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THE U.S. ARMY CORPS OF ENGINEERS EMERGENCY RESPONSE TO HURRICANE IDA

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED SEVENTEENTH CONGRESS

FIRST SESSION

OCTOBER 6, 2021

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ONE HUNDRED SEVENTEENTH CONGRESS

FIRST SESSION

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C O N T E N T S

THE U.S. ARMY CORPS OF ENGINEERS EMERGENCY RESPONSE TO HURRICANE IDA

WEDNESDAY, OCTOBER 6, 2021

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The Committee met, pursuant to notice, at 10:07 a.m. in room 406, Dirksen Senate Office Building, Hon. Thomas R. Carper (Chairman of the Committee) presiding.

Present: Senators Carper, Capito, Cardin, Whitehouse, Kelly, Inhofe, Boozman, and Ernst.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Good morning, everybody. I am pleased to join Senator Capito and our colleagues in calling this hearing to order.

Welcome, everyone.

To our witnesses joining us today from the U.S. Army Corps of Engineers; Major General Butch Graham; how long have people been calling you Butch?

General GRAHAM. Senator, since I was born. So, I am a junior, and my dad took Bill Graham, so they didn't call me Billy Graham.

[Laughter.]

Senator CARPER. My mother wanted me to grow up and be Billy Graham. Down in Danville, Virginia, we spent a lot of time in a Baptist church, so you know what I mean.

Welcome, Butch Graham, and welcome to Brigadier General Tom Tickner, nice to see you again, and to Colonel Steve Murphy. We are glad that you could join us today.

To the folks that are behind you and part of your supporting team, we welcome all of you.

Thank you for joining us for what, sadly, has become an all too frequent issue over that last couple of years, and that is providing emergency response in the aftermath of extreme weather.

Each of our witnesses comes from a different position within the Corps, and actually from different parts of the country, that we were just talking about. They all are going to be able to share with us their points of view on the Corps' response to Hurricane Ida, as well as their thoughts on investing in more resilient water resources infrastructure or building back better, as our President likes to say.

As we all know, since 1980, North Atlantic hurricanes have become more intense, and unfortunately, more frequent. This trend is projected to continue in the years ahead as our planet continues

to warm. Accordingly, the importance of the Corps' emergency response services will grow, as well.

That is why we must ensure that all parts of our government, that includes Federal, local, and State, are all working together in lockstep to improve the resiliency of our infrastructure so it can withstand these extreme storms.

In New Orleans, the 14 and a half billion dollar flood protection system built after Hurricane Katrina is a good example, really, a great example of a smart, all of government approach to resilience, one where the Federal Government funded the total cost of the project and the State of Louisiana has now begun to pay back its share.

They have, actually, a similar arrangement on a highway in Delaware, Route 301. If you get to drive out of here and go east from DC and go through Maryland and finally get into Delaware, 301, the Federal Government upfronted the money, and the State of Delaware is paying it back with tolls, a similar kind of approach.

When Hurricane Ida made landfall exactly 16 years after Katrina, this new system was put to its first test.

Fortunately, it held strong and prevented the catastrophic flooding in New Orleans that we saw in 2005. This is where we can see that Federal investment in resiliency pays real dividends, but challenges still remain.

One of the biggest obstacles with projects like the one in Louisiana, as well as the Indian River Inlet in Delaware, is that States and localities often rely on reimbursements from the Corps to cover the costs of operating and maintaining these projects after they are constructed.

But the Corps, constrained by politics and budget shortfalls, can't always recover all of these costs, leaving States and communities to foot the bills.

The result is that areas strapped for resources are unable to make the investments in resilience that they desperately need, and we know that the need is real. The stakes could not be higher, including our economy, our homes, and people's very lives and livelihoods are at stake.

Just look at how Louisiana fared during Ida. While sophisticated water infrastructure in New Orleans protected much of the city from flooding, other communities in the State were devastated. We might have a photo of that. Yes, there we go.

In my home State of Delaware, which found itself in the path of Ida's remnants as the storm turned north, we experienced severe beach erosion; we experienced flooding and wind gusts of up to 60 miles per hour. I think we have a shot of Smith Bridge Road that we saw.

New Jersey faced similar shoreline erosion, and many of us saw the videos of water rushing through and flooding New York City's subway systems. While the final number of deaths attributed to Hurricane Ida is not yet in, so we know 29 confirmed deaths in Louisiana and more than 40 in New York and New Jersey, with deaths reported in at least seven additional States.

In addition to its tragic human toll, experts project Ida's economic impact at over $90 billion, making it the seventh—seventh—costliest hurricane to hit the United States since the year 2000.

Just think about that: Seven hurricanes, each responsible for more than $90 billion in economic impact, all within 20 years; seven within 20 years.

Like all major storms, Ida is teaching us a lot, including about what works and what does not work.

While we can all be thankful for the feat of human engineering that protected New Orleans, one of the Nation's most vital port systems, from Ida's destruction, we must also recognize that, until we address the root causes of climate change, the U.S. will continue to face natural disasters of increasing severity and intensity with even more devastating impacts. That is why we need to rapidly and dramatically reduce our greenhouse gas emissions, while we increase investments in resilience and create a lot of jobs while doing so.

Benjamin Franklin once said that an ounce of prevention is worth a pound of cure, and his words still ring true today.

The Corps of Engineers Civil Works Program provides tremendous value to our Nation as the primary provider of water resources infrastructure.

And with more extreme weather events caused by a changing climate, it has never been more important that our infrastructure stands up to the growing challenge and protects the people that we all represent.

We look forward to hearing each of your testimonies today, but first, I want to turn to Shelley Capito; we call each other wingman and wingwoman, but we are partners in crime here, but hopefully partners for doing a lot of good. I want to turn to her for her opening statement.

We all have competing hearings that are going on right now. I have a business meeting going on in the Homeland Security and Government Affairs Committee, for which I used to Chair.

It is a business meeting where they need me to come and be there for a quorum and to do votes. We are going to do that at the beginning, and then you are in charge and will start our witnesses' testimonies, and I will come back as fast as I can.

Thank you, Senator Capito.

OPENING STATEMENT OF HON. SHELLEY MOORE CAPITO, U.S. SENATOR FROM THE STATE OF WEST VIRGINIA

Senator CAPITO. Thank you, and good morning to everybody.

It is good to see a familiar face here in Major General Graham, who served as Commander of the Pittsburgh District.

When I was in Congress, you were my Corps leader, which covers a significant portion of my State of West Virginia.

Colonel Murphy, thank you for being here today and for the warm hospitality extended by you and your team to the Committee staff during their visit to Corps facilities in Louisiana earlier this year.

And I want to thank you also, General Tickner, for being here with us today.

Thank you for your service. I know some of it has not been domestic; some of it has been international, and I thank you for that.

We all intently watched the impacts and aftermaths of Hurricane Ida, both in Louisiana, but also in the Northeast. Tragically, an es-

timated 82 people lost their lives and billions of dollars in damages. Those of us from States and communities that have recently experienced terrible natural disasters feel greatly for our fellow Americans impacted by this hurricane.

As both Ranking Member of this Committee and also of the Homeland Security Appropriations Subcommittee, my staff and I have stayed abreast of FEMA's response to this disaster and the efforts of other agencies providing support, such as the Corps. How important that has been.

By the most recent count, the Corps has more than 710 personnel deployed and received 24 mission assignments, totaling $223.4 million in response to Hurricane Ida. The Corps has also issued $2.5 million in Flood Control and Coastal Emergency funds under Public Law 84–99. This funding went toward the protection and repair of critical infrastructure, as well as the provision of equipment and facilities to fight floods and maintain essential services.

Again, I want to reiterate my gratitude to the men and women of the Corps for performing these critical functions. I am also eager to hear from you on how we can support the Corps' efforts to help the Nation respond and recover from these types of disasters in the future.

By all accounts, and our Chair talked about this, the Hurricane Storm Damage Risk Reduction System, known as HSDRRS, for New Orleans authorized by Congress and constructed by the Corps after the catastrophe of Hurricane Katrina performed as intended. The system prevented a more significant loss of life and severe damage to the city.

Not all areas are covered by the system, however, and that is where we saw the devastation in those unprotected communities in Louisiana and replicated in the northeastern States.

It is important that local, State, and Federal partners continue to work together to identify and address existing gaps in flood risk management and coastal storm damage reduction.

The $5.7 billion in supplemental funding provided by the Congress to the Corps just last week will support these efforts. Solutions will take time, however, which is why it is also important that the Corps continues to work with communities to identify and mitigate risks through its Silver Jackets Program, Planning Assistance to States, and other authorities.

Challenges with and suggested improvements to existing technical assistance programs are something that I am keen on hearing from all of you. I am also eager to hear about how we can support the Corps' efforts to help the Nation respond and recover from these disasters in the future.

This Committee will do its part in this process by authorizing individual projects and studies and providing programmatic direction to the Corps through biennial Water Resources Development Act legislation, which we are actively engaged in right now.

In closing, let me reiterate our gratitude, and again, I want to thank Chairman Carper for having this hearing.

Senator CAPITO [presiding]. I would like to introduce our witnesses in the absence of our Chair.

First, Major General William "Butch" Graham is the current Deputy Commanding General for Civil and Emergency Operations at Headquarters, U.S. Army Corps of Engineers, where he oversees all the Corps Civil Works activities, a $7 billion annual program, and responses to storms and other natural disasters.

His previous Corps assignments include Commander of North Atlantic Division and the Pittsburgh District, from which he hails.

Our second witness is Brigadier General Tom Tickner, the current Commander of the North Atlantic Division. He oversees all aspects of a $5 billion annual program that covers six districts, including activities in more than a dozen States, Africa, and Europe. His previous Corps command assignments include Pacific Ocean Division, Savannah Division, and Philadelphia District.

Our third witness is Colonel Steve Murphy. He is the current Commander of the New Orleans District, where he oversees all Corps activities in southern Louisiana, so you are a busy man. He previously commanded the Nashville District of the Corps of Engineers.

I want to welcome each of you to the Committee today. We appreciate your service to the country and look forward to your statements.

General Graham, we will start with you.

STATEMENT OF MAJOR GENERAL WILLIAM "BUTCH" GRAHAM, DEPUTY COMMANDING GENERAL FOR CIVIL AND EMERGENCY OPERATIONS, U.S. ARMY CORPS OF ENGINEERS

General GRAHAM. Ranking Member Capito and distinguished members of the Committee, thank you for the opportunity to testify today to discuss the U.S. Army Corps of Engineers emergency response to Hurricane Ida.

Again, I am Major General Butch Graham, the Deputy Commanding General for Civil and Emergency Operations here at headquarters.

I would like to start by extending our sincere condolences to the families who lost loved ones during Hurricane Ida. Our thoughts and prayers are with those who have been impacted by this storm.

As was mentioned, Hurricane Ida made landfall on August 29th as a category 4 storm and immediately began to draw comparisons to Hurricane Katrina. As was mentioned, following Hurricane Katrina and the devastating flooding in the city of New Orleans, $14.5 billion Hurricane and Storm Damage Risk Reduction System was built. As its name implies, it was built to reduce the risk of flooding caused by storms to the city. During Hurricane Ida, this system performed exactly as designed.

The projects the Corps builds help the reduce the flood risk of vulnerable communities. We must also be prepared to respond when some of those flood risks are actually realized. This aspect of resiliency is achieved through our emergency response partnerships with FEMA, State and local governments, and our key contracting partners.

In response to Hurricane Ida, as many as 760 Corps personnel have been deployed, so we snuck an extra 50 in on you.

The Corps has indeed done 24 FEMA Mission Assignments, totaling almost a quarter-billion dollars. As was mentioned, under

our Public Law 84–99 authorities, the Corps has issued $2.5 million of Flood Control and Coastal Emergency funds.

As part of this massive response, with the team I am immensely proud of, I would like to highlight one of our missions: Temporary roofing. Operation Blue Roof is managed by the Corps on behalf of FEMA. The goal of the program is to provide homeowners in disaster areas with industrial strength sheeting to protect storm damaged roofs. This allows residents to return to their homes, restarting local communities and local economies.

Since September 1st, the Corps has received over 34,000 valid requests. As of this morning, we have completed over half: 17,000 roofs have been installed to date.

To put this in context, last year for the two hurricanes that hit the Gulf Coast, Laura and Delta, the Corps installed 13,000. So, 13,000 last year, and we are up to 34,000 we need to install this year, and we have completed 17,000 to date. This threefold increase provides a perspective of just how damaging Ida was.

After any event, working with FEMA, we critically evaluate ourselves to see where we can improve. For the temporary roofing mission, even though we are installing roofs at almost twice the rate as our previous efforts, we are looking for ways to get started sooner by speeding up how we get work orders to our contractors and by bringing in, potentially, our contractors early, pre-landfall.

Looking more broadly, we continue to see record setting severe weather events across the Nation. Last year alone, we responded to 28 different disasters, including 10 hurricanes, nine major floods, and three major wildfires.

One of the ways we are responding to this challenge in the future is by incorporating climate change resiliency into our planning process, giving the scale of climate change a broader, more regional approach to planning for future events as required. Recently, the Chief of Engineers made a recommendation for the authorization of a $29 billion system wide risk management strategy for the coastline of Texas.

When looking at any future project, we understand that we need to comprehensively evaluate and analyze all project benefits. The Water Resources Development Act of 2020 created flexibility for the Army Corps to address the needs of economically disadvantaged communities, minority communities, and rural communities. The act promotes an approach that analyzes multiple benefits for project justification: Social benefits, economic benefits, and environmental benefits.

The authorities in this act encourage the use of natural and nature based features, seek alternatives to accommodate for sea level rise, and inspire innovative ways to expand beneficial reuse of dredged material. We are working hard to put these new authorities to work for the American people.

Thank you again for the opportunity to speak today. I look forward to answering any questions.

[The prepared statement of General Graham follows:]

DEPARTMENT OF THE ARMY

WRITTEN STATEMENT
OF

MAJOR GENERAL WILLIAM H. GRAHAM
DEPUTY COMMANDING GENERAL, CIVIL & EMERGENCY OPERATIONS

U.S. ARMY CORPS OF ENGINEERS

BEFORE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ON

THE U.S. ARMY CORPS OF ENGINEERS EMERGENCY RESPONSE TO HURRICANE IDA

OCTOBER 6, 2021

Chairman Carper, Ranking Member Capito and distinguished members of the Committee, thank you for the opportunity to testify before you today to discuss the U.S. Army Corps of Engineers (Corps) emergency response to Hurricane Ida.

I am Major General Butch Graham, the Deputy Commanding General for Civil and Emergency Operations. I am pleased to be joined by Brigadier General Tom Tickner, the commander of the North Atlantic Division, headquartered in New York City, and Colonel Steve Murphy, the district engineer of our New Orleans district.

First, I would like to start by extending our sincere condolences to the families of those who lost their loved ones during Hurricane Ida. Our thoughts and prayers are with all those who have been, and continue to be, adversely impacted by this devastating storm.

Next, I want to express how proud I am of the work the Corps has been providing since Hurricane Ida made landfall almost 40 days ago. When Ida made landfall as a category 4 storm on August 29, the storm immediately began to draw comparisons to Hurricane Katrina, especially in the city of New Orleans.

