the DIS. On May 8, 2012, the first shipping company was given provisional approval. On May 14th, the first vessel transited with a load of iron ore bound for Toledo at a draft of 26 feet, 9 inches, which was 3 inches above the published maximum permissible draft.

There were 17 transits in that first 2012 period, in that season. During this year's shipping season, through the end of June, there were already 74 DIS transits. So it's picking up.

At the beginning of the 2016 navigation system, there were 43 vessels equipped with DIS using it in the Seaway. So now that you've heard about this technology and the benefits that we have been able to gain from this cutting-edge system available in our waterway, I'm curious to hear from you, at the proper time, of other ways that maybe the Saint Lawrence Seaway Development Corporation and NOAA can work together to develop technologies that might be beneficial certainly for navigation through this very delicate part of our world. All right. Thank you.

MEMBER KELLY: Ed Kelly. This system that gives the squat and either gives a go, no go type of a decision for a ship to transit, is there any sovereign immunity involved with this because of the development with the Seaway and the governmental agency, or are ship owners just using this as information?

As an example, if something looked green on DIS, but he grounded, the lawyers want to know who pays.

MS. SUTTON: Well, I don't know the answer to that question, but it's a very, very good question. And certainly, I don't know if,

Marvourneen, you have that information.

MEMBER KELLY: Okay, because some of the high-end value of PORTS and some of the products that NOAA does deliver is that it is a government with a QA/QC that we have basically almost a sovereign immunity.

We can rely on that data and do so without legal consequence. So that's why the PORTS data is so valuable as opposed to things that might be out there from universities or this or that without any definite legal protection to it. So I would just be curious. What protections are available to use the DIS system?

MS. SUTTON: We will, even in real time, try to get you the answer to that question before the day is up. I feel that obviously it's a question right on the money, pretty significant to know. So --

MEMBER KELLY: Because I'm impressed with one foot anyway, even in Port of New York where we're two under and two above. So if you can get away with one foot, God bless you.

MS. SUTTON: Thank you. We do.

CHAIR HANSON: Go ahead, Ed.

MEMBER SAADE: I just had a quick question. Did you reference how often you update it? Is it multibeam that's done daily, or how do you know that it's changing within a three-inch window?

MS. SUTTON: It is done in real time. It is updated constantly. Marvourneen, is that correct?

DR. DOLOR: I'm not sure I understand the question. You're asking if your vessel is going out through a multi-beam --

MEMBER SAADE: Correct.

MS. SUTTON: Oh, okay.

DR. DOLOR: We can follow up with you.

MEMBER SAADE: So how do you know if it's right?

DR. DOLOR: We'll follow up with you with -- that's a --

MS. SUTTON: It is determined in real time while you're operating, so I don't know the technical nature of how that works, but obviously you need to know that it's right. We haven't seen any negative implications from the use of this information, so it is working, this

technology.

VICE CHAIR MILLER: Joyce Miller. One question I have, and this is as much to NOAA as to you. We've visited LA-Long Beach where they have something called a Precision Navigation System, and these are models of ship movement associated with that. Has there been any crosslinks between NOAA and this DIS system?

MR. MAGNUSON: I'd be glad to answer that.

VICE CHAIR MILLER: Okay.

MR. MAGNUSON: When Dave MacFarland was Director of Office of Coast Survey, a few of us I'd say, Darren, about eight of us went over to Saint Lawrence Seaway offices. Craig arranged for that, Betty.

And we had an interplay between their staff and the Draft Information System. That's when we first learned about it. Perhaps it's time to revisit that.

RADM SMITH: Yes, quite more recently we'd spent a lot of time with Louis Maltais, CHS, on the hydrographic survey side, often at the same conferences and that sort of thing. And so the Precision Navigation project that we did in LA-Long Beach was in fact inspired by this.

There were pieces of it that for the very reasons that Ed Kelly brought up, we decided not to have the system -- the integration of all the information be a government project, that we would limit, the government involvement to providing the bathymetry, the water level modes, the wave models, but integrating how those interact with a vessel and the settlement and squat that has to do with the vessel's operation not to do with the government.

And so perhaps -- that was sort of how we drew the line. I will also say, however, comma, we're still waiting for a really good system integrator to come along to help take that over the line, and so we do need to be -- maybe QPS is still in the room, I'm hoping their ears will perk up here because we are looking for a good system integrator.

MS. SUTTON: And I would say this is an example of someplace where the Seaway Corporations can innovate and move ahead sometimes in a way forward laying that groundwork

and others can't, just because of our size and sort of the way that we're structured.

MR. EDWING: Thank you. So I've been aware of the system for quite a while. I've been very impressed with it. Have you ever done an economic benefits study in terms of how much gets invested each year and what the benefits are that you get back?

MS. SUTTON: I don't believe that we actually have a study. We have anecdotal kinds of information you can hear from those who have utilized the system to their advantage, but I would be wrong to quote that.

MR. EDWING: Okay. All right. Thank you.

MR. NEKVASIL: All right. If there are no more questions, we'll move on. Our next speaker is Captain George Haynes, the Vice President of the Lakes Pilot Association, and he's going to talk about Great Lakes Weather and Commercial Navigation; A Pilots' Perspective.

CAPT HAYNES: There we go. Thank you, and thank you to the review panel for getting -- allowing the pilots to speak to you, and thank you to Lynne for coordinating it all, and thanks for saying we're esteemed. I appreciate that. I'll let my wife know that.

So I want to just make a distinguished -- excuse me. I pilot -- my group, we pilot the foreign ships that come onto the Great Lakes off the Ocean, and that's pretty much true anywhere in the United States with pilots, but I just want to make the distinguishment that we're -- they've got the lake freighters or lakers, the domestic fleets that Glen's organization represents.

There are two different kinds. The lake freighters have captains and officers that are already licensed pilots on their ships. They never really leave the lake, so they know these waters really well. Foreign freighters come to the Great Lakes. They may never have been here before, so they have to hire registered pilots, which is what my group does.

