



Atchafalaya River Backwater Flood Threat

USACE and International Partners Share Knowledge in Flood Risk Management

Forecast Informed Reservoir Operations: Research on Increasing Resiliency for Droughts and Floods

The USACE National Hurricane Program



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Change and Flood Risk Management

By Mark Roupas, Deputy Chief, Office of Homeland Security



Fall greetings and thank you for taking the time to review this edition of the Flood Risk Management Newsletter. I want to start this edition by reflecting on a topic that I have been hearing quite a bit about recently – change. Change is an all-encompassing topic that can include political change, leadership changes, policy changes, climate change and other land use and/or demographic changes.

Our own National Flood Risk Management Program (NFRMP) was born out of change - the change in understanding from flood control to flood damage reduction to flood risk management. The NFRMP also acknowledged the realization that no one agency possessed the authority, resources, or ability to manage flood risk alone, leading to an understanding of the necessity for interagency and inter-Governmental collaboration to address flood risk management challenges and achieve measurable risk reduction. Now, there is growing discussion of the concept of Flood "Resilience." By its very nature, flood risk is a topic that undergoes frequent change. Flood risk is a combination of a given hazard and the consequences of that hazard, and both of these factors change over time. In spite of the fact we flood risk managers are used to operating in a dynamic environment rather than a static one, I wondered if these changes are coming at us from more directions than usual right now, which may seem a little overwhelming. Despite this, it is critical we continue to view change as an opportunity, rather than fearing it or trying to avoid it. Change is the catalyst for action. Change is what interrupts our routine and enables us to at least consider a better 'normal'. Remember Newton's first law of motion that a body at rest will remain at rest, and a body in motion will remain in motion in a straight line unless acted upon by an outside force? Maybe those physical principles actually do apply to human nature. Change disrupts the status quo and leaves to us to determine how to use it to create a path to the vision we all work toward daily. The opportunities are plentiful.

"Changes in leadership prompt us to accommodate new leadership styles and priorities. They can also open doors to new opportunities..."

From a political perspective, for the first time in eight years, we are on the cusp of a change in Administration. This will bring not just a new President and Vice President but for those of us within the federal government, a new group of political appointees at the helms of our agencies. Each new Administration brings with it new perspectives on flood risk management as well as new focus areas and priority activities for us to incorporate into meeting our missions. One such example will be a revised Civil Works Strategic Plan.

In addition to the changes in Administration leadership, we in

USACE experience changes in leadership that occur over the course of time. We have a relatively new Chief of Engineers, LTG Todd Semonite, as well as a new Director of Civil Works, Mr. James Dalton, in addition to the ongoing transitions for Operations and Regulatory, Engineering and Construction, and Programs and Integration Divisions leadership. While many are familiar faces within USACE, they nevertheless bring new ideas to how the enterprise should fulfill its flood risk management mission. There have also been leadership changes in many of our partner federal agencies and I suspect very similar conversations about agency roles and responsibilities within flood risk management are occurring within those federal agencies' offices. These typical leadership changes are certainly not unique to the federal government and those of you at other levels of government and in other sectors also face these changes in leadership. Changes in leadership prompt us to accommodate new leadership styles and priorities. They can also open doors to new opportunities: to develop new advocates for flood risk management activities and further spread awareness and understanding of the challenges and potential solutions the nation faces in flood risk management.

A third area encompasses changes in policy. Currently, many federal agencies are grappling with development of implementation procedures for the Federal Flood Risk Management Standard, which is being implemented through Executive Order (E.O.) 11988 and E.O. 13690. As agencies implement these new requirements, it will change how we view federal investments and how we work to ensure they are resilient to future flood events. Within USACE, we have another policy change underway that will impact flood risk management – *Continued on page 2.*

the revision to 33 CFR Part 203, which outlines our implementation of Public Law (P.L.) 84-99. After this revision is completed, it will result in changes to our agency implementation procedures, found in Engineer Regulation 500-1-1. Beyond agency policy changes, there are also numerous changes in agency practice and focus areas that affect flood risk management. For instance, the USACE Levee Safety Program is placing additional emphasis on the importance of risk communication. Changes in agency policy and practice can be accompanied by a loss of certainty, predictability, and stability, as we adapt and learn how to implement new polices and place them into our business processes. As with any new idea, it will take time to fully understand how a change in policy or practice will impact ongoing activities. I absolutely see the changes in policy and practice occurring within USACE right now as a positive thing. These changes will allow us to work more collaboratively with project sponsors to understand the risk so that we make risk-informed decisions, that will help us to make wiser use of the taxpayer funds, which is a necessity in this budget-constrained environment.