The size and scope of Ida proved to be significantly different in the way it moved through the country. We saw damages caused by the storm from the Gulf Coast all the way up into Pennsylvania, New York and New Jersey.

Preparation
While Katrina and Ida share some of the same characteristics; both large, catastrophic storms that hit the Louisiana coast 16 years apart – to the day – it's important to remember that each storm has a unique set of characteristics such as speed, track and pressure, and each storm presents its own operational challenges.

Following Hurricane Katrina, which resulted in devastating flooding in New Orleans, the Nation invested $14.5 billion to reduce the future flood risk in New Orleans and some of the surrounding areas, which included full up-front funding for construction of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System. This system consists of approximately 200 miles of levees and floodwalls, 73 non-Federal pumping stations, four canal closure structures with massive pumps and three gated outlets.

The system was constructed to elevations that defend against surge levels that have a 1-percent chance of occurring in any given year, informally referred to as a "100-year storm surge." Additionally, by armoring the earthen levees and transition points, , the Hurricane Storm Damage Risk Reduction System is designed to be resilient to storms with greater than a 1-percent surge – to withstand overtopping without washing away. The system is a state-of-the-art design, and an outstanding example of what

engineering research and development, combined with prudent investments in infrastructure, can accomplish.

During Hurricane Ida, the system performed exactly as it was designed to.

In addition, it's important to highlight the partnership aspect of preparations for a storm. In a flood, hurricane, or other natural disaster, the Corps works with others, as part of a team. We contribute to and rely heavily on their efforts, at every echelon, from local, regional, state, and tribal partnerships, all the way up to the federal government. The partnerships we have with the Federal Emergency Management Agency (FEMA), state and local government agencies, as well as our contractors, are crucial during emergency response situations.

The Corps conducts its emergency response and recovery activities under two basic authorities: the Stafford Disaster and Emergency Assistance Act (Stafford Act); and Public Law 84-99, as amended (PL 84-99), 33 U.S.C. § 701n. Under the Stafford Act, we and other Federal agencies work under the direction of the Federal Emergency Management Agency (FEMA). PL 84-99 provides a separate source of authority for the Corps to prepare for and respond to floods, hurricanes, and other natural disasters, and to support emergency operations in response to such disasters.

Under the Stafford Act:

- As provided in the National Response Framework, the Corps serves as the lead Federal coordinating agency for Emergency Support Function 3 (ESF-3) (Public Works and Engineering); and

- As provided in National Disaster Recovery Framework, the Corps serves as the lead Federal coordinating agency for Recovery Support Function (RSF) – Infrastructure Systems.

In both of these capacities, the Corps assists the overall Federal effort, working with other Federal agencies as directed by FEMA.

When a major storm, such as IDA, is imminent, the Corps begins to identify and pre-position available resources to enable a timely and efficient response to potential requirements. The Corps coordinates with state, territorial, tribal, and local partners to ensure we are ready to provide support as soon as possible after receiving a FEMA mission assignment. In the case of IDA, we had teams positioned for response four days ahead of landfall. Our guidance from FEMA Administrator Criswell was clear: Lean forward.

Response
As I said, when disaster strikes, the Corps can conduct emergency response activities under two basic authorities – the Stafford Act and Public Law 84-99.

Under the Stafford Act, the Corps serves as the lead agency for Emergency Support Function #3 - Public Works and Engineering. In this capacity, the Corps responds with infrastructure response and recovery activities when missions are assigned by FEMA. Through this authority we provide services such as temporary power, temporary roofing, debris removal, and infrastructure assessments.

Public Law 84-99, Emergency Response to Natural Disasters, which is a separate source of Corps' authority, enables the Corps to provide certain kinds of assistance for emergency activities in support of state and local governments at their request. Under this authority, the Corps can provide both emergency technical and direct assistance in response to flood and coastal storms, and disaster preparedness services and advanced planning measures designed to reduce the amount of damage caused by an impending disaster.

Under this authority, the Corps has used $2.5 million of its Flood Control and Coastal Emergencies (FCCE) funds to prepare for and respond to Hurricane Ida.

In support of our navigation mission on the Mississippi River and the Gulf Intercoastal Water Way, ongoing activities to restore navigation include surveying the state of the federal channels, and excavating, dredging and removing obstructions to reopen these critical lines of commerce.

In response to Hurricane Ida, up to 408 individuals were deployed to the field, and up to 471 individuals were engaged to provide response support, coordinating with local, state, and federal partners in the affected areas.

To date, the Corps has received 24 FEMA Mission Assignments including temporary power, temporary roofing, temporary housing planning and design, infrastructure assessment planning, debris removal oversight, and unwatering. To date, mission assignments to the Corps from FEMA have totaled over $223 million.

I would like to take this opportunity to highlight two of those missions, temporary power and temporary roofing.

Temporary Roofing Mission
Operation Blue Roof is a priority mission managed by the Corps on behalf of FEMA. The goal of the Blue Roof program is to provide homeowners in disaster areas with fiber-reinforced, industrial-strength sheeting to protect storm-damaged roofs until homeowners can make permanent repairs.

This program is a no-cost service for homeowners. Operation Blue Roof is designed to protect property, reduces temporary housing costs, and allow residents to stay in their

homes while having repairs done. This program provides real results on the ground to people who have been impacted by a disaster.

Each one of the roofs that we install goes onto the home of a person or family who is experiencing a devastating and traumatic event. For Hurricane Ida, Operation Blue Roof began September 1, just three days after the storm made landfall. The first blue roof was installed one week later on September 8.

Since the program started on September 1, the Corps has received 37,217 valid requests and completed 9,800 installs across 25 of Louisiana's parishes. To put this in context – last year for both Hurricanes Laura and Delta combined, the Corps installed 12,977 blue roofs. This threefold increase in requests for blue roof installations also provides a perspective on how widespread the size and scope of the damage from IDA has been.

As this mission continues, the Corps is working closely with FEMA and prioritizing installs to provide the maximum amount of help to the maximum number of people as quickly as possible. The program registration period was extended to allow residents in the designated parishes to sign up through October 15.

Temporary Power Mission
Another of our response mission areas is providing temporary power to critical infrastructure such as water and wastewater treatment plants and pumping stations, medical facilities, communications facilities, and public safety facilities. These public facilities enable communities to function in the immediate aftermath of the storm.

The Corps executes this mission with our contractors and the U.S. Army's only prime power battalion.

In response to Hurricane Ida, one of the first installed generators was at the Southeast Louisiana Veterans Home in Reserve, Louisiana. As Governor Edward's top priority, the generator was installed on August 31 at the 156-bed facility, which prevented the residents of that home from having to move.

All total, the Corps completed 221 requested assessments and 82 generator installations.

Lessons Learned
After any event, we evaluate our processes to see where there are opportunities to do as much good as possible. While we are still in the process of responding to IDA, the Corps is already working with FEMA to see how we can improve our processes for the next storm.

So far, we have identified a few areas where we can better lean forward. For the Temporary Power mission, we are going to bring forward additional leadership, contracting, and program management support to assist in identifying quickly where temporary power is most needed. We also plan to better incorporate our contractors into that effort, fully leveraging their skills and expertise.

For the Temporary Roofing mission, we are looking for ways to get started sooner by speeding up the process of getting roofing work orders to our contractors, and perhaps by bringing in the contractors early, pre-landfall, so they are staged and ready to go.

Future Outlook

Looking more broadly, as we continue to see record setting severe weather events throughout much of the country, the challenge for our engineers is designing, building and operating our infrastructure to account for these significant severe swings in weather patterns. Last year, we responded to 28 different disasters including 10 hurricanes, nine major floods, and three major wildfires.

One of the ways we are preparing for the future is by incorporating climate change resiliency into the project planning process and incorporating natural and nature-based solutions, where feasible, in our Flood Risk Management and Coastal Storm Risk Management projects.

Building climate change resiliency into our designs and considering the large-scale effects of climate change challenges how the Corps has historically planned and designed our risk reduction projects. A broader, often regional, approach to planning for potential future events is necessary and we are starting to see the benefits of this approach in some of our studies.

Building climate change resiliency into our planning processes provides some challenges as well. The Corps understands that in planning for resiliency, it is important to comprehensively evaluate, analyze, and document project costs as well as the economic, environmental, and safety, benefits.

The Corps is working to help the Nation become more climate resilient. Our overall approach to water resources management considers a wide range of alternatives and their multiple benefits – not just a project's benefit-cost ratio. We are working to ensure the sustainability of the projects that we recommend, and to encourage the use of natural and nature-based features.

Closing

The Corps is committed to being as prepared as possible when the next storm hits. We will continue to apply lessons learned from past storms, work closely with our government and industry partners, and remain focused on delivering engineering solutions for the Nation's toughest challenges.

Thank you again for the opportunity to speak here today and I look forward to answering any questions you might have.

Senate Committee on Environment and Public Works
Hearing Entitled, *"The U.S. Army Corps of Engineers Emergency Response to Hurricane Ida"*
October 6, 2021
Questions for the Record for Major General Graham

Chairman Carper:

1. Considering all the relevant research that has been done on the importance of resilient infrastructure, how can the Corps design more resilient flood risk management solutions?

   Response: As the climate continues to change, USACE Civil Works studies will continue to utilize the most relevant research during feasibility and design ensuring resiliency is incorporated into the formulation of the solution and included in the project design. USACE recently published a Climate Action Plan that details the USACE commitment to integrate the best available observed and forward-looking climate information into its missions, programs, and management functions, as allowed within relevant authorities. This plan describes how climate effects and vulnerabilities are and will be considered in USACE decision-making.

   a. Does the Corps need to update its construction and engineering standards to better the issue of resiliency?

      Response: Per the 2021 USACE Climate Action Plan, USACE will be issuing revised technical design guidance and will be updating its guidance on the use of climate-affected hydrology data, climate preparedness, and sea level rise scenarios.

   b. What are the barriers to building the infrastructure back better post incidents that damage the existing construction?

      Response: There are none. However, it is often easier to repair or rebuild the infrastructure that was in place prior to the flood, instead of taking the time to evaluate other options that may be better in the long-run. If the performance of a federally authorized project during flood events signals the need to consider modifications outside the scope of PL 84-99, a feasibility study can be conducted to determine the appropriate changes, if any, to the existing project authorization.

2. What are the pros and cons of using financial agreements, like the one that built New Orleans' Hurricane Storm Damage Risk Reduction System, for future projects that protect the health, life, and safety of communities?

   Response: Beginning with the supplemental appropriations acts funding construction of the New Orleans' Hurricane Storm Damage Risk Reduction System and continuing with the supplemental appropriations acts that provided funding to address Hurricanes Sandy,

Harvey, Irma, Maria, Michael, and Ida, Congress has appropriated funds to 1) cover all Federal costs to construct certain flood and storm damage risk reduction projects. In addition, in these acts, Congress has included funds to 2) allow for the financing of the non-Federal cash contribution.

1) Providing all Federal funds upfront for the Federal share of construction costs:

PROS:

- Reduces uncertainty regarding the availability of future funding for the project.
- USACE may be more able to purchase mitigation credits when they become available.
- USACE and non-Federal sponsors may be more willing to reassign existing staff or hire additional staff to support efficient project execution.
- Non-Federal sponsors may be more able to acquire all of the necessary real estate for the project in a timely way.

CONS:

- USACE has had difficulty estimating the cost to complete some of its projects.
- Allocating funding that a project cannot use for several or more years may have the effect of delaying work on other projects.
- Some non-Federal sponsors may not be prepared to provide their share of the cost concurrent with project construction, or may not be willing to pay accrued interest on any part of their share that they may be allowed to repay later.
- Some non-Federal sponsors may not be prepared to acquire all of the necessary real estate for the project in a timely way.

2) Providing Federal funds to allow for financing of the non-Federal cash contribution for up to 30 years after completion of construction:

PROS:

- Schedules are not limited by the ability of the non-Federal sponsor to have funds in hand, enabling the possibility for an earlier start of construction, and more efficient project delivery.

CONS:

- Some non-Federal sponsors cannot or do not want to incur debt and therefore prefer the more traditional "pay-as-you-go" approach.
- Requires appropriation of additional Federal funds by Congress to offset non-Federal sponsor funds that otherwise would be provided during construction.
- Financing of the non-Federal cash contributions may reduce the amount of Federal funds available for other projects, and delay their implementation.
- There is no guarantee that the non-federal sponsor would be willing or able to provide their cost share (payback their "loan" from Treasury) at a future date.

3. Please describe the Corps' interface with FEMA, as well as other federal stakeholders, and non-federal stakeholders before, during, and after Ida passed and compare it to past interactions, like during Hurricane Katrina.

   Response: USACE routinely coordinates preparedness activities with FEMA, other federal agencies, state, Tribal, and local emergency management offices to ensure communities can more effectively respond and recover from disaster events. USACE is the designated lead federal agency in support of FEMA for Emergency Support Function 3, Public Works and Engineering (ESF 3), and in this capacity performs work assigned by FEMA as part of the coordinated federal response. USACE also can assist prior to, during, and after a flood disaster under its own authority, Public Law 84-99. Understanding the importance of being postured for a rapid response during declared emergencies, FEMA generally will mission assign USACE and ensure prepositioning of subject matter experts for debris management, infrastructure assessment, temporary power generation, temporary roofing, and other missions in order to be able to quickly assess the situation and respond. USACE uses continuous improvement processes to routinely review disaster response and recovery performance and make any necessary improvements for subsequent events.

   a. Are there policy changes for the Corps that could help the agency be a better partner to federal stakeholders in disaster response?

      Response: USACE has not identified any particular policy changes needed at this time, but remains committed to completion of its continuous improvement processes and any subsequent conclusions/recommendations.

   b. Are there policy changes for the Corps that could help the agency be a better partner to non-federal stakeholders in disaster response?

      Response: No USACE policy changes are recommended at this time. USACE is committed to a continuous improvement process. Using information from previous disaster responses, USACE will review, coordinate, and improve program delivery.

4. Section 133 of WRDA 2020 allows for the Corps to repair and rehabilitate USACE constructed pumping stations that are essential to Corps flood risk management projects. Given that many of the pump stations in New Orleans were locally constructed, do you support expanding this provision so that it applies to all pump stations, including locally constructed pump stations? Why or why not?

   Response: No. Locally constructed pump stations that are not an integral part of a USACE flood risk management project generally provide local stormwater management, which is a local responsibility.

Senator Cardin:

1. The remnants of Hurricane Ida unleashed record rainfalls in the Northeast, including New York City, where intense rainfall overwhelmed storm drainage systems and inundated

subway stations. In Maryland communities such as Ellicott City, we are also beginning to see impacts from severe rainfall events that are fundamentally different from the flooding events of recent memory. Rather than flooding solely from rising water levels in our streams as a result of regional rainfall, we now face flood risks from locally-intense rainfall alone.

a. How might the Army Corps of Engineers play a more proactive role in addressing new, growing risks to communities and infrastructure posed by intense rainfall events?

Response: The construction and the operation and maintenance of local stormwater management infrastructure is a local responsibility. However, USACE has a number of programs/authorities through which it can provide technical or planning assistance to state/local/Tribal/territorial partners to help them understand and address their flood risk, including the risk associated with urban stormwater.