So I want to talk about a couple things. I had a couple weeks to put this together and research, and I'm a little new at this presentation, too. But I went out and asked as many people as I could, pilots, and I have a

lot of friends who work on the lakers as well, what are you using?

My presentation is going to be more weather-based. I'm going to talk about PORTS, too, not charts. So I asked, what are guys using out there. And what's your favorite stuff? Do you use anything?

And so, I came up with this list, and it's not necessarily in order of importance or most used. What I did find was, and it's probably surprising, that older, more experienced navigators who have been around a lot longer tend to use text-based products because that's what they've always used and they've gotten it through VHF. They're not so much prone to pulling up their phones and looking at the websites. So the text-based services are still very important here.

And of course the younger pilots, which I like to include myself in that category although I'm probably getting borderline now, but tend to use the web, visual, interactive-type sites.

And really, it's a matter of personal preference. There's no -- everybody's got their favorite. I got a bunch of emails here what people described. Everybody's got their favorite stuff and how they like to see the world when it comes to making decisions whether to go in and out of a port, whether to proceed or not.

So one thing I would like to compliment on is the Operational Forecast Systems. I work on Lake Erie, so that's what I know the best. That is an excellent tool, to be able to go in hour increments into the future to see exactly what the lake is going to be doing and the winds and velocities, the currents and water levels.

So I just used it last week intensely. I was on a tug and barge off of Buffalo, and we knew we were going to be arriving in Buffalo at 0300. And the afternoon before we were able to look at the OFS for Lake Erie and see that we had a window to get into Buffalo.

Now if we had just listened to the marine forecast, it's more general. We really don't know where the winds are going to shift and what the lake is going to do, but looking at that

OFS, we went for it and turned out it was pretty accurate. It was just the wind shifted a little too early, and we lost a whole day. So we never got in, but the thing is we had a chance and it was because of that OFS. We probably wouldn't even had tried had we not had that information.

So the challenge for pilots other than a lot of things going on this year, using the Internet-based products. On the Great Lakes we pilot the ship for its entire Great Lakes transit, whereas on the coasts you have pilots get aboard at a harbor entrance or a sea buoy, then take it through a river or into the harbor.

We get onboard, and there's always a pilot on these vessels going across all the lakes right down the middle of each lake or wherever they're going.

So talking to my laker friends, they have Internet -- satellite-based Internet service. When they're in the middle of Lake Superior, Lake Michigan or Erie -- excuse me -- they can pull up all the great services that you provide -- NOAA provides on the Internet.

Pilots, we're different. We're on different ships every day. A lot of these foreign ships don't have sophisticated equipment. They have the basics. We're pretty limited, so we're highly reliant on our smartphones to get the websites and the real-time point reports.

And the problem is if we go down the middle of a lake, we're maybe 20, 30 miles offshore, and there is no cell phone service. And we're not going to run the shoreline close just to get cell phone service. We might do that for television, but we won't do it for cell phone service.

So anyways, our problem is we're kind of blind when we're out in the middle of the lake. We have no way of really getting all these great products.

The only thing we can get is VHF reports, and that would be Canadian Marine Forecasts and the National Weather Service forecasts, which are primarily land-based. I know there's a lot of marine information, forecasts and so on.

So when I -- let's say I leave the Welland Canal and I'm going to Cleveland or

Toledo, and I give an ETA to an agent who's handling the needs of the vessel at that port. And they have to line longshoremen, line handlers, tug boats, customs and everything.

And so I give him a good ETA, and then we got out in the middle of the lake and I have no updates. I mean I can look at the forecast and have a good idea, but I might be 12 to 14 hours out in the lake kind of blind from Internet service, and a lot can happen with changing weather in 12 to 14 hours.

So I might get to Cleveland and all of a sudden there's this big weather system that's preventing me from coming in, or the front finally came through or it came too early, and then I'm caught off guard, and then all those services that he lined up had to be cancelled, which is expensive to the shipping companies.

Or I get there, and maybe I said I'm going to -- let's wait four hours, and I'll give you a later ETA. And maybe I could have gone in, so having that real-time information is really helpful to reduce costs for the industry users.

So what I was going to ask as a recommendation is -- I know we can't -- you cannot put all this information on VHF, but you do have -- the National Weather Service broadcasts are already in place.

What would be great for us would be to put the water levels at the different stations. There's one of your OFS things, and if you look at the black places, Fermi Power Plant, Toledo, Marblehead, so on, those are where the water gauges are, and there's also -- most of them have wind speeds and directions.

If those point real-time information could be broadcast, doesn't have to be overly continuous, but every once in a while if those could be broadcast over the National Weather Service radio, then out in the middle of the lake I have -- I can kind of see what the lake is doing.

I know with water levels. I know the winds, so that I can find -- if I'm over in Buffalo, I know Toledo might have just had a wind shift, and I can follow that hour by hour when I'm out in the lake to know what's going on.

And then I can maybe somehow have the

ship let the agent know that hey, we're not going to make it because when we get there, that's weather is going to be bad. So it would be really helpful. We're kind of blind.

Now the Canadian Weather Service used to have a thing called -- I think it was called LAWEB. I don't know what it stood for, but they reported all their lighthouses and wind and speed and velocities on the lakes, and then they discontinued it, and we've been kind of lost ever since.

So that's one of my recommendations, and you can see Lake Erie. I mean look at the -- in the Buffalo there's less than 5 knots out of the east and over in Toledo they got up to 25, 30 knots out of the south. So Lake Erie, you can have a lot of different patterns on one lake, and that was in August just a couple weeks ago.

And my other thing is I would like to showcase one port in particular. I'm in and out of there all the time, and it's on Lake Erie. And Lake Erie, I think, is probably the most affected by winds, gales because a lot of you know this already, but the seiche effect.

The predominant winds coming through this area are southwest and especially when the wind's really going to blow. It's southwest or west, and Lake Erie is so shallow it's like a baking pan. This is how it was described to me. You put water in a baking tray and you move it a little bit, and all the water goes rushing to one side and spills over. Well, that's what Lake Erie does.

And so commonly, Buffalo gets piled high with extra water and Toledo gets drained right out, and so I want to showcase Toledo as a place where we really could use the PORTS system.