Finally, there are changes in the physical environment, including rising sea levels and changing precipitation patterns. These and other factors will have significant impact on flood risks and flood risk management. At the same time, there are changes in land use due to demographic shifts and other factors. While facing the effect of these physical changes on flood risk, changes in federal, state, and local budgets have implications for how we manage and adapt to flood risk. Many will agree that the era of building major new dam or levee projects is waning, as we instead begin to turn more to operating and maintaining the flood risk management infrastructure already in place and begin to consider nonstructural or nature-based approaches to manage flood risk in other locations. In some ways, designing and building a levee, or other flood risk management

infrastructure project, may seem like the obvious answer, and USACE has developed significant expertise in this arena over the last century or so. However, we have learned, particularly in the last decade that infrastructure solutions often come with their own set of challenges. The changes that are being observed in climate along with changes in budgets are an opportunity for us to collaboratively consider more holistic approaches to flood risk management. Instead of just discussing how and where to build a levee, we can discuss a multitude of options including nonstructural flood risk management alternatives, nature-based alternatives, risk communication, and emergency preparedness planning, to name a few examples from the full toolbox. This changing approach to flood risk management will help us to reach a higher level of resilience to flood risk, while also allowing us to achieve other objectives and benefits simultaneously. On the surface, the number of changes I just outlined looks overwhelming, and it may seem difficult to figure out how to operate in such a changing environment. However, keep in mind that none of this is actually new. We go through political elections and changes every couple years, we go through leadership changes on a regular basis, and agencies are constantly working to improve their policies and practices. Our understanding of the status of our climate has been evolving for decades as our scientific understanding has improved. We must keep in mind the Directorate of Contingency Operations' Guiding Principle number one - Anticipate and identify the "so what" and number six – Recognize and embrace change; focus on solutions. Remember to keep your eyes open for the opportunities as you face the changes. And finally, as a small teaser, for those able to join the upcoming USACE Flood Risk Management Workshop in late February, change will be a focus of conversation for us there as well! Best wishes for a beautiful change of seasons!

Trent Ferguson Recognized as First Levee Safety Professional of the Year



Screening level risk assessments have been the main focus of the USACE Levee Safety Program over the past years, and Trent Ferguson has made it his mission to "get 'er done." Mr. Ferguson, the Levee Safety Program Manager for South Atlantic Division, was recognized with the first ever "Levee Safety Professional of the Year" award at the recent Levee Safety Community of Practice meeting in Tulsa in August.

"We couldn't think of a more deserving Continued on page 3. person for our first award," said Tammy Conforti, Special Assistant for Levee Safety. "Trent is a true professional and extremely hardworking. During the past year, he even worked with a broken ankle, unable to walk, and didn't miss a beat! How's that for commitment?"

Trent has managed the agency's aggressive schedule for the screening initiative since 2011 while fulfilling his "day job." In addition to his LSPM duties, he is the subject matter expert and technical advisor for all engineering aspects of the Civil Works Water Management Program in SAD. Trent worked closely with all of the districts, the risk cadres, and the national centers to develop the risk assessments. When time came for draft assessments to be reviewed, he facilitated the Levee Senior Oversight Group.

Eric Halpin, Deputy Dam and Levee

Safety for USACE said, "Trent's ability to manage the national activities in addition to several full time duties within the SAD office demonstrates his complete commitment to the districts, division and agency in the area of Levee Safety. He is a true difference maker."

Information about nominations for next year's award will be published shortly, according to Steve Fink, the USACE Levee Safety Program Manager.

Vermont Silver Jackets Team Signs Charter

By Matthew Cosby, New York District



Signatories of the Vermont Silver Jackets Team Charter, above. The Charter was signed at an event commemorating the five year anniversary of Hurricane Irene.

On August 26, 2016 the Vermont Silver Jackets Team officially kicked off their partnership with the signing of their Charter. The Charter was signed at an event commemorating the five year anniversary of Hurricane Irene. Congressional Staff and top officials from the Federal Emergency Management Agency, the U.S. Army Corps of Engineers, the Natural Resources Conservation Service, the U.S. Geological Survey, and the National Weather Service were at the event, held in Barre City, VT, to formally launch the new Vermont Silver Jackets Partnership. State signatories on the charter included

the Agencies of Commerce and Community Development, Department of Transportation, Division of Emergency Management and Homeland Security with the State Hazard Mitigation Officer, and the Agency of Natural Resources (Department of Environmental Conservation). The working level team will hold their first formal meeting this fall.