USACE has technical assistance authorities, including Floodplain Management Services (FPMS) and Planning Assistance to States (PAS), which enable USACE to help a state, Tribe, or local authority understand their flood risk as well as develop concepts for addressing that risk. Through FPMS, partners can receive assistance with activities such as inundation mapping, development of floodplain management plans, emergency action/evacuation plans, flood risk assessments, nonstructural flood risk management alternative assessments, and risk communication and outreach efforts. Under FPMS, USACE also has access to the National Nonstructural Committee, a small team of subject matter experts who provide advice and assistance with implementation of nonstructural flood risk management techniques across the agency. Nonstructural solutions such as the acquisition of land and associated structures, floodproofing, elevation, etc., may be more cost effective for areas where higher frequency flooding events are localized and do not produce enough damages to justify large structural solutions.

Under the PAS program, USACE can partner with non-Federal interests to support state, Tribal, or local planning efforts on water resources issues, by providing technical assistance. Comprehensive planning can help to ensure that significant atmospheric events are analyzed in a manner that reflects the connectedness of the key resources within a watershed. The PAS program also includes technical assistance for analysis in support of a state's water resources management and related land resources development plans such as state hazard mitigation, preparedness, response, and recovery plans and plans associated with changing hydrologic conditions, climate change, long-term sustainability, and resilience. Consideration of climate change and community resilience are factors that may not have been adequately considered when existing stormwater management systems were constructed and are both critical to address risks that have developed since that time. It is important to note that these technical assistance programs cannot be used to construct or implement any solution that

may be identified as a result of the assistance, but they still provide valuable information and recommendations to the partner/jurisdiction.

USACE uses its existing resources to proactively communicate with non-Federal entities regarding both the FPMS and PAS programs, as well as other areas where USACE has authority to provide assistance. The Silver Jackets program is a great example of how USACE is engaged in states and communities and with Tribes in communicating flood risk and opportunities for partnering; however, challenges in communication do exist. The lack of knowledge of USACE programs could be a potential impediment to the USACE ability to assist these communities.

b. What are the current ways and/or venues in which the Corps is coordinating with other federal agencies that have a role to play in mitigating urban flooding, including EPA, FEMA, HUD, and NOAA?

Response: The National Flood Risk Management Program (NFRMP) provides mechanisms for USACE team members to coordinate with others involved in flood risk management broadly. Through NFRMP, USACE coordinates regularly with other federal agencies, including EPA, FEMA, HUD, and NOAA, on various aspects of flood risk management. USACE also coordinates with other partners involved in flood risk management, including partners at state/local/Tribal/territorial government agencies, academia, and nongovernmental organizations such as the Association of State Floodplain Managers (ASFPM) and the National Association of Flood and Stormwater Management Agencies (NAFSMA). The concept of urban flooding and opportunities to collaborate to address this flood risk management challenge has been discussed in various forums with all of these partners.

Within the NFRMP, USACE participates, along with other federal agencies, on the state-led interagency collaborative Silver Jackets teams, which focus on addressing state-identified flood risk management challenges. Support to these Silver Jackets teams provides a venue for interagency collaboration to find opportunities to leverage relevant programs/funding/authority across multiple agencies to improve understanding of urban (and other) flood risk challenges and identify opportunities to mitigate the risk.

USACE also participates in various other interagency bodies with a focus on flood risk management and mitigation. One example is the Mitigation Framework Leadership Group (MitFLG), chaired by FEMA. While focused on an all-hazards environment rather than flood risk or urban flooding specifically, the collaboration between agencies under this group enables focused support for hazard mitigation. MitFLG is currently focused on implementation of the National Mitigation Investment Strategy, which has the goal of increasing understanding by the affected federal, state, tribal, and local government agencies, nongovernmental partners, and interested members of the public of investment opportunities in hazard mitigation. Efforts to implement this strategy will enable

more focus on mitigation opportunities across the board, including those that might be specific to urban flood risk.

USACE also works with other federal agencies on data development, management, and communication through regular coordinated actions for the management of USACE water resource infrastructure. This is most evident through daily interactions with the various River Forecast Centers (RFCs) across the Continental United States (CONUS) and integrated efforts with NOAA, USGS and FEMA as part of the Integrated Water Resource Science Services (IWRSS). Decision makers in all sectors of water resources use new and more integrated information and services to adapt to uncertainty, climate and land-use changes, and increasing demand on limited resources. IWRSS represents an innovative partnership of federal agencies with complementary operational missions in water science, observation, prediction, assessment, management, and in the social sciences and risk management. Federal partners engage in water-related matters, including water storage and supplies, water quality and restoration activities, water infrastructure, transportation on United States rivers and inland waterways, and water forecasting, and continue working together where the federal partners have joint or overlapping responsibilities to improve interagency coordination among other items. Through expansion of IWRSS, other federal agencies are being incorporated to ensure the overlap and partner-to-partner support builds upon a more conglomerate assembly of federal participation. The emphasis on the expansion is to better coordinate water resources programs within current authorities; enhance interagency and stakeholder communications; increase the exchange and availability of releasable data and information; enhance collaboration on water resources mapping and modeling; and establish opportunities for joint projects, programs, facilities, and other collaborative science, services and tools to support integrative and adaptive water resources management.

USACE is a member of the Green Infrastructure Federal Collaborative. Along with other collaborative members, including USDA, DOI, DOT, FEMA, and EPA, USACE works closely with federal partners to align knowledge and resources to build capacity for green infrastructure implementation. These coordinated efforts provide a platform to publicize the multiple environmental, economic, and social benefits of green infrastructure, including for urban flood mitigation. In addition, the collaborative seeks to facilitate strategies that foster climate resilience and encourage the equitable implementation of green infrastructure in all communities.

c. What new authorities, resources, or organizational changes do you think are necessary in order for the Corps to make greater use of its capabilities to proactively identify areas of vulnerability to extreme weather events, assess levels of risk, and pursue more regional or comprehensive planning, including across Corps mission areas, to mitigate these risks and protect communities?

Response: Communication of federal program authorities and abilities has improved significantly through participation in the Silver Jackets program; however, challenges remain in informing smaller, rural communities about the potential for participating in technical assistance programs or cost-shared studies. Notwithstanding the Silver Jackets program, the communication by states may sometimes have mixed success due to factors such as the specific abilities of state outreach programs, local participation in outreach events, etc.

Internally, USACE continues to examine ways to improve communication and outreach. Districts and MSCs work to share ideas and concepts for continually improving execution, and HQUSACE is working towards a virtual workshop to improve collaboration and solicit new ideas from field resources. USACE also continues to work with groups such as ASFPM to share ideas and information that could help to promote improved participation in USACE programs.

Senator Inhofe:

1. The 2019 flooding on the Arkansas River in Oklahoma was devastating – over $3.2 billion in damages across the entire basin and thousands of homes, cars, and businesses flooded. In the aftermath, Congress provided the Corps with over $70 million in supplemental funding for emergency response work in Oklahoma. Additionally, beginning with Section 1024 of WRRDA 2014, Congress has authorized the Corps to accept and use materials or services contributed by a non-Federal entity to repair a water resources development project damaged in a natural disaster. Last year, in Section 130 of WRDA 2020, Congress again authorized the Corps to reimburse non-Federal entities who provide materials, services or funds to repair Corps projects following a natural disaster. Since Congress has adopted the regular, 2-year cycle to consider water resources legislation, the Corps has been authorized with a number of new authorities to aid in the post-disaster emergency response and to mitigate against future disasters.

    a. How would implementation of Section 130 of WRDA 2020 assist the Corps in responding to natural disasters more efficiently?

    Response: Implementation guidance for Section 130 of WRDA 2020 is currently under development. USACE's acceptance and use of funds, materials, or services provided under Section 130 could be used for repair, restoration, or rehabilitation of water resource development projects during an emergency event. In providing services or materials, the non-Federal interest or private entity would have to comply with 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (labor standards originally enacted as the Davis-Bacon Act, the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kickback Act); Buy American Act (41 U.S.C. 8302); and National Environmental Policy Act of 1969. In addition, the non-Federal interest or private entity must comply with all laws and regulations, including procurement requirements, that would apply if such services or materials were acquired or carried out by the Corps.

b. How can the Corps work more efficiently with the private sector following natural disasters?

Response: Pre-event planning and coordination activities between the Corps and industry partners have been key to successful emergency response activities. One example is the use of sector-specific industry days. These events highlight federal agency key roles, responsibilities, and business opportunities for particular business sectors and, in turn, improve awareness by USACE and others of industry capability.

c. Looking forward, what additional authorities does the Corps need to be able to respond more efficiently to natural disasters, such as severe flooding events?

Response: No additional authorities are necessary.

Senator Wicker:

1. The Engineering Research and Development Center (ERDC) has a number of ongoing research and development activities related to disaster preparedness and response. Much of this work is being done in Vicksburg, Mississippi, at ERDC's Coastal and Hydraulics Laboratory. What positive impacts to the Army Corps' mission have you seen from research and development activities?

Response: The Engineer Research and Development Center (ERDC) is critical to meet our evolving Civil Works challenges such as the development of new materials to strengthen our infrastructure, new inspection technologies, and new methods to enhance our ecosystems. ERDC also works with agency, academic, and industry partners to conduct R&D to estimate the combined risk of coastal storm hazards and riverine flooding to coastal communities, and provides tools to aid in post-disaster response.

Before Hurricane Katrina hit the Mississippi and Louisiana coasts in 2005, ERDC was working with partners to integrate numerical coastal storm and riverine models considering storm track, sea level and infrastructure conditions to quantify coastal risk and resilience for coastal communities. USACE utilized these integrated models in supporting post-Katrina work under Mississippi's Coastal Improvement (MsCIP) program and Louisiana's Hurricane Storm Damage Risk Reduction System engineering and design. ERDC supported the USACE district in designing nature-based approaches with multiple lines of defense for storm protection. This work is still ongoing with agency partners through NOAA's National Water Center, Louisiana's Coastal Protection and Restoration Authority, and additional partners throughout the nation to leverage and innovate these cutting-edge models.

The Coastal Hazards Rapid Prediction System rapidly estimates impacts of storms and provides information to the district's Emergency Operations team to facilitate the deployment of personnel as well as flood/storm mitigation and recovery equipment.

In addition to laboratories in Vicksburg, MS, ERDC has a Field Research Facility, located in Duck, NC. This world-class coastal observatory has more than 40 years of

coastal process and response data – the longest, most complete record in the world. It has been utilized by other federal agencies, academia, and industry to test and validate the advanced modeling systems through a nearshore Coastal Model Test Bed, construct and test Engineering with Nature alternatives, and quantify the value for coastal communities.

Senator CAPITO. Thank you.
General Tickner.

STATEMENT OF BRIGADIER GENERAL THOMAS TICKNER, COMMANDER, NORTH ATLANTIC DIVISION, U.S. ARMY CORPS OF ENGINEERS

General TICKNER. Ranking Member Capito, distinguished members of the Committee, I am Brigadier General Tom Tickner, Commander of the Corps' North Atlantic Division. Thank you for the opportunity to provide some context to the Corps' response to Hurricane Ida in the Northeast region.

As storm risk management is a shared responsibility, one executed best in a whole of community approach, the Corps partners with Federal agencies and non-Federal stakeholders. This collective skill set, combined with the capability, enhanced our effectiveness in preparing for, responding to, and recovering from storm events.

In my role, I am responsible for Federal engineering work in all parts of the 14 northeastern States, from Virginia to Maine.

Before the storm hit our region, my districts were able to obtain reliable advance information concerning potential Ida impacts from the National Hurricane Center, the U.S. Geological Survey, the National Weather Service River Forecast Centers, and other meteorological data. This data, obtained through Public Law 84–99 authority, assisted in the accurate prediction of potential consequences Ida could bring, and we were able to communicate this risk to FEMA and the States through the Corps' mapping systems.

To manage risk to Corps owned and operated projects, USACE conducted predictive analysis based on weather forecasts, and the division lowered its Corps' dam reservoir elevations before the rain arrived to retain the maximum amount of flood storage available to reduce potential impacts downstream.

We provided early support to our State and local partners by contacting them to determine their needs. Several of our district emergency operation centers activated to provide technical assistance under P.L. 84–99. Flood fighting materials, such as sandbags, plastic sheeting, and alternate flood fighting materials, were placed on standby, prepositioned, and ultimately released as needed.

When the remnants of Hurricane Ida arrived, we were impacted mostly by significant fluvial events where rainfall overwhelmed stormwater systems and inundated local streams, leading to flash flood events and isolated tornadoes.

As part of our post-emergency assessments, I was able to conduct site surveys of locations within the storm's impact area. These locations included areas where the Corps has conducted studies, as in the Passaic River Basin, New Jersey; Manville, New Jersey; and in Merrimac, New York.

I also surveyed sites where the Corps has active projects, like the Indian Rock Dam in York, Pennsylvania, and the Raritan River in Bound Brook, New Jersey, and I am happy to report our projects performed as designed.

Finally, I observed areas where there was significant impact, but no current Corps projects or studies, like the Brandywine and Schuylkill Rivers areas of Philadelphia.

We also provided technical expertise to the States, including a Corps liaison officer to both Pennsylvania and New Jersey State Emergency Operation Centers. A subject matter expert on watering and debris removal to New Jersey EOC and on watering information for the Pennsylvania Department of Transportation. Both FEMA Regions 2 and 3, along with the States they supported, Pennsylvania, New Jersey, and New York, were satisfied with our proactive approach to this event.

In the aftermath of Superstorm Sandy, Congress asked USACE to prepare a performance report analyzing how our completed projects performed. That report and other work following Sandy has heightened our intent to build resilience into our coastal storm risk management and flood risk management projects.

Together with our Federal and non-Federal partners, we are currently completing post-storm evaluations to determine impacts and develop deficiency reports for these projects. An initial assessment showed damages incurred to some of our flood risk management project elements, which will require an investment in repairs.

In addition to the repairs and maintenance we conducted on these projects, in some cases, the Corps recommends a comprehensive assessment of their status to include a review of performance criteria and recommendations for updating based on current science, recent storm events, and factors such as climate change.

In common with much of the Nation's infrastructure, many of our projects require continuing investment and operation and maintenance to ensure their effectiveness. The Corps' team is committed to working together with our Federal interagency, State, and local partners to provide best engineering solutions for the tough challenges facing our communities.

Thank you again for inviting us to speak today. I look forward to your questions.

[The prepared statement of General Tickner follows:]

DEPARTMENT OF THE ARMY

WRITTEN STATEMENT
OF

BRIGADIER GENERAL THOMAS J. TICKNER
COMMANDER, NORTH ATLANTIC DIVISION

U.S. ARMY CORPS OF ENGINEERS

BEFORE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ON

THE U.S. ARMY CORPS OF ENGINEERS EMERGENCY
RESPONSE TO HURRICANE IDA

OCTOBER 6, 2021

Chairman Carper, Ranking Member Capito, and distinguished members of the committee, thank you for the opportunity to join Major General Graham in providing context to the U.S. Army Corps of Engineers (Corps) response to Hurricane Ida.

I am proud of the support our organization provided to states in preparation for the effects of Hurricane Ida, our response to recovery efforts, and our coordination with and support of the Federal Emergency Management Agency (FEMA) throughout this event.

As storm risk management is a shared responsibility, executed best in a whole-of-community approach, the Corps continues to partner with other Federal and non-Federal stakeholders. Our collective skillsets and capabilities form the basis for optimizing our effectiveness in preparing for, responding to, and recovering from storm events.