And I know Cleveland's got that system in place, and I was coming here to ask NOAA to fund that, all four, so now I know the answer -- when I saw Glenn get his plaque.

So anyways, I won't ask for the funding, but we would like the system, and so Toledo at the very western end of Lake Erie, when the wind blows all that water out of the west end of Lake Erie, Toledo can drop 4 to 5 feet in a matter of hours. And of course Buffalo gets it all on the other side in a matter of hours.

Toledo really isn't a harbor. It's more of a 6 mile long -- as far as navigational purposes go, it's a 6 mile long section of the Maumee River. And I like to say that Toledo has it all, and I'm not in the tourist business to promote it, but it has all the challenges of navigation.

Lots of bridges. The ship is limited on all sides: above, below and on both sides when we go through the bridges. And so it also has -- some of these bridges where you wonder what were they thinking? They're at angles. They're narrow, and of course bridges always tend to break down or they want to run their trains before we -- they want to open up for us.

Anyways, Toledo has all the natural challenges, I think. It's a flat land area. It's not mountainous. So when the winds are blowing, you're susceptible to crosswinds or from whatever direction, extreme water levels like I just explained, can drop very quickly. And then when the water levels drop, of course, the currents pick up out of the Maumee River and the currents can also be severe, and they also can be caused by rainfall.

If you've got heavy rains for a couple days, that current in the Maumee River is really ripping through there. Plus, you got a lot of mud, and you got seasonal shoaling. They dredge it all the time and keep it pretty cleaned up, but still -- fortunately, it's mud in there and not rock.

Just to show you how severe the water levels can drop, that's Toledo in 2003. It happened to be a big blow that came through really fast, and it just -- it dropped everything 4 or 5 feet. I'm not sure what it was. It was at least 5 feet.

So this is around the docks. A couple of those tug boats are aground. That ship, I was told is aground. And you can get the picture. So this is a slide from just this month, two weeks ago, showing the water level change.

Now this isn't the stormy time of year. This is just -- this is summer. It's supposed to be pretty calm, but even so, with the 25 knot wind that day the water level dropped 20 inches. You can see that on the far right side

of the slide, 20 inches in probably about six hours.

And we're running over the ground couple feet. Toledo's got another really cool bridge. It's an overhead bridge called the Anthony Wayne Bridge, and it's clearance over low water datum is 10 feet less than what the Welland Canal and the Saint Lawrence Seaway is. Again, what were they thinking? Probably it was so old they weren't thinking about it.

But the ships we bring in there and we go up all the way to the head of navigation, and we have to go under this bridge. And we have to have the ship captains do everything they can to get these ships ballasted down so that we can get under that bridge.

And a lot of times they have to put water in the cargo hold. They have to do whatever they have to do, and we try to shoot for 101 feet for the air draft of the ship. And lately we've had about 3 or 4 feet of water above datum.

I don't expect you to understand all these calculations right away, but the gist of it is, when we go under that bridge we have about 2 feet, maybe 3 feet of clearance. And so we are constantly checking these websites.

And I took a trainee with me the other day coming out of Toledo, and to help me out I said keep checking the water level and keep checking the currents and everything. And so his thumb was really moving the whole time because we had wind, and the water levels and the current were changing quickly. So anyways, I kept him busy.

I put the head of navigation in Toledo. It's about 6 miles in. There's three grain elevators, and we bring a lot of the ocean ships up there to load grain. And a lot of the Canadian lakers go up there to load grain. The American ships really don't do that anymore.

So anyways, that's a turning basin, and this is -- when we leave a dock up there, we're starting from a stationary position. The tugs pull us out to the middle. We got to hit the pedal to the metal and go through this Norfolk Southern Bridge, which is a very, very narrow bridge. Again, what were they thinking?

A hundred and fifteen feet wide in the one side of the span, and our beams on the ships are 78, so that leaves about 35, 37 feet. And I think it's a lot of less. But anyways, if we have a heavy current up there, we really can't leave.

And your current meter is right up there off of the -- it's called the ADM Elevator Current Meter, and we are referring to that all the time. That is very, very important.

And the red arrows, they show the direction of the actual current usually. When it's flowing northward or up, that's outbound. So we leave the docks. We got a current setting us toward the east bank. And then as we get going, the current bounces off the east bank and sucks us towards the west when we get into the bridge.

So -- and if it's really running, we can get in bad shape or it can really cause problems. So that current meter is invaluable. It used to be, before the current meters, we'd get on the ship. We'd look over the side and go, wow, those weeds are really going by fast. And boy that log is really cruising by. Maybe we shouldn't go.

And that's how scientific we were. Now with the current meter, the tug boats won't take us if it's above 0.8 knots. And so now we use the current meter to make or break the decision to leave or not. And the pilots, we're fine with that. We don't want to get in trouble either.

And the current meter also shows the direction. We can have an inbound current. When the water levels are increasing, we can have an inbound current when outbound, it's a -- when the water levels are decreasing. Anyways, you know.

So this what the current can do in the space of 24 hours. The inbound and the outbound current change seven times. Granted, it's not that much. It was only half a knot, but when it's -- when the water levels are changing, we have to know that to decide whether to leave or not.

There's a visual of that bridge, Norfolk Southern Bridge, two tug boats going through it. We go through the span on the left,

and those tug boats are 20 feet wide, so that kind of gives you some perspective.

Leaving the dock, we start from a stationary position, put the pedal to the metal to get some control, and away we go. We come really close to it. You can see that it's 115 feet wide. I don't think it is. I think it's a lot less, and we're 78 feet wide. So there's not a lot of room.

I was talking to my colleague when I was taking these pictures after he cleared the bridge. He was telling me how he went through one time, and the bridge tender who's standing in the little gray shack said hey, you're too close to my bridge.

And I said, well, what did you say to him. He goes, I didn't say anything. I just slapped him. So all jokes aside, this is pretty serious, and in 2001, one of the Canadian lakers left the dock and the currents were from low water levels in Lake Erie and heavy rainfall days before. And he got out of the control. The Coast couldn't save him, and he went sideways against the bridge.