In a joint statement, Senator Patrick Leahy, Senator Bernie Sanders, and Congressman Peter Welch said: "After seeing the devastation caused by the 2011 floods in cities and towns throughout Vermont, we are pleased to see that our work to secure federal funding and support has advanced state and local efforts to plan ahead and make Vermont safer and more resilient in future storms." In addition, the congressional staff passed on supportive and encouraging words for the newly formed interagency team.

The event was well attended by state partners, federal partners, congressional staff, and public. It was also covered by local and regional media outlets.

Atchafalaya River Backwater Flood Threat

By Michael Krehely, New Orleans District



2016 Barge Flood Side-Taken from the flood side of the barge post construction, the sheet pile wings walls remaining from 2011 can be identified. There is also a noticeable difference in the silt laden flood water on the flood side versus the protected side.

The flood season started early this year in the New Orleans District when the lower Mississippi River and Tributaries reached phase 1 flood fight trigger levels in December 2015. Typically, the lower Mississippi River flood season starts in the March timeframe and recedes around May. Not only did the flood season start early this year, we also reached project design flow requiring the operation of the Bonne Carré Spillway and potentially the operation of the Morganza Spillway. Although the spillways are part of the planned project design flow, peripheral impacts still require flood fight efforts.

During events that include high water surface elevation in the Atchafalaya River, portions of both St. Mary Parish and Terrebonne Parish have historically "The National Guard installed over 30,000 linear feet of HESCO baskets in areas that anticipated impacts wfrom back water flooding."

experienced an increased risk of flooding from the Gulf Intracoastal Waterway (GIWW)/Bayou Boeuf channel. While the construction of the Bayou Boeuf Lock by the U.S. Army Corps of Engineers (USACE) alleviated the immediate flooding threat through the GIWW/Bayou Boeuf waterway, another flood risk situation was

created by the downriver channeling of high river waters that eventually flow back in a northeasterly direction up Bayou Chene. This redirection of high water levels, commonly referred to as backwater flooding, has plagued portions of St. Mary, Terrebonne, St. Martin, Assumption, Lafourche, and Iberville Parishes on a number of occasions, causing damage to homes and public infrastructure. According to the 2010 United States Census Bureau, the affected area consists of 680 square miles and a population of approximately 28,500 with an estimated value of personal property in excess of \$300 million; with the inclusion of local businesses, the estimate is in the billions.



Hesco Lock- this is where the HESCO tie into the Bayou Boeuf lock. The water is covering the field and encroaching on the HESCO baskets, the large Sandbags are on site to close the road and complete the tie in when required.

During the historic flooding of 2011, prior to the installation of the Bayou Chene closure, the impacted parishes worked diligently to increase the level of their respective non-federal risk reduction systems through the use of earthen levees, sand bags, water tubes and HESCO baskets. The National Guard installed over 30,000 linear feet of HESCO baskets in areas that anticipated impacts from back water flooding. The entire process took several weeks, a plethora of man power, and a large financial commitment by the individual parishes to complete the work. Despite the monumental effort, there were some areas that would still be outside the improvements and a vulnerability to vandalism where HESCO had been removed, creating a weakness in the system.

In 2011, higher than normal Atchafalaya River levels were predicted and a potential opening of the Morganza Spillway was considered. Using an idea "Once complete, the three separate parts of the system worked synergistically and eliminated over 3.5 feet of backwater from entering the surrounding communities."

from the 1973 flood event, USACE worked with the St Mary Levee District to implement a temporary flood control project to close off a navigable waterway connected to the GIWW. While there were many changes in the navigable waterway in 38 years, USACE and the St Mary Levee District devised and the Levee District submitted an emergency permit to complete what would come to be known as the Bayou Chene Closure. The project, with an approximate cost over \$11 million, required a couple

of weeks of planning and 10 days for construction. There were three distinct parts for construction; a complete closure of nearly 900 feet across the Bayou Chene closing of the Tabor Canal, and constructing levees on Avoca Island. The Bayou Chene closure consisted of a 500+ foot barge that was purposely sunk to provide support for over 300 pairs of sheetpile and 24,500 tons of stone that created a wall from bank to bank tying into high ground. The Tabor Canal closure utilized super sandbags to fill in the existing pipeline crossings and close off the weir at the end of the channel. Avoca Island required a combination of earthen levees and HESCO baskets in low lying areas. Once complete, the three separate parts of the system worked synergistically and eliminated over 3.5 feet of backwater from entering the surrounding communities.