In my role as the commander of the Corps North Atlantic Division, I am responsible for federal engineering work throughout 14 northeastern states, from Virginia to Maine.

While Hurricane Ida hit Louisiana with the range of impacts associated with a Category 4 hurricane — coastal and fluvial flooding due to storm surge and rainfall, and wind impacts, including tornados — the remnants of Ida made their way across the North Atlantic region as a tropical storm. As a tropical storm, Ida caused fluvial impacts with rainfall overwhelming stormwater systems and inundating local streams leading to flash flood events and tornados.

Preparation
Before the storm hit the Northeast, we used the authority of Public Law 84-99, as amended, 33 U.S.C. § 701n, to obtain reliable, advance notice of potential Ida impacts from the National Hurricane Center, U.S. Geological Survey, the National Weather Service's River Forecast Centers, and other meteorological data, which assisted in the accurate prediction of potential consequences as Ida passed through the Northeast.

We communicated this risk using our Corps Common Operating Picture and Geographic Information System mapping tools to create and share shared potential flood inundation maps with FEMA as they became available. We shared information with states and other Federal agencies in real time.

We provided early support to our state and local partners by contacting them to determine their needs. We activated several of our district emergency operations centers to provide technical assistance under PL 84-99. Flood-fighting materials, such as sandbags, rolls of polyethylene plastic and alternate flood-fighting materials, were placed on standby, prepositioned, and ultimately released as needed.

To manage risk to the projects the Corps owns and operates, we conducted predictive analysis based on weather forecasts, and the division lowered its Corps' dam reservoir

elevations before the rain arrived to retain the maximum amount of flood storage available to reduce potential impacts downstream.

As you know, the flooding was significant. More than four dozen people from Virginia to Connecticut died as a result.[1] Our thoughts and prayers are with the communities who have been affected by this devastating loss of life and the significant damage to property caused by this extreme weather event. In our region, Hurricane Ida has been hailed as the costliest storm to hit the northeast since Hurricane Sandy in preliminary open-source assessments.[2]

In the aftermath of Hurricane Sandy, Congress asked the Corps to prepare a performance report analyzing how our completed projects performed. That report and other work following Sandy, has underscored the value of building resilience into our coastal storm risk management and flood risk management projects.

During Ida, the vast majority of our Corps projects performed as designed, lowering the damages from flooding in low-lying communities.

Response
After making landfall August 29 on the Louisiana coast, Ida weakened over land, becoming a tropical depression on August 30, as it turned northeastward. On September 1, the storm became a post-tropical cyclone accelerating through the northeastern United States, breaking multiple rainfall records, causing widespread flooding, and producing tornadoes in various locations along its path to the Atlantic Ocean the next day.

The storm exceeded our preliminary estimates. As I traveled northward touring the storm damage, I witnessed the aftermath of the event, and the projects and study areas in its path.

I first met with our team at Indian Rock Dam, a Corps project in York, Pennsylvania, to see how it was responding to the influx of rain; it performed as designed. I met with the FEMA Region III team in the Pennsylvania State Emergency Operations Center (EOC) along with our Corps' liaison officer who had been embedded with them prior to the storm's arrival. The only significant request was to provide unwatering information for Pennsylvania's Department of Transportation in the Philadelphia area. I also met with the FEMA Region II team in the New Jersey State EOC, where we also deployed a Corps liaison officer and two subject matter experts for unwatering and debris removal missions. Both the FEMA Regions and the states they support — Pennsylvania, New Jersey, and New York — were satisfied with our proactive approach to this event.

I also conducted site surveys of the flooding at the Raritan River in Bound Brook, New Jersey, where our Green Brook Flood Control Project also performed as designed. Despite an issue with a stranded commuter train near a railroad gate, which prevented a floodgate closure, Mayor Robert Fazen told news agencies Bound Brook fared much

better than during past comparable storms like Tropical Storm Floyd in 1999, which brought 10 inches of rain to town and 15 feet of water to its Main Street.[3]

My site survey of the Passaic River in New Jersey showed that regular flooding continues to be an issue in this area. The Corps has studied the Passaic River Basin for 85 years. Our studies have considered buyouts, tunnels and levees. We have installed stream gauges and early warning mechanisms that more than likely saved lives in this storm. During Ida, the Passaic River Basin saw moderate levels of flooding in its low-lying areas. To date, the comprehensive flood risk management proposals developed by the Corps have met resistance from stakeholder groups and have not moved forward.

I also surveyed Manville, New Jersey, and Mamaroneck, New York. Manville was included in the Millstone Study, which was terminated due to insufficient economic justification. The Mamaroneck Study has been authorized and is now in the Preconstruction Engineering and Design Phase.

In the Brandywine and Schuylkill River areas near Philadelphia, there were significant flash floods and loss of property during this storm event. Currently, there are no Corps' studies in this area[4], but we do own and operate Blue Marsh Lake — a dam and reservoir system used for flood risk management, water supply, water quality and recreation — which worked as designed. Unfortunately, local non-Corps' collection systems for communities located below the dam were overwhelmed by the intensity of the rainfall, which contributed to localized flash flooding.

Closing

Together with our federal and non-federal partners, the U.S. Army Corps of Engineers is currently completing post storm evaluations, including an assessment of the impacts of this storm for our projects. An initial assessment showed damages incurred to some of our flood risk management project elements, which will require an investment in repairs.

In addition to the repairs and maintenance we conduct on these projects, in some cases, the Corps recommends a comprehensive assessment of their status, to include a review of performance criteria and recommendation for updating based on current science and factors such as climate change.

The Corps recommends a comprehensive reevaluation using modern analysis to improve future performance and assess our projects' ability to withstand potentially more frequently occurring events. In common with much of the nation's infrastructure, many of our projects require a continuing investment in operation and maintenance to ensure their effectiveness.

We need to look at the overall performance of our completed works to inform future decisions on both that infrastructure and possible future infrastructure investments.

The Corps' team is committed to working together with our federal interagency, state, and local partners to provide the best engineering solutions for the tough challenges facing our communities. I am thankful of this committee's support as we continue these endeavors.

Thank you, again, for inviting us to speak to you today. I look forward to your questions.

-- END --

[1] Ida-related deaths in northeast region: 29 in New Jersey, 18 in New York, two in Pennsylvania, and at least one each in Virginia, Maryland and Connecticut.

SOURCE: https://disasterphilanthropy.org/disaster/2021-atlantic-hurricane-season/?gclid=Cj0KCQjwwNWKBhDAARIsAJ8Hkhed2RV5zeFYVQpYKDkPB2nySWPvc1CQ8J38orK0ZfNThSl9USYknPkaAp7PEALw_wcB

[2] Source: https://www.marketwatch.com/story/ida-caused-an-estimated-24-billion-in-damage-in-the-northeast-but-a-dismal-number-of-people-were-insured-for-flooding-11631127448

[3] Source: https://nj1015.com/once-synonymous-with-severe-flooding-bound-brook-did-ok-during-ida/

[4] On the Schuylkill, we have an aquatic ecosystem restoration study (Bartram Gardens). We also have a Flood Risk Management study near the Schuylkill in Eastwick (Southwest Philadelphia area) although the study area is focused on Darby/Cobbs Creeks area.

- Bartram's Garden Ecosystem Restoration Feasibility Study
  - Section 1135 CAP (Project Modification for Improvement of the Environment)
  - Purpose of study is to restore mudflats and wetland habitat at Bartram's Garden (botanical garden) along the Schuylkill River that was degraded by Schuylkill River maintenance dredging
  - Executed FCSA in February 2020 with Bartram's Garden ($500K total study costs)
  - Feasibility study currently underway and anticipated to be completed in January 2023 pending receipt of additional Federal and non-Federal funds

- Eastwick neighborhood of Philadelphia Flood Risk Management Feasibility Study
  - Section 205 of CAP (Flood Risk Management)
  - Purpose of study is to provide flood risk management to the Eastwick neighborhood of Philadelphia near the confluence of Darby/Cobbs Creek and the Delaware River
  - Executed FCSA in May 2019 with Philadelphia Water Department ($930K total study costs)
  - Feasibility study is currently underway and is evaluating an array of alternatives to address the flooding with a focus on a levee/floodwall plan in the area

Senate Committee on Environment and Public Works
Hearing Entitled, *"The U.S. Army Corps of Engineers Emergency Response to Hurricane Ida"*
October 6, 2021
Questions for the Record for Brigadier General Tickner

Chairman Carper:

1. Considering all the relevant research that has been done on the importance of resilient infrastructure, how can the Corps design more resilient flood risk management solutions?

   Response: As the climate continues to change, USACE Civil Works studies will continue to utilize the most relevant research during feasibility and design ensuring resiliency is incorporated into the formulation of the solution and included in the project design. USACE recently published a Climate Action Plan that details the USACE commitment to integrate the best available observed and forward-looking climate information into its missions, programs, and management functions, as allowed within relevant authorities. This plan describes how climate effects and vulnerabilities are and will be considered in USACE decision-making.

   a. Does the Corps need to update its construction and engineering standards to better the issue of resiliency?

      Response: Per the 2021 USACE Climate Action Plan, USACE will be issuing revised technical design guidance and will be updating its guidance on the use of climate-affected hydrology data, climate preparedness, and sea level rise scenarios.

   b. What are the barriers to building the infrastructure back better post incidents that damage the existing construction?

      Response: There are none. However, it is often easier to repair or rebuild the infrastructure that was in place prior to the flood, instead of taking the time to evaluate other options that may be better in the long-run. If the performance of a federally authorized project during flood events signals the need to consider modifications outside the scope of PL 84-99, a feasibility study can be conducted to determine the appropriate changes, if any, to the existing project authorization.

2. What are the pros and cons of using financial agreements, like the one that built New Orleans' Hurricane Storm Damage Risk Reduction System, for future projects that protect the health, life, and safety of communities?

   Response: Beginning with the supplemental appropriations acts funding construction of the New Orleans' Hurricane Storm Damage Risk Reduction System and continuing with the supplemental appropriations acts that provided funding to address Hurricanes Sandy, Harvey, Irma, Maria, Michael, and Ida, Congress has appropriated funds to cover all Federal costs to construct certain flood and storm damage risk reduction projects. In

addition, in these acts, Congress has included funds to allow for the financing of the non-Federal cash contribution.

1) Providing all Federal funds upfront for the Federal share of construction costs:

PROS:

- Reduces uncertainty regarding the availability of future funding for the project.
- USACE may be more able to purchase mitigation credits when they become available.
- USACE and non-Federal sponsors may be more willing to reassign existing staff or hire additional staff to support efficient project execution.
- Non-Federal sponsors may be more able to acquire all of the necessary real estate for the project in a timely way.

CONS:

- USACE has had difficulty estimating the cost to complete some of its projects.
- Allocating funding that a project cannot use for several or more years may have the effect of delaying work on other projects.
- Some non-Federal sponsors may not be prepared to provide their share of the cost concurrent with project construction, or may not be willing to pay accrued interest on any part of their share that they may be allowed to repay later.
- Some non-Federal sponsors may not be prepared to acquire all of the necessary real estate for the project in a timely way.

2) Providing Federal funds to allow for financing of the non-Federal cash contribution for up to 30 years after completion of construction:

PROS:

- Schedules are not limited by the ability of the non-Federal sponsor to have funds in hand, enabling the possibility for an earlier start of construction, and more efficient project delivery.

CONS:

- Some non-Federal sponsors cannot or do not want to incur debt and therefore prefer the more traditional "pay-as-you-go" approach.
- Requires appropriation of additional Federal funds by Congress to offset non-Federal sponsor funds that otherwise would be provided during construction.
- Financing of the non-Federal cash contributions may reduce the amount of Federal funds available for other projects, and delay their implementation.
- There is no guarantee that the non-federal sponsor would be willing or able to provide their cost share (payback their "loan" from Treasury) at a future date.

3. Please describe the Corps' interface with FEMA, as well as other federal stakeholders, and non-federal stakeholders before, during, and after Ida passed and compare it to past interactions, like during Hurricane Katrina.

   Response: USACE routinely coordinates preparedness activities with FEMA, other federal agencies, state, Tribal, and local emergency management offices to ensure communities can more effectively respond and recover from disaster events. USACE is the designated lead federal agency in support of FEMA for Emergency Support Function 3, Public Works and Engineering (ESF 3), and in this capacity performs work assigned by FEMA as part of the coordinated federal response. USACE also can assist prior to, during, and after a flood disaster under its own authority, Public Law 84-99. Understanding the importance of being postured for a rapid response during declared emergencies, FEMA generally will mission assign USACE and ensure prepositioning of subject matter experts for debris management, infrastructure assessment, temporary power generation, temporary roofing, and other missions in order to be able to quickly assess the situation and respond. USACE uses continuous improvement processes to routinely review disaster response and recovery performance and make any necessary improvements for subsequent events.

   a. Are there policy changes for the Corps that could help the agency be a better partner to federal stakeholders in disaster response?

      Response: USACE has not identified any particular policy changes needed at this time, but remains committed to completion of its continuous improvement processes and any subsequent conclusions/recommendations.

   b. Are there policy changes for the Corps that could help the agency be a better partner to non-federal stakeholders in disaster response?

      Response: No USACE policy changes are recommended at this time. USACE is committed to a continuous improvement process. Using information from previous disaster responses, USACE will review, coordinate, and improve program delivery.

4. Section 133 of WRDA 2020 allows for the Corps to repair and rehabilitate USACE constructed pumping stations that are essential to Corps flood risk management projects. Given that many of the pump stations in New Orleans were locally constructed, do you support expanding this provision so that it applies to all pump stations, including locally constructed pump stations? Why or why not?

   Response: No. Locally constructed pump stations that are not an integral part of a USACE flood risk management project generally provide local stormwater management, which is a local responsibility.

Senator Cardin:

1. The remnants of Hurricane Ida unleashed record rainfalls in the Northeast, including New York City, where intense rainfall overwhelmed storm drainage systems and inundated

subway stations. In Maryland communities such as Ellicott City, we are also beginning to see impacts from severe rainfall events that are fundamentally different from the flooding events of recent memory. Rather than flooding solely from rising water levels in our streams as a result of regional rainfall, we now face flood risks from locally-intense rainfall alone.

a. How might the Army Corps of Engineers play a more proactive role in addressing new, growing risks to communities and infrastructure posed by intense rainfall events?

Response: The construction and the operation and maintenance of local stormwater management infrastructure is a local responsibility. However, USACE has a number of programs/authorities through which it can provide technical or planning assistance to state/local/Tribal/territorial partners to help them understand and address their flood risk, including the risk associated with urban stormwater.

USACE has technical assistance authorities, including Floodplain Management Services (FPMS) and Planning Assistance to States (PAS), which enable USACE to help a state, Tribe, or local authority understand their flood risk as well as develop concepts for addressing that risk. Through FPMS, partners can receive assistance with activities such as inundation mapping, development of floodplain management plans, emergency action/evacuation plans, flood risk assessments, nonstructural flood risk management alternative assessments, and risk communication and outreach efforts. Under FPMS, USACE also has access to the National Nonstructural Committee, a small team of subject matter experts who provide advice and assistance with implementation of nonstructural flood risk management techniques across the agency. Nonstructural solutions such as the acquisition of land and associated structures, floodproofing, elevation, etc., may be more cost effective for areas where higher frequency flooding events are localized and do not produce enough damages to justify large structural solutions.