And that's a picture. You can see the water flowing around his stern. He became a big dam in the river, and it took seven tugs two days later and lightering the ship to get that vessel removed. And he's lucky he didn't hit the bridge or take out one of the spans. So that's the good thing.

So anyways, that's -- two things I really wanted to say was we could use some real time water level and wind spin direction on the VHF channel. And that would be great. I know some of it is already transmitted, but it's sparse and it isn't always consistent. So I'm not sure why.

And we also really need that current meter, and we could stand to have more port system. And I think South Chicago, the Calumet River, Milwaukee and Duluth could benefit from PORTS as well. So thank you.

MR. NEKVASIL: Any questions for George?

MR. EDWING: Thank you, George. Rich Edwing here. So I do have a question for you. As an alternate to the Weather Service VHF, and

we will talk to them and see if that's an option.
I think we can work with them on that. But how about getting you that data, the PORTS data, the water level data and maybe even the modeling data over AIS? Do you get AIS out there in the lake?
CAPT HAYNES: We do, but that's kind of the VHF basis.
MR. NEKVASIL: Yes.
FEMALE PARTICIPANT: Could you speak into the mic?
CAPT HAYNES: We do get AIS, and sometimes it works really great. I can see ships that are 120 miles away on a temperature inversion, or I might really have a hard time.
And then remember, we're on different kinds of ships all the time and not all their equipment is always working well. We see some work better than others. But it's an option. We're all for it if there's a better way to get that real time information.
MR. EDWING: Right.
CAPT HAYNES: We'd love it.
MR. EDWING: Okay, because we are working with the Coast Guard to make that happen. We're still a little ways off.
CAPT HAYNES: Okay.
MR. EDWING: I think that's coming, so that's maybe one solution. But it sounds like you need several solutions, so we'll certainly explore with the Weather Service.
CAPT HAYNES: That would be great.
MR. EDWING: That way we can get more information out over that way as well, and we're certainly aware of your interest of the current meter on the Maumee River. Again, that was one of three current meters we established over ten years ago.
It was part of a demonstration project with the Corps and demonstrated we could operate current meters year round. They designed some really nice sight shields for those, and it's really long past proving that concept.
We've kept them going, so we know people have been using them, but as Glen can attest, I've been up here for a number of years kind of forecasting the day when we're not going to be able to keep them going and we've been able

to move one over into the PORTS system, so we'd love to welcome you into the PORTS system with that meter. But it does take some funding. The good news is it's already in. It's the real deal.

CAPT HAYNES: Yes, I know.

MR. EDWING: It's already in. We're just looking for that O&M money to keep it going.

CAPT HAYNES: I did -- was talking to Darren over the winter. We explored that, and the people we would be partners with as pilots would be a lot of the Canadian ship owners.

And I did talk to a couple of the Canadian ship owners representatives over the winter and tried to communicate with them, and I never really heard anything back. So I'm not sure if they're interested in that.

So maybe there could be some guidance on who do we bring into this partnership because American lakers don't really go up there. I do have to say though, everybody uses it even if you don't go all the way up there to the elevators.

The navigators use it for the mouth of the lake as well. It's good information. It's lets you know which direction the current's going in.

MR. EDWING: All right. So we'll continue talking with you. Our partners are as diverse as they come across all the different PORTS systems, so we had of maybe examples, some other approaches that may help work for you as well.

CAPT HAYNES: That would be great.

MR. EDWING: Okay. All right. Thank you.

CAPT HAYNES: Thank you.

MR. NEKVASIL: Any other questions? Okay. I would like to add just one thing to George's presentation. He was talking about the mud in Toledo. There's another name for it. It's called Indiana. I am told that most of what they dredge out of the Maumee River is Indiana farmland. Oh, I'm sorry.

MR. WRIGHT: One source that you might use for finding funding is where you're taking your vessels to. If you impress on them that they could be saving money by using a system like this and reduce delays and making sure the

vessels get there safely, that might be an avenue. And of course we can discuss that offline.

CAPT HAYNES: Okay. All right. Thank you.

CAPT HAYNES: All right. If there are no more questions, then our final panelist is Mr. Mike Piskur who is the Program Manager for the Conference of Great Lakes and Saint Lawrence Governors and Premiers, and he is going to review their recently released regional strategy for the Great Lakes, Saint Lawrence Maritime System.

MR. PISKUR: All right. Thanks Glen, and thank you for the invitation to speak today. As he mentioned, I'll be talking about the first strategy for the Great Lakes, Saint Lawrence Maritime Transportation System, which was just released in June of this year. And I'll be talking quickly about our organization, the process we went through the develop the strategy and then what's in the strategy itself.

So our organization is a partnership of the governors of eight Great Lakes states as well as the premiers of Ontario and Quebec, so our organization existed as the Council of Great Lakes Governors since the early 1980s and worked on a lot of the pressing environmental and economic issues of the time, when the group was formed.

The conference is essentially a rebranding recognizing the full partnership of the two Canadian premiers who -- their involvement kind of ramped up over time, and this is sort of formalizing that relationship.

Maritime is a new, a relatively new field of interest for us. Our maritime initiative was launched in 2013, and traditionally our work was centered on water management, on aquatic invasive species, on Great Lakes restoration and protection on the environmental side and then regional economic development and trade promotion.

So maritime kind of nicely bridges the gap between the environmental and the economic side. Governor Snyder of Michigan is our current chairman and has been for several years and has been instrumental in our launching of our maritime initiative.

And as you our mission, growing the region's five now almost $6 trillion economy and protecting the world's largest system of surface fresh water, about 20 percent of the world's fresh water.

So we heard from, I believe it was the Army Corps this morning about the idea of the Great Lakes, Saint Lawrence System as a system. And that's really what informed the thinking behind the strategy we put together.

As you see on this map here, it's not just a patchwork of independent ports and different actors doing their thing, but it's a whole region. It's the eight states. It's two provinces. It's the Seaway, and it's really all of these things working in concern. And we look at maritime as the backbone of that regional economy.