Having good documentation and institutional knowledge provided a solid



Project Overview Map- Map submitted by St Mary Levee District (yes we have permission to use it) that shows the entire project areas.

foundation coming into the December 2015 flood event, when the Atchafalaya River was predicted to reach flood levels and a potential for opening Morganza existed. The Bayou Chene Closure proved very effective at holding off backwater flooding from the surrounding areas during the 2011 event, reducing the need for the surrounding Parishes to work on individual risk reduction projects for backwater flooding. After the 2011 flood, St Mary Levee District obtained a permit to leave part of the closure in place for use during future events and inherently improved the time to put the closure in place. The closure still required the three separate construction parts of Tabor Canal, the channel closure, and elevation of low areas on Avoca Island. Tabor Canal required 625 3,000 lb. sandbags to close the pipeline crossings and weir. The channel closure required a 400 ft. submersible barge, 169 pairs of sheetpile,

"During both the 2011 and 2015 flood events, the coalition of USACE, local governments, state government and Nation Guard was essential in completion of the Bayou Chene Closure."

10 – 48 inch piles, 7 – 30 inch piles, 760 ft. of H-beams and 6,600 tons of rock. Elevation on Avoca Island consisted of three areas and approximately 12,500 ft. of 3' and 4' HESCO baskets. Construction of the channel closure and Tabor Canal sandbagging was completed within seven days. The HESCO baskets achieved minimal risk reduction levels within seven days, but austere conditions extended the completion to just over two weeks. The Morganza structure was not opened for the December 2015 flood event, but the Bayou Chene Closure did hold back just under 2 ft. of backwater flood from the surrounding area. Using lessons learned and retaining part of the structure from the 2011 flood event resulted in a reduced implementation time and a reduction in cost to just over \$7 million.

During both the 2011 and 2015 flood events, the coalition of USACE, local governments, state government and Nation Guard was essential in completion of the Bayou Chene Closure. The St. Mary Levee District submitted an initial joint permit application in 2013 and is actively pursuing a permit for a permanent Bayou Chene Closure structure.

USACE and International Partners Share Knowledge in Flood Risk Management

By Joe Goldstein, Los Angeles District

Three of the premier public engineering agencies in the world have partnered together to collaborate and learn from each other's flood risk management strategies. The U.S. Army Corps of Engineers (USACE), Rijkswaterstaat (RWS) from the Netherlands, and the Environment Agency (EA) from the United Kingdom have joined forces to share knowledge, approaches, and best practices in levee safety.

The Levee Safety International Partnership, established under an agreement between the USACE and RWS, has held regular partnership meetings for almost 10 years to explore areas and issues of common interest, conducted workshops and training sessions, performed peer reviews of design and technical documents, conducted joint research, and enabled multiple staff exchanges by the partners. The catastrophe from Hurricane Katrina triggered USACE to seek input from other government agencies and work together towards better flood risk management. [The EA recently joined the Levee Safety Partnership two years ago.] The activities from the partnership have created the opportunity to share knowledge between subject matter experts and build upon that expertise. Each agency's program is constantly evolving and striving to drive down flood risk in their respective countries.

Over the years, the partnership has discussed important issues such as riskinformed levee design, expert judgment in levee performance, using risk to manage real-time flood events, and hydrologic and hydraulic uncertainties. Also, USACE and RWS have conducted joint research on internal erosion and piping (one of the primary failure modes of engineered embankments like dams



Spring 2016 Levee Safety Partnership meeting participants toured the Keswick, England flood defenses that overtopped during the record-breaking winter floods.

and levees). The EA has shared their best practices for floodfighting based on their recent response to historic flooding in northern England, and more recently, a member from the RWS presented a unique solution to increasing flood risk awareness in the Netherlands at the USACE Levee Safety Community of Practice Workshop. The RWS created a Dutch website and mobile app that allows the public to enter their zip code to see how high potential flood waters could be at their home or office, the likelihood that they could be flooded in their lifetime, and what to do to prepare for and during a real flood event. [http:// www.overstroomik.nl/

Levees are getting an increased amount of attention as these agencies start to understand more about the risks and benefits of these infrastructure systems. The Partnership recently achieved a great result by influencing the International Committee On Large Dams (ICOLD) board to put levees on the agenda for their conference in 2018. Emerging issues and future priorities for the Partnership include the use of expert judgment in levee design, potential risks to infrastructure associated with mineral extraction, continued research in erosion and piping, and risk communication.