Under the PAS program, USACE can partner with non-Federal interests to support state, Tribal, or local planning efforts on water resources issues, by providing technical assistance. Comprehensive planning can help to ensure that significant atmospheric events are analyzed in a manner that reflects the connectedness of the key resources within a watershed. The PAS program also includes technical assistance for analysis in support of a state's water resources management and related land resources development plans such as state hazard mitigation, preparedness, response, and recovery plans and plans associated with changing hydrologic conditions, climate change, long-term sustainability, and resilience. Consideration of climate change and community resilience are factors that may not have been adequately considered when existing stormwater management systems were constructed and are both critical to address risks that have developed since that time. It is important to note that these technical assistance programs cannot be used to construct or implement any solution that

may be identified as a result of the assistance, but they still provide valuable information and recommendations to the partner/jurisdiction.

USACE uses its existing resources to proactively communicate with non-Federal entities regarding both the FPMS and PAS programs, as well as other areas where USACE has authority to provide assistance. The Silver Jackets program is a great example of how USACE is engaged in states and communities and with Tribes in communicating flood risk and opportunities for partnering; however, challenges in communication do exist. The lack of knowledge of USACE programs could be a potential impediment to the USACE ability to assist these communities.

b. What are the current ways and/or venues in which the Corps is coordinating with other federal agencies that have a role to play in mitigating urban flooding, including EPA, FEMA, HUD, and NOAA?

Response: The National Flood Risk Management Program (NFRMP) provides mechanisms for USACE team members to coordinate with others involved in flood risk management broadly. Through NFRMP, USACE coordinates regularly with other federal agencies, including EPA, FEMA, HUD, and NOAA, on various aspects of flood risk management. USACE also coordinates with other partners involved in flood risk management, including partners at state/local/Tribal/territorial government agencies, academia, and nongovernmental organizations such as the Association of State Floodplain Managers (ASFPM) and the National Association of Flood and Stormwater Management Agencies (NAFSMA). The concept of urban flooding and opportunities to collaborate to address this flood risk management challenge has been discussed in various forums with all of these partners.

Within the NFRMP, USACE participates, along with other federal agencies, on the state-led interagency collaborative Silver Jackets teams, which focus on addressing state-identified flood risk management challenges. Support to these Silver Jackets teams provides a venue for interagency collaboration to find opportunities to leverage relevant programs/funding/authority across multiple agencies to improve understanding of urban (and other) flood risk challenges and identify opportunities to mitigate the risk.

USACE also participates in various other interagency bodies with a focus on flood risk management and mitigation. One example is the Mitigation Framework Leadership Group (MitFLG), chaired by FEMA. While focused on an all-hazards environment rather than flood risk or urban flooding specifically, the collaboration between agencies under this group enables focused support for hazard mitigation. MitFLG is currently focused on implementation of the National Mitigation Investment Strategy, which has the goal of increasing understanding by the affected federal, state, tribal, and local government agencies, nongovernmental partners, and interested members of the public of investment opportunities in hazard mitigation. Efforts to implement this strategy will enable

more focus on mitigation opportunities across the board, including those that might be specific to urban flood risk.

USACE also works with other federal agencies on data development, management, and communication through regular coordinated actions for the management of USACE water resource infrastructure. This is most evident through daily interactions with the various River Forecast Centers (RFCs) across the Continental United States (CONUS) and integrated efforts with NOAA, USGS and FEMA as part of the Integrated Water Resource Science Services (IWRSS). Decision makers in all sectors of water resources use new and more integrated information and services to adapt to uncertainty, climate and land-use changes, and increasing demand on limited resources. IWRSS represents an innovative partnership of federal agencies with complementary operational missions in water science, observation, prediction, assessment, management, and in the social sciences and risk management. Federal partners engage in water-related matters, including water storage and supplies, water quality and restoration activities, water infrastructure, transportation on United States rivers and inland waterways, and water forecasting, and continue working together where the federal partners have joint or overlapping responsibilities to improve interagency coordination among other items. Through expansion of IWRSS, other federal agencies are being incorporated to ensure the overlap and partner-to-partner support builds upon a more conglomerate assembly of federal participation. The emphasis on the expansion is to better coordinate water resources programs within current authorities; enhance interagency and stakeholder communications; increase the exchange and availability of releasable data and information; enhance collaboration on water resources mapping and modeling; and establish opportunities for joint projects, programs, facilities, and other collaborative science, services and tools to support integrative and adaptive water resources management.

USACE is a member of the Green Infrastructure Federal Collaborative. Along with other collaborative members, including USDA, DOI, DOT, FEMA, and EPA, USACE works closely with federal partners to align knowledge and resources to build capacity for green infrastructure implementation. These coordinated efforts provide a platform to publicize the multiple environmental, economic, and social benefits of green infrastructure, including for urban flood mitigation. In addition, the collaborative seeks to facilitate strategies that foster climate resilience and encourage the equitable implementation of green infrastructure in all communities.

c. What new authorities, resources, or organizational changes do you think are necessary in order for the Corps to make greater use of its capabilities to proactively identify areas of vulnerability to extreme weather events, assess levels of risk, and pursue more regional or comprehensive planning, including across Corps mission areas, to mitigate these risks and protect communities?

Response: Communication of federal program authorities and abilities has improved significantly through participation in the Silver Jackets program; however, challenges remain in informing smaller, rural communities about the potential for participating in technical assistance programs or cost-shared studies. Notwithstanding the Silver Jackets program, the communication by states may sometimes have mixed success due to factors such as the specific abilities of state outreach programs, local participation in outreach events, etc.

Internally, USACE continues to examine ways to improve communication and outreach. Districts and Divisions work to share ideas and concepts for continually improving execution, and HQUSACE is working towards a virtual workshop to improve collaboration and solicit new ideas from field resources. USACE also continues to work with groups such as ASFPM to share ideas and information that could help to promote improved participation in USACE programs.

Senator Inhofe:

1. The 2019 flooding on the Arkansas River in Oklahoma was devastating – over $3.2 billion in damages across the entire basin and thousands of homes, cars, and businesses flooded. In the aftermath, Congress provided the Corps with over $70 million in supplemental funding for emergency response work in Oklahoma. Additionally, beginning with Section 1024 of WRRDA 2014, Congress has authorized the Corps to accept and use materials or services contributed by a non-Federal entity to repair a water resources development project damaged in a natural disaster. Last year, in Section 130 of WRDA 2020, Congress again authorized the Corps to reimburse non-Federal entities who provide materials, services or funds to repair Corps projects following a natural disaster. Since Congress has adopted the regular, 2-year cycle to consider water resources legislation, the Corps has been authorized with a number of new authorities to aid in the post-disaster emergency response and to mitigate against future disasters.

    a. How would implementation of Section 130 of WRDA 2020 assist the Corps in responding to natural disasters more efficiently?

    Response: Implementation guidance for Section 130 of WRDA 2020 is currently under development. USACE's acceptance and use of funds, materials, or services provided under Section 130 could be used for repair, restoration, or rehabilitation of water resource development projects during an emergency event. In providing services or materials, the non-Federal interest or private entity would have to comply with 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (labor standards originally enacted as the Davis-Bacon Act, the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kickback Act); Buy American Act (41 U.S.C. 8302); and National Environmental Policy Act of 1969. In addition, the non-Federal interest or private entity must comply with all laws and regulations, including procurement requirements, that would apply if such services or materials were acquired or carried out by the Corps.

b. How can the Corps work more efficiently with the private sector following natural disasters?

Response: Pre-event planning and coordination activities between the Corps and industry partners have been key to successful emergency response activities. One example is the use of sector-specific industry days. These events highlight federal agency key roles, responsibilities, and business opportunities for particular business sectors and, in turn, improve awareness by USACE and others of industry capability.

c. Looking forward, what additional authorities does the Corps need to be able to respond more efficiently to natural disasters, such as severe flooding events?

Response: No additional authorities are necessary.

Senator CAPITO. Thank you.
Next, we will have Colonel Murphy.
Thank you.

STATEMENT OF COLONEL STEPHEN MURPHY, COMMANDER, NEW ORLEANS DISTRICT, U.S. ARMY CORPS OF ENGINEERS

Colonel MURPHY. Good morning, Ranking Member Capito and distinguished members of the Committee. I am Colonel Steve Murphy. I am the Commander of the Army Corps of Engineers, New Orleans District. On behalf of my team and I, thank you for the opportunity to meet with you today and discuss the Corps' response to Hurricane Ida in my district area of operation.

My area of operation encompasses all of south Louisiana, from Texas in the west to Mississippi in the east. Day in and day out, I focus in large part on coastal and climate change issues.

The Louisiana coast is a working coast, as the State calls it, due to the significance of its activities and waterways and their benefits to the national economy. These include five of the Nation's top busiest ports, the Mississippi River, which is the busiest waterway in the Nation, and our economic artery, as well as the Gulf Intercoastal Waterway, which is the Nation's third busiest waterway, all of which have been and continue to be impacted by gulf storms.

The majority of the State's population also lives in the southern half of the State near the coast.

Coastal Louisiana sits at the epicenter of climate change. Sea level rise and subsidence co-exist as threats that are major concerns for both the Corps and the State. Consequently, my major missions are navigation, coastal and environmental restoration, coastal storm risk management, and flood risk management. Flooding of any kind, whether from rainfall, storm surge, or riverine flooding, or what has been occurring on a more frequent basis, the occurrence of all three at the same time, is a major concern for the State and for my district.

The men and women of my district are residents of south Louisiana. During a storm, they endure the same impacts as their neighbors. For them, working with our partners to ensure a promising future in coastal Louisiana is not just a professional responsibility, it is a personal commitment.

During Ida, almost a third of my 1,100 person work force evacuated out of State, to include my wife and children. Almost all of us lost power, and almost half saw some form of damage to their homes, with 37 of us experiencing so much damage from Ida that their homes are now unlivable.

While we couldn't be more proud of the performance of the greater New Orleans area's Hurricane Storm Damage Risk Reduction System, and how it validated the massive national investment of $14.5 billion that you have heard about already, other parts of the State were not as fortunate.

Where there was Federal investment and levees and flood walls, though, the systems performed as designed. Hurricane Ida has validated and reinforced many of the lessons we have learned over the last 16 years since Hurricane Katrina made landfall.

The systems that the Federal Government invested in, and especially the HSDRRS, have reinforced the value of the Corps' system

wide approach and demonstrated the importance of sustainability and resilience that the Corps has incorporated since then into its designs. We have projects currently underway that are now incorporating these principles outside of the greater New Orleans area.

We are now in day 40 of recovery from Hurricane Ida. I will close by saying there could not be a better team to handle natural disasters and climate change than the team that has gathered, Federal, State, and local in Louisiana. Everyone here knows disaster response is truly a team sport. I do not think we could be working more closely or more cooperatively with the State of Louisiana than we are right now.

After personally experiencing two of the longest Lower Mississippi River flood fights in our district's history, the most active Atlantic hurricane season in history last year, the COVID pandemic, and now Hurricane Ida, I can definitively say that this is a highly functional and collaborative team that has made the USACE response in support of this State and these disasters, and especially Ida, successful.

That same team spirit and cooperation also drives the Corps investigation and implementation of natural and nature based solutions that are in sync with the State's 50 year, $50 billion coastal master plan. These include measures ranging from beneficial use of dredged material to coastal restoration to environmental mitigation to the consideration through my regulatory program of large scale diversions in the Lower Mississippi River aimed at restoring the coast and making it more resilient.

I could go on, but out of respect for your time and to allow for questions, I will close there. Thank you again for the opportunity to be here.

[The prepared statement of Colonel Murphy follows:]

DEPARTMENT OF THE ARMY

WRITTEN STATEMENT
OF

COLONEL STEPHEN MURPHY
COMMANDER, NEW ORLEANS DISTRICT

U.S. ARMY CORPS OF ENGINEERS

BEFORE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ON

THE U.S. ARMY CORPS OF ENGINEERS EMERGENCY RESPONSE TO HURRICANE IDA

OCTOBER 6, 2021

Introduction
Chairman Carper, Ranking Member Capito, and members of the committee. I am Colonel Stephen Murphy, commander of the U.S. Army Corps of Engineers New Orleans District. On behalf of me and my team, I thank you for the opportunity to meet with you today.

On August 29th, Hurricane Ida made landfall near Port Fourchon, Louisiana, approximately 60 miles southwest of the greater New Orleans Area, as one of the strongest storms to ever impact the Louisiana coast. For nearly four hours after landfall, the storm remained a Category 4 storm and then sustained Category 3 winds for an additional four hours. By the time the storm completed its slow crawl through Louisiana, 25 of the state's 64 parishes would be eligible for federal disaster assistance Addressing the needs of this important region will require the continued shared efforts of all local, state, tribal and federal partners.

The men and women of the U.S. Army Corps of Engineers (Corps), New Orleans District are residents of South Louisiana. Their friends and families live here; they maintain active roles in their communities. During a storm, they endure the same impacts as their neighbors. For them, working with our partners to ensure a promising future in coastal Louisiana is not just a professional responsibility; it is a personal commitment.

Greater New Orleans Hurricane and Storm Damage Risk Reduction System
Preparations and readiness for Hurricane Ida began with identifying and applying the lessons learned 16 years prior during Hurricane Katrina. The application of these lessons would be foundation on which we constructed the Greater New Orleans Hurricane and Storm Damage Risk Reduction System.

First, we understood that each storm is unique. Hurricane systems prior to Katrina were designed to defend against the Standard Project Hurricane, a storm scenario with a specified intensity, path and rate of movement. However, each storm has a unique set of characteristics that define the storm and its potential impacts. To construct a system designed to defend against a variety of scenarios, we identified 350 points around the system, then calculated the one-percent – commonly called '100-year' – surge levels and levee elevations needed for that specific location.

We also advanced the idea of a perimeter system. The pre-Katrina system was designed to line the many waterways, canals and lakefronts with levees and floodwalls. This parallel approach consisted of approximately 200 miles. of levees and floodwalls. With the perimeter approach, we reduced the miles of front-line levees to 133 while pushing these levees as far away from the densely populated areas as geography would allow.

To ensure this perimeter system would be effective for up to a one-percent storm surge for its design life, we incorporated subsidence and sea-level rise into the elevations of our hardened structures such as floodwall and closure structures. While earthen levees are constructed to the elevation needed today, our floodwalls are built to the elevations that we estimate for the one-percent storm surge in the year 2057.

Equally important, we incorporated the concept of resilience into the design of the system. We understood that no matter how big or how large we build, inevitably there will be a storm that will overtop the system. Designed to be overtopped without breaching, earthen levees were constructed with more stringent materials and selectively armored, while any perimeter floodwall was built using the more robust T-wall designs. Any structure, such as the West Closure Complex, which requires operation throughout an event, were constructed completely independent of the power grid or any other structure. Many local pump stations were either storm-proofed or have safehouses so crews can safely work throughout the storm.

Applying the lessons and best practices we learned from Hurricane Katrina has resulted in the most robust and resilient risk reduction system in the Nation. However, without the national support for rebuilding provided 16 years ago, this system would likely not be in place today.