So -- and a lot of the things we put into the strategy eventually or that made it into the strategy really is around that thinking. What are some of the critical components? Where are the investments that can be made that have the highest return on investment, the biggest bang for the buck, that really would benefit the entire region?

So as I mentioned, the maritime initiative was launched in 2013. Governor Snyder convened a meeting of the governors and premiers on Mackinac Island, and they signed a resolution.

And one of the first items included in that was the creation of a maritime task force. And this was the first time that all the states and provinces working together had participated in such a group.

So for some of the states, maritime was an afterthought if it was thought about at all. For some of the others it was a bigger deal, of course, depending on the flow of commerce and that sort of thing.

So that group was convened and was tasked with developing some recommendations to go about improving the efficiency and competitiveness of the system. So two years later, June of 2015, we had another such meeting in Quebec City.

There you see Governor Snyder with the premiers of Ontario and Quebec, and this was

where the work of that task force first started to come to completion.

So there were three main items that came out of that. The first was a maritime asset system inventory. And like I said, for some of -- particularly for some of the states, this is the first time that really anyone from state government was sitting down and looking at -- if we're going to manage this system as a system, what are the components of that system.

So this was looking at what are the ports. What are the terminals? What cargo flows are moving through? What are the connections to other modes, to road and rail and sort of the -- again that critical infrastructure so that we can begin to think more strategically about them.

Regional priorities. These were ten overarching principles that guided the development of the strategy, and these were things like talking about the benefit of maritime as an environmentally efficient mode of moving cargo, talking about the ability to use maritime to alleviate service congestion and a lot of other things like that.

And then finally was the creation of a regional maritime entity. Basically as of June of 2015, that task force became this group, and this will be the body moving forward that coordinates regional maritime governance on behalf of the states and provinces.

And the first order of business for that maritime entity was to develop a regional strategy built around those priorities. So the process here, it was basically a year.

We started in June 2015 and finished in June of 2016, and -- well it was led by the state and provincial representatives. There was close coordination with an advisory committee, and this was a group of about two dozen or so different agencies and organizations.

So Bill Hanson participated in that group. Betty Sutton was on that panel, the Lake Carriers, Admiral Ryan from the Coast Guard, the Army Corps, other private sector groups, environmental NGOs, really trying to get to the idea of having a regional consensus.

The ideas coming out of the strategy isn't just what the governors and premiers think

but what the region thinks is important. And that's something we've been proud of as the process that we took to get here.

So I'll talk a little bit more about that. So in the strategy we came up with, the main goal is to double maritime trade, to shrink the environmental impact of transportation regionally and in terms of moving freight and to support the region's industrial corps.

As Glen mentioned and was mentioned earlier, maritime is vitally important to the flow of materials, into steel production and automobiles and any number of other things.

Again, this is a really collaborative process. Over the course of that year, we had several meetings and any number of phone calls and other things with all these groups.

We did have a public comment period in January of this year, and we heard from I think about 20 different groups. Overwhelmingly supportive of the ideas and the strategy as well as including some ideas and comments that we integrated to the best of our ability.

So the strategy itself is a blend of policies, programs and projects to grow the regional maritime system and the regional economy.

So getting into these here, we grouped these. There's about 40 recommendations included in the strategy, and they're grouped into these four main categories that you see here.

Some of them aren't necessarily relevant for this group. Some are a little more so, so I'll focus on the ones that might be of particular interest.

So around increasing efficiency and reducing costs, locks for instance. We heard from the Army Corps about the importance of the Soo Lock. We do support the construction of a new Soo Lock to reduce the risk of any sort of failure there.

Channels and harbors, this is really harbor dredging, and I wasn't aware I guess of -- I think there was some allusion this morning to some of NOAA's capabilities and how that can inform some of the dredging decisions that the Army Corps makes.

I know that there's something like a

$200 million backlog of dredging needs in the Great Lakes that has existed for some time. So perhaps some of the data tools that NOAA has to bear can help make those decisions a little more strategic to better understand some of the current conditions.

Perhaps fluctuating water levels affect some of the depths and the different channels and harbors. I think I want to make sure to also mention one of the items, again getting to the theme of thinking about the system as a system.

We heard from particularly a lot of the industry side, that the Saint Mary's River was really kind of the key artery, and if that is not maintained to its authorized depth, then that sort of has ripple effects throughout the rest of the system, authorized up to between 27 feet for the most part.

So ensuring that is, in fact, maintained to its authorized depth as well as looking at the potential for adding additional depth there, 2 feet of additional depth, so that would be -- and that's obviously more of a longer term project requiring a lot of analysis, both on the cost benefits and the environmental impact but something we've encouraged in the strategy, and as well as an analysis of system bottlenecks of looking at where are some of the pinch points through the system, which if opened up, can really benefit the entire -- the ports and other parts of the entire system.

So that's something that I think the U.S. federal government is uniquely situated to be able to do -- I don't know if NOAA is necessarily the appropriate agency for them, maybe USDOT or somebody else, but seeing that sort of system wide analysis would be very important to future decision making.

Icebreaking. We heard a bit about that already and certainly would encourage anything NOAA can do to better understand current ice coverage situations across the lakes.

And efficiency and environmental performance. This is -- one of the recommendations included in there was for the U.S. and Canadian federal governments to have just better monitoring and understanding really

of the environmental performance of the fleets, of the ports, just to get a better track.

I know the Lake Carriers and the Seaway have a nice graphic showing the numbers, but one laker equals something like 3000 railcars or --

MALE PARTICIPANT: It's 1000 footer is 700 railcars or 2800 trucks.

MR. PISKUR: Okay. There you go. So that's a great number, and being able to continue to make that case and better understand and advocate for the inherent efficiency of moving cargo by ship.

Season optimization is one. Of course ice is a reality in the Great Lakes. And as we understand that the Soo Lock and the Seaway locks require closure for maintenance at least some of the year, but are there things we can do to get incremental improvement of expanding the shipping season, whether it's coordinating the opening and closing of the different locks.

Again, if this is something where perhaps some of NOAA's tools can help to better inform the current conditions, recognizing that there are important environmental considerations to ice coverage as well as certainly the economic benefits of it.

And containers, I don't really have anything to say here for this group necessarily. But while I'm in Cleveland I have to plug the Port of Cleveland's efforts on container shipping.

They're the only container shipping on the Great Lakes currently. It's done a really good job taking that from being a monthly service to I believe a weekly service now, from Cleveland to Antwerp.

And I believe there's now a piggyback service to India. So that's grown nicely, and it's something we would like to see hopefully some of the other ports on the Great Lakes be able to duplicate.

On passenger travel and cruising, I know a couple of the members of this panel come from that industry. This is something, in particular, some of the governors and premiers were very interested in being able to cultivate on the lakes.

And there's sort of a small industry now. There are some obstacles to them growing their business, whether it's some of the customs regulations, some of the costs of doing business on the lake, so these are things we're trying to think about, how to encourage that.

The Great Lakes Cruising Coalition is part of our advisory committee as well, and they had sent out an email recently. I don't remember the group, but some international cruise tourism body, apparently the Great Lakes region is one of the finalists for recognizing it is the premier cruising destination in the world.

So obviously that's great, just to have that, especially if the award goes to the Great Lakes for raising the profile. So again, anything we can do to promote that would be great.

And domestic/international marketing. This is continuing to build on a lot of the good work that the freeway has done through their Highway H2O initiative and really just raising -- again raising the profile of the Great Lakes.

My boss who has traveled to Europe recently to understand how they do things in turns of maritime on the Baltic Sea was talking to them, showing them the map of the system and the 20 percent of the surface fresh water.

And some of these folks in Europe were absolutely astounded to hear. They didn't really think about geographically that there's this connection from the Atlantic Ocean into the essentially middle of the North American continent. So there's a lot we can do to continue to grow the profile.

This section, not a lot necessarily. It's pretty new for this group. This is basically looking at some of the building upstate and provincial capacity, looking at ports as not just a place where ships come and drop off and pick stuff up but having the state and provincial governments think about them as really economic drivers and not just something that the -- first of all, it would be great to have the Departments of Transportation thinking about it.

And we've got that underway, but really having different agencies, economic development and others, thinking about how they

can better leverage their ports.

And finally a couple things here. Talent and workforce development, we hear from a lot of the system users that it's an aging industry, that there is a growing need for skilled labor.

So looking for ways, whether it's some of the marine -- excuse me, military to marine sort of transition for Coast Guard and other veterans, whether it's things like maritime academies, which there's in Toledo and I believe here in Cleveland as well and encouraging those things more system wide and encouraging people to seek a career in maritime.

And around governance, this is one where in addition to, again, building the state and provincial capacity to deal with maritime, it's also the idea of developing -- one thing our regional maritime entity will be working on is developing recommendations for a treaty between the two federal governments to really manage the way that they cooperatively -- I should say how they cooperatively manage the bi-national system going forward. So that's something we will be working on over the next year or so.

And then finally metrics. This is just better data, better understanding how the system works, some of the things I mentioned earlier, just the efficiencies of the system, how the Great Lakes System is sort of situated not just in comparison to other modes of transit but even to other regions of the country, just to get a better handle of I guess how we're doing -- how well we're doing the things that we do.

So -- and there will be -- there's a data working group, upstate and provincial people, that are being convened basically right now. And we're going to be working on some of the portions of that.

But that's certainly something that federal partners, NOAA and others, can certainly participate in, in the future. So with that, our web address is there at the bottom.

The regional strategy is available there. It's a 35 or 40 page document, so please check that out. Like I said, that was released in June. And with that, I will take any questions or comments.

CHAIR HANSON: I'll go ahead and start, Mike. First off, just a comment because the whole structure that we went through, the whole conversation was really quite interesting about how to develop collaboration and coalition thinking, if you will, throughout the Great Lakes.

Some of the first meetings we had with a state level DOT director showing up and had no clue that they even had shoreline or ports within their states.

MR. PISKUR: Right.

CHAIR HANSON: And that's one of the reasons you had to go to the asset list was you had to go back home and start asking around to see just exactly what it is that they have in their state that they should be advocating for and paying attention to. So they've come a long way from that.

MR. PISKUR: Indeed.

CHAIR HANSON: I think one of the takeaways I had from all of our meetings was the optimization of the seasons and perhaps climate change, whatever you want to call it. It changed the way you think about the lakes and the Seaway.

And I'm looking at it talking to Joyce. I don't think we have much conversation about ice, and given the fact in the course of the next couple days -- and given the fact that you're shut down for several months a year, would it be appropriate to give you guys -- have a comment, each of you, on the impact of the seasonality on your businesses.

How often do you shut down, and what gets you back in line? And are you thinking about anything changing in the future?

(Off microphone comments.)

MS. SUTTON: So the Seaway is usually open from mid to late March through the end of the year. We do our winter work, our maintenance work, during that shut down time.

I think that the question -- obviously there are concerns that we -- there's a whole system, a whole list of things we consider when we're determining what to do. Certainly the weather is the biggest among them.

The forecast, where the assets will be in terms of icebreaking assets, also what the

demand is. So there's -- and it's bi-national, so it's done obviously in conjunction with our Canadian counterparts. And safety is of utmost important.

With that said, I think there have been studies in the past. With the Seaway System being mostly the bread and butter has been bulk, as you've heard here today. But there is some diversification going on now.

Those containers coming into the lakes really does represent a breakthrough in Great Lakes Seaway shipping. So the question with bulk was always, would it really -- what did it really translate into.

Did it translate into more voyages but not necessarily more volume? And I think that there was a good argument that really it didn't translate into a lot of extra movement of cargo, just maybe more ships passing.

So I think there's a question right now about looking at what it would actually mean if the season could be extended safely. There's testing going on, on navigation aids.

There are advancements that could be made perhaps there, but we're always going to have to be concerned with safety, environmental integrity and also, of course, having to get the work done that we do.

The one thing that we tried, even as we look at this and evaluate whether there's any way for the season to be extended, and it has been lengthened a bit over time is we don't -- as a transportation route, it's important that we don't focus solely on what we can't do so much that we forget about what we can do.