As a result of incorporating the lessons learned, the greater New Orleans area now has the most robust and resilient hurricane risk reduction system in its history. Although there are never any true victories against Mother Nature, the system did perform as designed and prevented flooding from reaching inside the system. As we remain in hurricane season, I am happy to note that initial reports are that the system experienced very minimal damage during the event and can be counted on to perform again should we face another storm this season.

Hurricane Ida Response and Recovery
Overall, none of the region's federal levee systems overtopped during the storm. However, some of the area's non-federal levee systems did require unwatering. As the Corps received mission assignments from the Federal Emergency Management Agency, we worked closely with the State of Louisiana Coastal Protection and Restoration Authority, the Louisiana National Guard, and the U.S. Navy to get pumps into the critical areas by way of truck, barge or helicopter. We installed temporary pumps in Jefferson, Lafourche, Plaquemines and St. Bernard parishes. Twelve temporary pumps have been demobilized while eleven will remain on site in the event they are needed as we move deeper into hurricane season.

Additionally, in Plaquemines Parish, we initiated engineered levee cuts to expedite the removal of water in the lower portions of the parish. Once these areas no longer benefitted from the cuts, we closed and armored the sections so that they can again provide risk reduction in the event we face additional storms this season. Overall, we expect to be complete with the unwatering mission this week.

One of the Corps oldest civil works missions is to ensure safe and reliable navigation along our Nation's waterways. In south Louisiana, this includes the Nation's busiest and third business navigation routes, the Lower Mississippi River and the Gulf Intracoastal Waterway respectively. Impacts such as obstructions, debris, and shoaling were extensive along these waterways as well as Bayou Lafourche and Barataria Waterway. Working with the U.S. Coast Guard, the U.S. Navy and industry, we focused our attention to returning these waterways to service.

We have completed one section of dredging to address shoaling along the Gulf Intracoastal Waterway and are in the process of clearing shoals in the remaining section. With regards to obstructions, nearly 200 have been identified along Bayou Lafourche and the Barataria Bay Waterway. Working closely with the U.S. Navy, we have removed 158 of these obstructions.

Regional Flood Risk Management Path Forward
The Corps fully understands the importance of recovery efforts after a storm, and is committed to leveraging its resources and capabilities to assist in these efforts. But, we also understand the role of risk reduction efforts ahead of a disaster.

To the west of the Hurricane and Storm Damage Risk Reduction System, we continue to work on the West Shore Lake Pontchartrain risk reduction system. The construction of this system was fully funded by the Bipartisan Budget Act of 2018 and once completed in 2024, it will provide portions of St. Charles, St. John the Baptist and St. James parish with the same level of risk reduction now delivered by the New Orleans hurricane system.

South of the system, we continue to make progress in delivering the New Orleans to Venice project that reduces risk for portions Plaquemines Parish. For this project, we are either building new or replacing existing non-federal levees with a system built to the federal standard. During Hurricane Ida, the portions of this system already constructed did not overtop and performed as designed. However, we still have a lot of work ahead of us. I am happy to report that we just recently advertised a contract for building a 9-mile reach that will provide the historic communities of Ironton and Myrtle Grove with levees that range from 10.5 to 14 feet in elevation.

Closing
My testimony today focused largely on the lessons that allowed us to build the system that we have in place today. However, I would be remiss if I did not also mention that we learned more than just how to build a better system. We have and will continue to incorporate lessons learned from every storm to improve how we do business - not only in design and construction, but also in our operational and contingency planning.

For example, in partnership with federal, state and local leaders, we conduct annual structural assessments of the system. Prior to the start of each hurricane season, the Corps and its partners operationally test all major structures and conduct joint hurricane exercises here in New Orleans as well as at our division headquarters in Vicksburg, Mississippi. The purpose of the exercises is to test the well-planned command and control procedures, our technical steps for responding to the next storm, the procedures for closing and reopening major structures, as well as the partnership and synchronized efforts among federal, state and local agencies. Our partners in these extensive planning efforts include the U.S. Coast Guard, the Coastal Protection and Restoration Authority Board, the Governor's Office of Homeland Security and Emergency Preparedness, the Southeast Louisiana Flood Protection Authorities and their supporting districts and the Louisiana Department of Transportation and Development.

Just as we work with our partners to buy down residual risk, we further these efforts by engaging communities through a frank and honest discussion regarding risk, residual risk, and individual responsibility. Residents have a role and it is our job to provide them the necessary information so that they can make their own risk-informed decisions. With each passing storm, this open and transparent communication becomes more and more important because complacency among the residents could become the system's greatest vulnerability.

Above all, we remain dedicated to supporting the citizens of southeast Louisiana. We accomplish this by sharing responsibility and working collaboratively, relying heavily on our non-federal partners and on extensive communication with the general public. I must emphasize that the Corps could not have done this work on its own – this was absolutely a team effort – federal, state, local government, tribal, levee authorities, levee boards, academia, industry, non-governmental organizations, peer reviewers and other stakeholders.

Mr. Chairman, thank you for allowing me to speak to you this morning. I will be happy to answer any questions you may have.

Senate Committee on Environment and Public Works
Hearing Entitled, *"The U.S. Army Corps of Engineers Emergency Response to Hurricane Ida"*
October 6, 2021
Questions for the Record for Colonel Murphy

Chairman Carper:

1. Considering all the relevant research that has been done on the importance of resilient infrastructure, how can the Corps design more resilient flood risk management solutions?

   Response: As the climate continues to change, USACE Civil Works studies will continue to utilize the most relevant research during feasibility and design ensuring resiliency is incorporated into the formulation of the solution and included in the project design. USACE recently published a Climate Action Plan that details the USACE commitment to integrate the best available observed and forward-looking climate information into its missions, programs, and management functions, as allowed within relevant authorities. This plan describes how climate effects and vulnerabilities are and will be considered in USACE decision-making.

   a. Does the Corps need to update its construction and engineering standards to better the issue of resiliency?

      Response: Per the 2021 USACE Climate Action Plan, USACE will be issuing revised technical design guidance and will be updating its guidance on the use of climate-affected hydrology data, climate preparedness, and sea level rise scenarios.

   b. What are the barriers to building the infrastructure back better post incidents that damage the existing construction?

      Response: There are none. However, it is often easier to repair or rebuild the infrastructure that was in place prior to the flood, instead of taking the time to evaluate other options that may be better in the long-run. If the performance of a federally authorized project during flood events signals the need to consider modifications outside the scope of PL 84-99, a feasibility study can be conducted to determine the appropriate changes, if any, to the existing project authorization.

2. What are the pros and cons of using financial agreements, like the one that built New Orleans' Hurricane Storm Damage Risk Reduction System, for future projects that protect the health, life, and safety of communities?

   Response: Beginning with the supplemental appropriations acts funding construction of the New Orleans' Hurricane Storm Damage Risk Reduction System and continuing with the supplemental appropriations acts that provided funding to address Hurricanes Sandy, Harvey, Irma, Maria, Michael, and Ida, Congress has appropriated funds to cover all Federal costs to construct certain flood and storm damage risk reduction projects. In

addition, in these acts, Congress has included funds to allow for the financing of the non-Federal cash contribution.

1) Providing all Federal funds upfront for the Federal share of construction costs:

PROS:

- Reduces uncertainty regarding the availability of future funding for the project.
- USACE may be more able to purchase mitigation credits when they become available.
- USACE and non-Federal sponsors may be more willing to reassign existing staff or hire additional staff to support efficient project execution.
- Non-Federal sponsors may be more able to acquire all of the necessary real estate for the project in a timely way.

CONS:

- USACE has had difficulty estimating the cost to complete some of its projects.
- Allocating funding that a project cannot use for several or more years may have the effect of delaying work on other projects.
- Some non-Federal sponsors may not be prepared to provide their share of the cost concurrent with project construction, or may not be willing to pay accrued interest on any part of their share that they may be allowed to repay later.
- Some non-Federal sponsors may not be prepared to acquire all of the necessary real estate for the project in a timely way.

2) Providing Federal funds to allow for financing of the non-Federal cash contribution for up to 30 years after completion of construction:

PROS:

- Schedules are not limited by the ability of the non-Federal sponsor to have funds in hand, enabling the possibility for an earlier start of construction, and more efficient project delivery.

CONS:

- Some non-Federal sponsors cannot or do not want to incur debt and therefore prefer the more traditional "pay-as-you-go" approach.
- Requires appropriation of additional Federal funds by Congress to offset non-Federal sponsor funds that otherwise would be provided during construction.
- Financing of the non-Federal cash contributions may reduce the amount of Federal funds available for other projects, and potentially delay their implementation.
- There is no guarantee that the non-federal sponsor would be willing or able to provide their cost share (payback their "loan" from Treasury) at a future date.

3. Please describe the Corps' interface with FEMA, as well as other federal stakeholders, and non-federal stakeholders before, during, and after Ida passed and compare it to past interactions, like during Hurricane Katrina.

   Response: USACE routinely coordinates preparedness activities with FEMA, other federal agencies, state, Tribal, and local emergency management offices to ensure communities can more effectively respond and recover from disaster events. USACE is s the designated lead federal agency in support of FEMA for Emergency Support Function 3, Public Works and Engineering (ESF 3), and in this capacity performs work assigned by FEMA as part of the coordinated federal response. USACE also can assist prior to, during, and after a flood disaster under its own authority, Public Law 84-99. Understanding the importance of being postured for a rapid response during declared emergencies, FEMA generally will mission assign USACE and ensure prepositioning of subject matter experts for debris management, infrastructure assessment, temporary power generation, temporary roofing, and other missions in order to be able to quickly assess the situation and respond. USACE uses continuous improvement processes to routinely review disaster response and recovery performance and make any necessary improvements for subsequent events.

   a. Are there policy changes for the Corps that could help the agency be a better partner to federal stakeholders in disaster response?

      Response: USACE has not identified any particular policy changes needed at this time, but remains committed to completion of its continuous improvement processes and any subsequent conclusions/recommendations.

   b. Are there policy changes for the Corps that could help the agency be a better partner to non-federal stakeholders in disaster response?

      Response: No USACE policy changes are recommended at this time. USACE is committed to a continuous improvement process. Using information from previous disaster responses, USACE will review, coordinate, and improve program delivery.

4. Section 133 of WRDA 2020 allows for the Corps to repair and rehabilitate USACE constructed pumping stations that are essential to Corps flood risk management projects. Given that many of the pump stations in New Orleans were locally constructed, do you support expanding this provision so that it applies to all pump stations, including locally constructed pump stations? Why or why not?

   Response: No. Locally constructed pump stations that are not an integral part of a USACE flood risk management project generally provide local stormwater management, which is a local responsibility.

Senator Inhofe:

1. The 2019 flooding on the Arkansas River in Oklahoma was devastating – over $3.2 billion in damages across the entire basin and thousands of homes, cars, and businesses flooded. In the aftermath, Congress provided the Corps with over $70 million in supplemental funding for emergency response work in Oklahoma. Additionally, beginning with Section 1024 of WRRDA 2014, Congress has authorized the Corps to accept and use materials or services contributed by a non-Federal entity to repair a water resources development project damaged in a natural disaster. Last year, in Section 130 of WRDA 2020, Congress again authorized the Corps to reimburse non-Federal entities who provide materials, services or funds to repair Corps projects following a natural disaster. Since Congress has adopted the regular, 2-year cycle to consider water resources legislation, the Corps has been authorized with a number of new authorities to aid in the post-disaster emergency response and to mitigate against future disasters.

    a. How would implementation of Section 130 of WRDA 2020 assist the Corps in responding to natural disasters more efficiently?

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    b. How can the Corps work more efficiently with the private sector following natural disasters?

    Response: Pre-event planning and coordination activities between the Corps and industry partners have been key to successful emergency response activities. One example is the use of sector-specific industry days. These events highlight federal agency key roles, responsibilities, and business opportunities for particular business sectors and, in turn, improve awareness by USACE and others of industry capability.

    c. Looking forward, what additional authorities does the Corps need to be able to respond more efficiently to natural disasters, such as severe flooding events?

    Response: No additional authorities are necessary.

Senator Wicker:

1. I appreciate all of the work that the Corps has done in preparing for and responding to Hurricane Ida; however, I am concerned about the timeline for reopening waterways,

such as the Gulf Intracoastal Waterway, following natural disasters. What are some of the challenges the Corps has faced when undertaking a dredging operation of this size, and how does the sediment load from Hurricane Ida compare to other storms?

Response: Hurricane Ida's track, intensity, and speed resulted in massive amounts of fragile marsh grasses and sediments along Lake Salvador's shorelines to be dislodged. As the storm surge receded from the lake, the marsh grasses and sediments were deposited in the GIWW**,** at its intersection with Bayou Perot and reaches of the GIWW channel to the west.

The marsh grasses and vegetative debris from Lake Salvador that Hurricane Ida deposited in the GIWW are not comparable to the typically silty-sand shoaling experienced in entrance/bar channels. Silty-sand sediments can be dredged, and pumped out as a slurry, with efficient hydraulic dredging plant. However, the vegetative debris deposited in the GIWW must be removed using mechanical equipment. Hydraulic cutterhead dredges were used to remove vegetative debris from the GIWW. However, the nature of the plant material clogged and snagged in the machinery, such that the effort required to sustain equipment operability significantly increased the time required to clear the channel.

The dredging challenges at this particular channel created by these unique circumstances during Hurricane Ida (necessitating the removal of vegetative debris from the GIWW) were addressed by both USACE (in-house labor and equipment) and barge mounted excavating equipment acquired by contract to expedite clearing of the main stem of the GIWW. It should be noted that as designed, the GIWW- Port Allen to Morgan City Alternate Route allowed the flow of traffic on the GIWW to continue as recovery operations progressed (although the route added 170 miles to the trip).

Senator CAPITO. Thank you, Colonel.

We will go to questions, and a belated happy birthday to my colleague from Maryland, Senator Cardin.

Senator CARDIN. Well, Senator Capito, thank you very much. I only have 364 days remaining until my birthday, so thank you. I appreciate that.

First of all, thank you all very much for your service. We really do appreciate the leadership of the Army Corps. It is critically important in Maryland; it is critically important to all of our States.

I was in Louisiana, New Orleans, after Katrina. Our Committee went down there to inspect first hand the damage that was done, and it was shocking to see the amount of loss of life and of property. So, the $14.5 billion investment is one that we all supported, and it worked, as you all have said. We are proud of what we were able to do to mitigate Hurricane Ida.

We also recognize that these storms are becoming more frequent and more severe and that we have a responsibility to deal with the realities of climate change, both in mitigating future pollutants that are emitting greenhouse gases, as well as adapt to the realities. Your responsibilities on adapting to the realities, I want to just touch on briefly.

Many years ago, we made a decision in Maryland to invest in beach renourishment, because the Northeasters were becoming more and more severe. We invested millions of dollars. The result has been billions of dollars of savings, and savings of life.

These types of investments really pay off dramatically, but there is also a change in the risk factors that I am seeing in our communities. We saw it during Ida. We have had flooding before, because of a long sequence of rain, causing banks to rise beyond what they can handle, and you have dealt with that issue through your flood management programs.

But in recent years, we have found something different occurring, and that is the large volume in a short period of time of rainfall. That was true during Ida. So, it wasn't really the integrity of the flood system. It was more the extreme amount of rain in a very short period of time.