So that's one of the things that we preach, but thank you for letting us have a chance to speak to that.

MR. NEKVASIL: For the lakers, our season already is longer. We basically have an 11 month season for the domestic lakers. We'll start moving cement and iron ore in early February, and then when the Soo Locks open up on March -- I'm sorry. We would start moving in early March.

And things really get going when the Soo Locks open on March 25. Then the Soo Locks close on January 15, but we will continue to move

iron ore out of Escanaba until the end of January.

And the cement trade will go until the end of January, and if you're having a mild season, they will actually continue into February. And actually a few years ago, we had a horrible winter but because the steel mills were so desperate for iron ore, we tried to move some iron ore there in February.

One ship loaded iron ore in Escanaba, Michigan for the steel mill here in Cleveland. Under normal circumstances, that trip would have been 50 hours, but it ended up taking ten days.

And that winter, the ice was so bad that winter, we did more than $6 million worth of damage to our vessels. So as I said, we I think, have largely optimized our season right now.

If we were to continue to try to say oh even longer, we would definitely need more Coast Guard icebreaking resources. One of our primary goals is getting the U.S. government to build another heavy icebreaker here.

We have one, the Mackinaw, but we need at least two. And the Canadian government, they used to have seven icebreakers here on the Great Lakes. They now have two that are permanently stationed here. And both of them are coming to the end of their useful lives.

Canada will bring in other assets from the East Coast, but you have to remember, once the Seaway is closed they can't. That option is out. So -- and of course there's environmental conditions that have to be -- environmental considerations.

And two, we need some time during the year to work on our boats. In a typical winter, we will spend fifty to $60 million just doing routine maintenance and modernization.

And then this past winter, two of our members collectively spent about $50 million repowering a couple boats. So there's a lot of things that would need to come into place if we were going to lengthen the season any.

MR. PISKUR: I would just add to that. Our strategy does include a call for a second or an additional Great Lakes class icebreaking vessel. I know during the process of developing the strategy, we had heard that was it 2014 was a

particularly harsh winter, had ice coverage.

There's a study that showed on the U.S. side $350 million of lost business related to that halting of shipping whereas the cost of a new icebreaker I believe is $250 million.

So one season's loss of business more than pays for a new ship. Obviously that's not the only consideration. It's a lot of money no matter how you cut it, but definitely something to think about.

And then just I mentioned containers before. Really the closure of the system for the winter is probably the single biggest barrier because anyone who wants to be able to move their goods by container really needs to have that year round reliability.

If they have to find another option for three months of the year, they're going to find another option for the whole year. So that's it.

CAPT HAYNES: On the foreign freighter side of the international freight side of things, we can move the ships through the ice. We can do that. We can go up and down the rivers. It takes more time.

You got icebreakers. Sometimes you don't need icebreakers, but we can do that. The problem for the international ships is the locks, getting into the Great Lakes. Like most of them now have 76 to 78 foot beams, and the locks are 80 feet wide.

Once you have ice in the canals and the rivers start making ice, you can't get that ice out of the locks easily. They do things to flush them out, run some -- open up the valves, run water through to flush out any ice, so then the ship can get in. But it's a lengthy process.

And sometimes the ships go in with ice stuck between the side of the ship and the lock wall, and with the pressures and everything, it actually almost turns into like glue. And the ship can't even get out of the lock. That's happened before.

The other problem for the international trade is they have to book their cargos in advance. They have pretty good ahead time where it takes two weeks to cross the Atlantic.

They line these cargos up probably two months ahead of time or a month and a half ahead of time, so if you have a particularly cold December and the ice starts making really fast unexpectedly, a lot of cargo could be left on the dock that was supposed to go by ship.

So unfortunately, we don't have a crystal ball. The laker companies are more nimble. They can book cargos in a few days' notice because they're right here on the lakes and they can throw in an extra iron ore load or load of stone somewhere. If the locks -- if it's still warm and there's not too much ice.

The ocean freighters have a problem. We have lots of horsepower on the ocean freighters. We have no problem getting through ice, but it's just the locks.

VICE CHAIR MILLER: To what extent are the lakers versus the foreign vessels ice-strengthened. What type of vessels are on them -- on the lakes?

MR. NEKVASIL: A number of our vessels have ice-strengthened bows, but we still need commercial icebreakers because especially the newer vessels, they have been designed to maximize their carrying capacity.

So their bows are kind of -- well, let's put it this way. The old boats, they rode up on the ice and broke it down. These boats have a rounded bow. It maximizes the carrying capacity, but it's not too good for pushing through ice.

So that's why we have to have the U.S. Coast Guard icebreakers leading the way for us. We've got the hull strength, but we still need somebody to break the ice for us.

MEMBER PERKINS: Just a curiosity question on the economics. So you're able to levy enough fees for the tonnage going through all 13 of those locks that cover your full operational and maintenance budget, and it's sustainable?

MS. SUTTON: That's a great question. Again, going back to the way the Seaway is governed. As a bi-national system, the Canadian Management Corporation operates on tolls.

And it has a number of years back. It used to be identical to the Saint Lawrence Seaway

Development Corporation, supported by the federal government of Canada.

Now it has privatized the management so to speak of their locks. So they have 13 locks. They charge tolls. The Seaway on the U.S. side does not charge tolls. We are an appropriated agency.

So we operate under an annual appropriation through the federal government like any other operating mode or agency of the U.S. So we're not mirror images. It's fascinating.

Although, I will tell you users of course don't distinguish, and they often think that they're paying Seaway tolls and they think they're paying Seaway tolls to the U.S. So I'm always struck by having to clarify that because of course I think the U.S. Seaway is a complete value add, the best deal going.

If I could just provide the responses to the questions that were raised earlier, I'd like to do yours first I think because it makes -- the order makes the most sense.

The two DIS models in use in the Seaway were verified against criteria at the implementation -- in the implementation specs before. Obviously they were allowed to be used in the Seaway.

The new hydrographic survey data is input when it becomes available. As it becomes available and the other information, such as the speed, the location, water levels, they are all provided in real time via AIS.