I mention that because in Ellicott City, Maryland, as you all know, we experienced in a 20 month period two 100 year floods. But what was really unique about these floods that we had never experienced this type of flooding before. Ellicott City is on the banks of rivers. We have seen the rivers rise and cause flooding into Ellicott City. We had never seen the large volume of rain occur in such a short period of time that couldn't possibly be managed by the current system.

So, my question to you is, as we look at these new risk factors, more violent storms, not necessarily hurricanes, just a large volume of rain coming down in a very short period of time that are flooding communities, how do we prepare for this?

Now, I appreciate, Colonel, your mentioning the beneficial use of dredged material. We are doing that in replenishing wetlands. That is part of our strategy, because wetlands not only manage the flooding situation, but it also manages the pollutants going into from runoff, so it is an important part of our strategy.

I am interested as to what your recommendations are to us to manage the realities of the current risk factors on violent storms occurring with a large amount of rain in a short period of time, which is not the way we have traditionally been dealing with infrastructure to prevent flooding.

General GRAHAM. Senator, thank you for that question, and let me address that. We have put together, the Administration has directed it, a climate action plan. It is right up with CEQ right now, and we expect that to be released soon.

It has five major components to it. I think those address your concerns, and those five major components are: We have to modernize our approach, and that is our programs and our policies, to deal with a different future. We have to manage better the facilities we do operate, like the dams around Philadelphia that General Tickner mentioned. We have got to enable, as Colonel Murphy spoke to, our partners, and a lot of that is with sharing our science with them.

I know some of the Committee staff members went down to Duck, North Carolina, and saw some of that science being created. We have got to share that information with our local partners, and that includes this actionable data that can stand up to scrutiny, so folks, local communities, States, realize the challenges that they are under.

Then finally, Senator, we have got to plan and put into operation those futures, and this authorizing Committee plays a key role in that. Thank you.

Senator CARDIN. I think my time has run out. I just would urge us to think about how we can work in partnership to deal with these extreme raining events that are causing communities to be extremely vulnerable. It is hard to plan for every part of our community getting an extreme weather event, but we have to have a game plan for our communities, because it is occurring. We saw it during Ida; we have seen it several times in Maryland.

It is unprecedented, the type of flood risks that we currently have, so we are going to be looking to you and this report to give us a game plan on how we can protect communities the best that we can from the realities of these storms.

Thank you, Madam Chair.

Senator CAPITO. Yes.

Senator Inhofe.

Senator INHOFE. Thank you, Madam Chair.

I know this hearing is on Ida, but all three of the individuals as witnesses here were participants in a real tragedy that we faced in 2019, a flooding case in Oklahoma, where we had levees that were 75 years old and well, well past their normal historic lifetime, and they held up. I can remember actually being up to my waist in water during that time, and so it was something that we were very fortunate.

Since that time, we have been on pins and needles what might happen if we should get another flood. But nonetheless, everyone performed very well, and the WRDA language that we put into the 2020 WRDA system performed very well.

General Graham, as the Corps plans and budgets for future projects, do you believe it is important to take into account safety of life benefits like you did in the Tulsa Levees Chief's Report?

General GRAHAM. Senator, absolutely.

Senator INHOFE. Well, I have to say that we really did a good job in terms of the private sector. We had to make some changes in our current statutes to accommodate that at the time, and things did work, and worked out really well. Now, we don't have many hurricanes that hit Oklahoma, but what it is important to remember is that Oklahoma is as connected as Arkansas is to the Mississippi River through the MKARNS. A lot of people have a hard time understanding that we in Oklahoma are navigable.

I have probably said this 300 or 400 times in the last few years to let people know that we need to be a part of a system and participating in that system and have actually done really good work in terms of working with the private sector.

Colonel Murphy, I would have to say this, I am sure—Senator Boozman and I have spent a lot of time working on the impact of the navigation way. Colonel Murphy, is it true that getting our navigable waterways open to commerce is key to a successful recovery effort, and how does the Corps prioritize dredging efforts following flooding in storm surge events?

Colonel MURPHY. Senator, thank you for the question. I would say, absolutely. That is one of the first things we are looking to do as soon as we can get boats on the road and in the water. I have survey boats going out on all the Federal waterways that I am responsible for to get surveys in conjunction with the Coast Guard to clear them.

Senator INHOFE. I appreciate that. The 2019 flooding was a shock and exposed a lot of gaps in our system, but we are lucky in Oklahoma to have numerous private sector entities that we had to bend the law a little bit to make it happen.

So what I would like to ask you to do is to, for the panel, for the future, look at the authorities. What authorities does the Corps need to enable them to respond as capably as they did respond in this case, and this might be something that you can do for the record. Get your ideas together as to how can we work more efficiently with the private sector, such as we did in the State of Oklahoma.

OK? Very good, thank you.

Senator CAPITO. Thank you.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Senator.

Welcome, all of you. I am glad to have you here. I represent Rhode Island in the Senate.

Up in New England, the most extreme climate related shift that we have seen has been in the form of extreme rainfall. It is kind of off the charts.

In terms of a persistent underlying shift related to climate, what we see coming is sea level rise. In fact, we are going to have to redraw the map of Rhode Island to accommodate the loss of seashore and what is now land turning into an archipelago of flooded islands.

Against that backdrop, we experienced dramatic failure of FEMA mapping. I have read press reports that, in Texas, FEMA mapping was off by as much as 50 percent when floods hit the Houston area.

As a result, Rhode Island has had to do its own mapping, going back to the original data and bringing in our own scientists.

As a result, we have got a very, I believe, accurate and successful mapping tool called STORMTOOLS that has been run by our CRMC agency, the Rhode Island Coastal Resources Management Council. It is annoying as hell to fund FEMA and also have the State of Rhode Island have to pay for its own mapping because FEMA mapping isn't accurate.

I know FEMA ducked because a lot of the reason for the inaccuracy was that they would have to bake in climate change, and there are very powerful forces that want to punish anybody who talks about climate change.

So FEMA took a dive on this one, in my view. But the result is one that you all have to live with all the time, which is bad maps.

What are you doing to try to make sure that you are operating off of good flood maps, and when you have to come in with your emergency response, people aren't being clobbered by the fact that they didn't know they were in a flood zone, so they didn't have proper insurance, so now they are really stuck? You are in the middle of all that. What is the view from the front?

General GRAHAM. Senator, thank you for that question. In any project that the Corps does, there are two imperatives, Senator. We want to make sure that we get the engineering right, and that we want to make sure that we are in control of the projects and are good stewards of the taxpayer's money.

So to your comments, to make sure that we understand the topography and the hydrology, that is, we agree with you that it is absolutely essential, and that is the bedrock that all that engineering is founded upon.

Senator, I will go back and relook based on the information you provided to make sure we are, indeed, using the best science available.

Senator WHITEHOUSE. I think, often, predictions related to climate change are simply zero factored out, which is just simply bad prediction when we know perfectly well what is going on here. You see it change, and then you act as if it is just going to go straight from here on over, rather than continue its trajectory, when there is zero science to support that proposition that it is going to go level state. So please take a look at that.

The other thing I want to just flag for this hearing and for my colleagues, which I always do, is that, we are talking about Ida. Ida hit as a coastal flood. The Army Corps of Engineers has something called the Flood and Coastal—Coastal—Storm Damage Reduction Program.

In the last decade, it has run between favoring inland over coastal flooding by 19 to 1. That was our best year, to be at the tail end of a 19 to 1 losing battle, to 120 to 1, $1 for coasts for every $120 for inland.

And the fiscal year 2022 budget has it at 45 to 1, somewhere in the middle, $1 for coastal for every $45 for inland. And I want to

thank the Corps for agreeing to take a good, hard look at this and try to understand exactly what the heck is going on.

But when you look at sea level rise, when you look at offshore storms, when you look at Ida coming ashore as a coastal storm, the idea that you guys have set up your inland, your Flood and Coastal Storm Damage Reduction Program in a way that so inexplicably favors inland flooding over coastal flooding is a matter of real concern to those of us who represent coastal States and have huge flooding issues, like what STORMTOOLS reveals about Rhode Island.

We are working on that through another lane, but I just didn't want to let this opportunity to go by without raising that astounding discrepancy and what it means for my State.

Thank you; my time is up.

Senator CAPITO. Senator Boozman.

Senator BOOZMAN. Thank you very much and thank you all for being here. We really do appreciate your service to our country in this capacity, but you have all had outstanding careers and have just served in so many different ways.

I want to associate myself with Senator Inhofe's words regarding the MKARNS, the importance of getting back on track, the benefit to the economy, all of those kinds of things. He truly has been a great champion and great leader in that for many, many years, and it really is important, not only to our States, but to the economy of the entire country, and really, the world.

Major General Graham, media reports indicate that the cost of damage from Hurricane Ida could be as high as $95 billion.

This compares to $170 billion resulting from Katrina, $131 billion from Harvey, and $74 billion from Sandy, according to estimates by the National Oceanic and Atmospheric Administration.

In your testimony, you discussed how our country invested $14.5 billion to reduce flood risk in New Orleans. I like how you used the term "invested" instead of "appropriated" or "obligated," because infrastructure projects truly are an investment, especially ones such as the Hurricane Storm Damage Risk Reduction System that did protect New Orleans, which saves this country money, and more importantly, saves lives.

I guess the question is, do you believe the American people received a good return on their $14.5 billion investment? If so, why?

General GRAHAM. Senator, thank you for that question. I think, certainly, it was a great investment. I was able to go visit Colonel Murphy about a week after the storm hit, and I was expecting to have to stay out in Mobile or maybe up in Baton Rouge.

But a week after the storm hit, the amazing city of New Orleans was back on its feet, and it would not have been back on its feet if it wasn't for that $14.5 billion investment.

Senator BOOZMAN. Very good.

Colonel Murphy, in your opening statement, you talked about the team effort between the Federal, State, and local government, tribal and levee boards, to address the issues caused by Hurricane Ida. In your opinion, how much does it help the Corps when they are able to lean on their non-Federal sponsors, and what are the benefits of having local side by side with the Federal Government when

addressing the aftermath of extreme weather events, and I would say, even, not only aftermath, but the precursor?

Colonel MURPHY. Senator, I say in short, having a single non-Federal sponsor through the State has been invaluable. Just during the storm, I was talking to the Governor directly via phone call and text; I was talking to Chairman Kline with the State's Coastal Protection and Restoration Authority, and I push out what we call LGLs, Local Government Liaisons, but Corps employees directly to the parish and levee district emergency operation centers.

That communication that that has facilitated really has created a—we like to say, a one door to the Corps approach, whereby questions, concerns, friction is immediately identified, and we can solve problems.

So it helps quicken our response, and I would attribute, really, a lot of the communication that exists right now to why we have been successful to date.

Senator BOOZMAN. Colonel, what other Corps constructed Flood and Storm Damage Reduction projects within the New Orleans District, apart from Hurricane and Storm Damage Risk Reduction System, were impacted by Hurricane Ida, and what is your assessment of their performance?

I had the opportunity to be down there in Congressman Scalise's district, which butts up to New Orleans, and after Katrina, and I know that there was tremendous impact there, sometimes we leave those areas out because of the focus, you know, on the bigger centers, but tell us what else was impacted.

Colonel MURPHY. Thank you, Senator.

Senator BOOZMAN. Assessment of their performance.

Colonel MURPHY. Like I said during my opening remarks, any Federal system performed as designed. We didn't see any major overtopping, and certainly not on the hurricane storm damage.

Outside of that, though, we have over $1 billion in DB 18 supplemental projects that we didn't see any major impacts on.

Sadly enough for the West Shore Lake Pontchartrain Project, unfortunately, that was not in place. The good news is, we are actually moving forward. We have let contracts; we just let the first contract on that. That will reduce risk to La Place, which was one of the most heavily impacted areas to the storm, and with those contracts in place, really, the majority of them this coming year and 2022, we will be well on our way to completing that project.

Senator BOOZMAN. Very good. You have got a good story to tell. That is great, thank you.

Senator CARPER [presiding]. Senator Capito.

Senator CAPITO. Thank you, and thank you all for being here.

After I question, and the Chairman has given me this time, I have to go to another 11 o'clock meeting, so I want to thank you.

So, I am going to start with you, Colonel Murphy, on a quiz. You said, navigation routes, the busiest is the Mississippi; the third is the inland waterway. What is the one in the middle?

Colonel MURPHY. Senator, it is the Ohio River.

Senator CAPITO. I was hoping you would say that.

[Laughter.]

Senator CAPITO. It just happens to run right along the western border of my State.

Major General Graham, thank you. This is the second time we have gotten to work together, so this is great. I am going to say something that we talked about, pre-disaster mitigation and how important that is. It is interesting to hear my colleagues talk about these flash rains that just sort of sit, and that was our last flood in 2016, was very devastating, as you know.

But what we hear from our local partners sometimes, and even FEMA in some sense, and I am not laying blame here, is that sometimes, the processes to get help are so doggone complicated. So you have got an opportunity through the climate program that you said you wrote that has five different aspects to it to, I think, really streamline some of these.

If I look at my cities and towns and counties, they don't have flood disaster experts. They have somebody that is tasked with that, but they are also tasked with traffic or some other—trash pickup, or some other functions, because they are spread pretty thin. You all have all that expertise, and I think, as much as you can streamline those processes in working with your local partners, certainly in New Orleans, they have a lot of experience with it.

But what we found was it was just chaos, but managed chaos. But I think we could have done better with it and recovered quicker, had we had a little bit more hand holding and simplistic way to react to some of those.

I want to ask you, just put that on your radar screen, we have just appropriated $5.7 billion in supplemental appropriations in the continuing resolution. I was wondering, your process and timeline for expending these funds, if you have any ideas on that.

Also, will you make sure that that information regarding this funding, when we make requests for information, that that comes in a timely fashion?

General GRAHAM. Ranking Member Capito, in terms of transparency with—to respond to the Committee's request, absolutely. We will be absolutely committed to being responsive on those.

To the timeline on getting those $5.71 billion that we just received at work for the American people, we are working on that right now. We are looking at the investigation projects, the construction projects, certainly we are looking at the Mississippi River projects, and the O&M work that we have got. Our goal is to, as with any of the disaster supplementals, is to get that work delivered as fast as we possibly can.

Senator CAPITO. What is the timeline stretch on that, on those dollars? Do you know?

General GRAHAM. Ma'am, I don't know. I will get that answer back to your team.

Senator CAPITO. OK, thank you.

General Tickner, I think we were all astounded when we saw the video of the post of, well, it wasn't the post, it was Hurricane Ida flooding the subways in New York City. I think it was something we hadn't ever really anticipated.

What do you attribute that to? Was there something, again, here that pre-disaster could have been better performed to be able to mitigate that?

Because we saw, obviously, as the Colonel said, the pre-disaster that we did in response to Katrina actually prevented a lot more

damage in Ida. So, what do you see in the Northeast in terms of very unlikely places to see pictures like that?

General TICKNER. Ranking Member Capito, I appreciate that question. And as an engineer, we all watched what happened in New York City. We don't really have a project there that takes care of that.

But what happened was a large amount of rain fell in a very short period of time, record levels, and their stormwater system, the drains, couldn't handle it.

So the roads turned into rivers, and water went to the lowest point, many of which was a basement.

There were a lot of rescues that happened in the basements.

Then there were also folks trying to drive through those, that stormwater, which, once you get out of your vehicle, you are now fighting the water, and the power of the water, it will overtake anybody.

So, regretfully, New York City had 18 deaths. New Jersey had even more with 30, I believe.

So, from talking to my counterparts at the State level, from a pure flash flood, when we are not putting in a project, it is about education and letting people know that this risk is out there. Don't go into the water. Regretfully, some people lived in the basements, and hopefully, that problem is being corrected, where they have a way out.

Senator CAPITO. Well, I would say that the bill that we passed, the Safe Drinking Water and Wastewater, and then as was incorporated into the BIF, in terms of trying to manage or trying to modernize some of these old storm systems, I don't know how old New York City's storm system is, but I would imagine it is in excess, probably, of 100 years. Certainly, we have systems that old in our State, and then to try to manage that.

So, this is where I think if we do on the front end, what we know to have fallacies on the back end, we are going to end up saving money, saving lives, saving property.

But we have got to make these processes for communities and States to access these dollars so they actually feel like they can work with you and work with other local partners, FEMA and whoever, to be able to get these projects up and running.

So thank you all very much, and I appreciate all of your good hard work. Thank you.

Senator CARPER. Senator Capito, thanks so much, and thanks for keeping the trains on time while I was trying to wear two hats at once.

No, the Army is always on time. It is the Navy we worry about, right? I say that as a retired Navy captain. I like to say, different uniforms, same team. There we go; how is that?

Colonel Murphy, let me just say, this could be for anybody, but in terms of what we witnessed in greater New York, the subways flooding and that sort of thing, my sense is that with climate change, we are seeing more intense rain. In some cases, we are seeing storms hunker down and sit on an area for a while, and just create a lot of flooding. Is that a fair characterization or not, anybody?

General GRAHAM. Chairman, I believe it is, that that is a fair characterization, and in that massive rainfall events that we weren't expecting is, I think, what caught a lot of people by surprise. We saw the tragedies in western Tennessee with some of the mountain flooding, and the valleys, where we tragically lost some lives this year.

If you would ask somebody in New York City, do you think that could happen here? I am going to guess that they probably said it couldn't.

So I think education on this coming out of this is probably our best defense.

Senator CARPER. Yes.

General, anyone else want to comment? I know that you weren't trained, I wasn't either, in weather-ology or meteorology.

General TICKNER. I will just mention a little bit, maybe beyond New York City, where we have done, we have started to build over the last 100 years in the flood plains. That is something that I know our State partners are very concerned with because they don't want just to do projects; they would like to do natural and nature based features and non-structural, which could be moving people out of the flood plain that exists today.

Senator CARPER. All right, thank you.

I want to put a human face on it, so when Hurricane Ida came up the East Coast, it spun some tornadoes. One of those tornadoes ripped through nearly just on the other side of the Delaware Memorial Bridge.

It struck a family farm, a number of them, but also the family farm of Katie Grasso. We know her; she is my communications director in Delaware, lives in New Jersey. Her family farm, their family farm was destroyed, houses, buildings, equipment.

So, that is a human face. People that we know, and there are a lot of other folks that are suffering, were suffering, are suffering today, still, as a result of all of this, but Hurricane Ida was the first big test of the new Hurricane Storm Risk Reduction System.

By most accounts, maybe by all accounts, it was given an A. I didn't get a whole lot of As when I was in school, but that is very encouraging to hear. I got a few. This system, however, is only part of the picture. It doesn't function without tireless communication and collaboration with other critical players.

My question is for you, Colonel, please. Please tell us about the differences between the Corps' response to Hurricane Katrina and Rita and the response to Hurricane Ida. What were the biggest changes and lessons learned from previous storms that you put into use in responding to Hurricane Ida?

Colonel MURPHY. Thank you, Chairman. I could probably spend 30 minutes, but I won't.

I would tell you a big difference is the systems approach that the Corps now uses. Before Katrina, it was the Hurricane Protection System, and it was a system in name only. It allowed water into the city via canals, and it was incrementally funded. So I would say a huge change is the Corps approached it as a system, which I think has application to what this Committee is interested in is, how do we get after coastal resilience, how do we get after flooding, is looking at things as a system.

So, that full Federal funding, key lesson learned, allowed the Corps to move forward. All the talents and the technology that the Corps had, we see today in the system. It allows decisions to be made that are not funding based, but they are risk based, and you see that in what performed right during Ida.

I would say we had a willing Federal partner, a single Federal partner, that did not exist between Katrina.

And now with the State, I work with the Coastal Protection and Restoration Agency, and they work with the levee districts. The communication is back and forth.

But I have a single State sponsor who is responsible for working real estate issues, who I work with on payback, all the kinds of issues.

Then really third, I would say, another key enabler was the alternative environmental arrangements. There is no way to build the kind of infrastructure you need without having some kind of an environmental alternative arrangements to allow you to move quickly. Now, we still met those environmental requirements, but what really Congress allowed working with CEQ after Katrina, we were able to move forward very quickly.

Senator CARPER. You didn't need the 30 minutes, but you have 27 more minutes. We will just put that in the bank, OK?

I am going to turn next to General Graham for a quick question pertaining to climate change and project design. As I mentioned earlier, the intensity, the frequency, the duration of storms has increased significantly, and as climate continues to warm, as our climate continues to warm, hurricane intensity and rainfall are only projected to increase as we continue to experience the impacts of climate change. The way in which we approach risk reduction must take these factors into account.

My question is, and I will ask you to be fairly brief on this because I want to recognize Senator Kelly shortly, but does the Corps currently account for climate change in its design process for flood risk management projects?

General GRAHAM. Sir, it does, absolutely. I will give you a very quick example. We are working on a project. It is on Highway 1, which goes down to the Florida Keys in Monroe County, the southern tip of Florida.

We have formulated that project, we designed that project, for the high sea level curve, because one of the aspects is raising Highway 1, the only road in and out.

So, we went and had the authority to use the higher sea level curve, and that is what we are using for this project.

Senator CARPER. All right, good.

I have a follow up question for the entire panel. I am going to yield to Senator Kelly. He is a man on a mission, so he can ask his questions and head on to his next assignment.

Senator KELLY. Well, thank you, Mr. Chairman, and thank you for all the witnesses today for being here.

General Graham, this question is for you, on emergency preparedness in Arizona. You have spoken both in your testimony about the lessons that the Army Corps of Engineers learned from Hurricane Katrina and how those lessons informed the Corps' response to Hurricane Ida.

But of course, the goal of emergency preparedness should be to be ready to respond to any catastrophe the first time. With a changing climate affecting all aspects of the country differently, preparing for the worst case scenarios everywhere is even more important. That is why I was pleased to see that the Los Angeles District partnered with the Arizona Department of Emergency and Military Affairs in early September to host an emergency exercise to plan for a scenario where above average rainfall in Arizona causes the Corps' Painted Rock Dam near Gila Bend to fail and risk significant downstream flooding.

So, General, can you describe the value that tabletop exercises like the one hosted in Arizona can provide to the Corps as you prepare for the worst case scenarios? What value do exercises like these provide for the Corps as you work to respond to the real world damages, like those cause by Hurricane Ida?

General GRAHAM. Senator Kelly, I certainly thank you for that question. We were all watching the monsoon season, very, very wet monsoon season down in New Mexico and Arizona closely. So, those exercises that our South Pacific Division did in the Albuquerque District were absolutely key to making sure that the partnership that Colonel Murphy spoke to that works so well within the State of Louisiana, that we build that connective tissue within our State partners in Arizona. It is the "make a friend before you need a friend," and it is really all about trust.

In the middle of a disaster, if you haven't established that trust beforehand, you have got a storm, norm, and perform during the hurricane or the storm, and we don't want to do that. So it is absolutely key, those exercises are, to building trust in that whole of government team.

Senator KELLY. Yes, I mean, it just reminds me of not only flying the space shuttle simulator, but at times, we also do tabletop a lot of different scenarios that often are rather complex.

In Arizona right now, as you know, we have had the worst drought in our country's history, in Arizona's history. I have a subcommittee hearing on this specific issue later today to discuss what do we do here going forward to mitigate for this drought.

Because of climate issues we are facing, we have had one of our worst wildfire seasons. As you know, after the fire, if it rains, comes the flooding. We have been dealing with that, so I appreciate you doing this.

I have got another question about Corps benefit-cost ratio, General. As you know, the Corps makes most construction and investigation investments based on a project's benefit to cost ratio as a way to measure the value of the project, what value that project will provide to the surrounding community, including preventing a worst case scenario during a disaster.

I, like many folks, Senators, on this Committee, support efforts to ensure that a project's benefit to cost ratio reflects not just the monetary value of property damage, but the risks to life and health of those affected by a potential Corps project. So, General, when you look across the country, do you believe the Corps does a good job at prioritizing investments in the construction and investigation projects, which are most likely to prevent future disasters?

General GRAHAM. Senator Kelly, thank you for that question. On anything we do, there is always room for improvement. For the benefits that you spoke of, we often evaluate a project primarily on its national economic development benefits. We are working now to incorporate three other benefits, and those are the regional economic benefits, the societal effects, and the environmental benefit, as well. So, those include the life, health, safety that you just spoke to, so we are going to make sure that we are including all of those when we design our studies.

Senator KELLY. Well, thank you General Graham, and thank you to all of you for being here today. And I yield back 18 seconds.

Senator CARPER. We appreciate each one of those 18 seconds. Senator Kelly, thanks. I know you had a full plate this morning; thanks for making time to come by and participate.

Before I recognized Senator Kelly, I was talking to General Graham about climate change and project design, and I has asked, does the Corps currently account for climate change in its design process for flood risk management projects. You were good enough to answer that.

I want to do a follow up to that question for the rest of the panel, if I could. That would be, how does the Corps adapt its design processes with the rapid advances in science and our increased understanding of the interconnectivity of these systems, keeping in mind the increased frequency and intensity of climate related impacts into our future?

Tom Tickner, would you like to take a shot at that, then Colonel, and then we will come back to General Graham?

General TICKNER. Chairman Carper, thanks for the question. We have lots of projects on the Northeast that we are studying. We do take the current science, the existing engineering that is out there that is really not changing.

But the science and the new data that is coming in with climate change is adjusting our projects. You see that on the coastal projects that we have in Delaware and New Jersey and Maryland with the dune systems that we have.

But it also is going on to all our flood risk management projects as we look at the potential amount of water that has got to pass through safely, past urban areas, and to where we are going to let it expand or go out to sea.

Senator CARPER. All right.

Colonel Murphy, anything you want to add to this?

Colonel MURPHY. I would say, down in the Mississippi, Chairman, I would say down in the Mississippi Valley Division, which is my higher headquarters, we have the Engineer Research and Development Center, which is Corps of Engineers, and for a lot of our issues, we are working closely with them to get—they are our lead for science, technology.

I can tell you, just on studies on the Lower Mississippi River, we are incorporating the best science and data that they have helped to provide us.

Senator CARPER. All right, thank you. General Graham, anything else you want to add before we turn the page?

General GRAHAM. Just to reemphasize that, the research and development aspects of this, which is, we know the world is changing,

and to make sure that we are on a solid foundation of science is absolutely critical.

Senator CARPER. All right, thank you. We will be guided by science, not blinded by science. That is good.

General Tickner, if I could, another question for you regarding flooding impacts in urban areas, not unlike what we saw in the Greater Wilmington, Delaware, area when this hurricane came through. General Tickner, your command covers, as we know, the North Atlantic Region, which includes some of the most densely populated areas in our Nation. While Ida had significantly weakened by the time it made its way up the East Coast, it nevertheless produced devastating impacts throughout our region, including in my home State of Delaware.

Could you just describe for us briefly some of the specific challenges that the Corps faces in conducting flood response in urban environments, and how did you overcome them, and how might we better overcome them in the future?

General TICKNER. Chairman Carper, thank you for the question. It is a shared response. We are working very closely with all the States, definitely Delaware, but through all the States in the Northeast.

It is a combination of structural things that the Corps of Engineers would come up with, non-structural, moving folks out of the flood plain. It is allowing the water to expand into certain areas, like parks or other environmental habitats. It is other educational tools to allow people to know what could happen in their area, river gauges and installing more of them, which goes right to the early warning systems.

One of the successes that I have heard from the States was, they were able to warn their citizens through the automated systems that were out there. They knew flash flooding was happening because of the river gauges, and so it is a partnership and a shared responsibility.

Senator CARPER. All right, thank you.

General Graham, a different question, if I might, one that deals with environmental justice communities; there is a lot of them in my State and around the country. General Graham, despite the recent supplemental bills that have provided a significant increase in Federal investments for critical infrastructure, the impact of storms like Ida will always disproportionately affect those who may not have the means to evacuate in a timely manner, especially those in economically disadvantaged communities with large environmental justice populations. Rather than mitigating the damage from these storms on the back end, it is imperative that we invest up front to protect those communities that need the most help.

My question would be, would you just discuss with us for a bit how the Corps is specifically helping these communities from future storms or natural disasters?

General GRAHAM. Chairman Carper, thank you for that question. The guidance we received from President Biden is absolutely clear, to focus the Federal investments on environmental justice.

One of the areas, and I will focus up in the Northeast, would be the back bays. We have put coastal storm risk management systems, the berm and dune systems that you are familiar with, on

the parts of the coast facing the oceans. A lot of the flooding also happens around the back bays, and oftentimes, the folks that live back there aren't as well off. There is a great deal of environmental justice concerns back there. So we are formulating a bunch of those projects.

Certainly, General Tickner is right now, and those will soon be, some of them have already been in front of this Committee, and some of the larger ones will soon be there. I think that is one aspect of how we are getting at that.

Senator CARPER. All right, thank you.

I have more questions I would like to ask, but I am needed back at the Homeland Security and Government Affairs markup business meeting, so they are saving you from any further damage I might inflict. Actually, I have not inflicted, and you have been very forthright and clear minded in your responses.

I just want to give a brief closing statement here, and then you can look for a couple more questions for the record that I would like to have asked, and you will receive those shortly.

Before we adjourn, a little bit of housekeeping. I would like to ask unanimous consent to submit for the record a variety of materials that include letters from stakeholders and other materials that relate to today's hearing, and asking unanimous consent while I am the only one in the room, that is a pretty easy thing to do, so no objection.

[The referenced information was not received at time of print.]

Senator CARPER. Additionally, Senators will be allowed to submit questions for the record through close of business of Wednesday, October 20th. We will compile those questions; we will send them to our witnesses. We ask that you provide a reply to us by Wednesday, November the 3rd.

In closing, I just want to thank our witnesses for your testimony today. I really want to thank you for your continued service to our Nation. As one who spent a few years in uniform myself, I have huge respect for the work that you and the men and women you lead do for our Nation.

I know of so many of your teams, both serving in the military work around the clock to help Americans who are suffering in the wake of these disasters. We are grateful for your work. I want to make sure the Corps is equipped with the resources it needs to carry out your missions and fortify communities amidst a worsening climate crisis.

I don't have any other unanimous consent requests, do I? No?

With that, we are dismissed.

Thank you again so much. Great to see you all.

[Whereupon, at 11:20 a.m., the hearing was adjourned.]

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