So that's how that all works together, which again leads us to a very important question that you asked. There is no sovereign immunity.

This isn't really going to surprise I think anybody there but -- because we don't operate the technology. We allow for its use. We don't mandate its use. To use it, they're expected to use it within the required technical specifications.

And so they are responsible for ensuring that it's used properly. If a ship were to run aground, then there would be an investigation like there is an investigation for any grounding. Hopefully that clarifies those two questions.

MEMBER KELLY: And my question

revolved around the integrity of your data. If we found that your data that they relied on to use was incorrect, so you're just, like a lot of the other people say, if you use this data you will die, your children will die. Don't use this data for navigational purposes. It's a disclaimer. And if a pilot does rely on that, they're going to say well, why did you do that.

CAPT HAYNES: We're in trouble anyway.

MEMBER KELLY: You're in trouble anyway.

MS. SUTTON: Okay. So here's the thing. I don't know that it's ever been tested. I have not heard of the case, but you would have to make your case. And the pilot would have to make their case.

And whoever -- for responsibility because it's possible that you could be using DIS and a pilot could make an error. But I'm not saying that would ever necessarily happen. But -- so I think that the point is obviously there's not protection going in.

And I would be interested, since you raised the question, in knowing more about whether there are real life examples because I am not aware of problems with DIS having been raised to call this issue to question. That's got to say something.

MR. ARMSTRONG: Can I ask you a follow up question? So you mentioned the hydrographic surveys. And I'm just wondering who is it that does those. Do you have a Seaway hydrographic survey agency or the Corps of Engineers or NOAA or all of the above?

MS. SUTTON: Well, most of our information comes from the Canadian Hydrographic Survey because of where the data is that we're utilizing and just the partnership that we have with the Canadian survey. It's a very good question. Doesn't mean we couldn't use information from NOAA.

MS. MERSFELDER-LEWIS: I have comments from people online who wrote in. And someone said, the last man speaking reflects our view. All fine and good to talk about lengthening the system, but as he said, we have maintenance to do off season.

And with this last winter, we ran the

ferries all winter, very expensive to run all season and hard to do all maintenance, painting required. And running all season does not mean clear routes.

We ran lots of times in ice, which causes damage to hulls and problems with shifting ice fields. And the bow might be strengthened but can do damage to the rudder. Our ice ferries have a V hull and run up on the ice to break it.

Not easy, but other seasoned boats are not built that way. And like the man speaking now, it is difficult to predict the weather. And that was from Robin Russell who's with the -- who owns a ferry and also is very active with the Passenger Vessel Association. You guys might know her.

And she had another comment, which was, she said it was a very interesting discussion regarding the currents in the Maumee River. Are they predictable? These are questions to you, George, sorry.

Are they predictable? Is it due to the weather systems? Is it due to low and high pressure? Do they change directions that many times in a day? Very dangerous operating conditions, Robin.

CAPT HAYNES: Yes. They are somewhat predictable because you got a big low pressure heading north of the Great Lakes, and it sweeps through and creates a gale on Lake Erie.

What you know, we know that those water levels are going to drop, and the currents are going to pick up. If you got a couple of days of heavy rainfall in Indiana or the Maumee River watershed, then yes, it's going to pick up.

But we get surprised a lot. We get surprised a lot. You can't always figure it out, and Lake Erie also once the water blows all the way to one end, it has to come back eventually. And it's like a big lump that goes over the middle of the lake.

And it'll slosh around back and forth for two days after a severe storm. And one of the great things about our water level gauges is I can call up Great Lakes online or look online and see where the lump is.

I've anchored off of Toledo for two days before waiting for the water to come back

in, the winds to die down, and I watched the lump or the wave come back from Buffalo. I was able to time my arrival when I got enough water.

So that's what your products and these gauges and the current meters do, but a lot of it -- some of it's predictable but some of it isn't. It still changes like the wind.

MR. NEKVASIL: Well, if there are no more questions I would just like to make one final comment here. Mike talked about the lakes being a system, and earlier this morning the Corps of Engineers talked about this being a system.

I'd like to give you an example. Back in late 2012, early 2013, the water levels on the lakes were in a free fall. As a matter of fact, Lake Michigan, Huron actually set a new low.

And I took the CBS Evening News on one of our ships that had laid up in Milwaukee, and on her last trip of the season she had come in 3 feet short on draft.

She had left about 11,000 tons of iron ore back in Minnesota, but it wasn't her receiving port, Gary, Indiana. It wasn't her loading port. The reason why that boat lost 11,000 tons of cargo was there was this stretch in the St. Mary's River, and that's what set the draft.

And today, we could drudge Cleveland to 50 feet, but it wouldn't make any difference because there's a spot in the St. Mary's River that decides how much that boat can carry to Cleveland. So you have to look at this as a system.

MEMBER BRIGHAM: Back in historical record, back in the late 70s when there was extended navigation almost through the year -- in fact I think one year it was just shy of three weeks. I think one of the unintended consequences was, in fact, damage on the coastal areas.

And so I think if we try to do this in the 21st century there would be a big more pressure on one of the unintended consequences of ice flow and damage and coastal erosion, et cetera with the new heightened interest in the Great Lakes.

CHAIR HANSON: Anybody else? All

right. We'll conclude the panel, and really appreciate you all that was on it. I knew you'd come through for you me.

Sometimes a good panel actually leaves as many questions unanswered as they do answered, right? There's a lot going on right now. So this is a public meeting, and this is an opportunity for the public to speak.

So if we have anybody in the audience who would like to address the panel or has some questions, now would be a time to do so. Either raise your hand or step to the mic or forever hold your peace. I think we'll have another opportunity tomorrow.

(Off microphone comments.)

CHAIR HANSON: All right. So the meeting with adjourn for the day. We will reconvene tomorrow morning at 0800, same room. Thank you very much.

(Whereupon, the above-entitled matter went off the record at 2:40 p.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Hyrdrographic Services Review Panel

Before: NOAA

Date: 08-30-16

Place: Cleveland, OH

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R. Gross

Court Reporter