The next planned meeting will be hosted by USACE in Davis, CA, where the team will meet and visit the Sacramento area levees. With the recent flooding in southeastern Texas, West Virginia, Maryland, and Louisiana in the United States, the record-breaking winter storms in northern England, and with one third of the economic production and millions living below sea level in the Netherlands, it is important now more than ever for this Partnership to continue to tackle the complexities of levee safety and flood risk management.

Coastal Hazard Rapid Prediction System (CHRPS)

By Cary Talbot, Ph.D, P.E., Engineer Research & Development Center - Coastal & Hydraulics Laboratory and Jeff Melby, Ph.D, ERDC-CHL

The Problem

Flood and wind damage from annual coastal storms continues to cause dramatic negative impacts to the U.S. economy with direct cost of over \$400 billion for the top 7 hurricanes. Six of the top seven most damaging storms have occurred since 2004. Over 52% of the U.S. population lives in coastal watershed counties and the coastal population is expected to increase 10% between now and 2020. Sea level rise and increasing storminess are exacerbating the vulnerability of coastal communities. Hurricane Sandy alone accounted for roughly \$66 billion in damage and over 200 lives lost. Hurricane prediction technology is either rapid with low accuracy (errors of 1.5 - 2 meters with uncertainty estimates in several hours) or slow with high accuracy (errors of 0.3 m with some parameters and 0.4 -0.8m with others but taking 2-4 hours). Uncertainty estimates are required in hurricane response prediction, but only the low accuracy estimates include uncertainty. Public surge forecasts only include peak response but knowledge of the time history is required for federal planning. In short, the challenges in coastal hazard prediction are:

- Federal agencies and partners need accurate and rapid hurricane response estimates
- Hazard forecasts must include a complete description of the response and its uncertainty
- Measurements are too spatially sparse and instruments are prone to failure during extreme events
- Coastal storm simulations are complex and produce gigantic data sets requiring innovative analysis, data formats and big data technology

A Solution

In response to this problem, the Engineer Research & Development Center (ERDC) has developed the Coastal Hazard Rapid Prediction System (CHRPS), a suite of software tools and data utilizing artificial intelligence to make very rapid accurate hurricane response predictions. CHRPS is based on high-fidelity comprehensive coastal storm modeling within the Coastal Hazards System (CHS). The CHS is a national, coastal, storm hazard data storage and mining system, storing comprehensive, high-fidelity, stormresponse computer modeling results including climatology, surge, total water levels, waves, and currents. CHRPS rapid predictions are useful for

- Hurricane response forecasting
- Risk and resiliency assessment
- Project planning and design
- Quantifying climate change impacts

Accurate Response in Seconds

CHRPS is based on a machine learning technique called Gaussian Process Emulation (GPE) or Kriging. The technique is applied to hurricane response, training the GPE model with a few inputs and thousands of outputs. The inputs are storm landfall location, speed, heading, storm size and minimum central pressure. Storm responses, such as surge, total water level, and wave height, are outputs. The responses are output at 30-minute time steps over a 48hour period from 1 day before to 1 day after landfall. The output locations are spaced about 1 km apart over the region. CHRPS predictions have been validated against actual storms. In Louisiana-Mississippi, Hurricanes Katrina, Gustav and Rita were used as validation. The CHRPS predictions have a root-meansquare error of about 0.3 m (1 foot) when compared to measurements and careful validations using the highest fidelity numerical models, and a single storm run time takes roughly 0.02 seconds for about 1000 spatial points.

Benefits

USACE and other Federal emergency managers require rapid and accurate predictions of hurricane response and the associated uncertainty as storms approach the coast. These estimates are required by Emergency Operations personnel for, for example, operating floodgates, deploying emergency personnel, equipment and supplies as well as assisting with the federal disaster relief in the immediate aftermath of a devastating storm. Risk estimates from rapid hazard predictions can be used for emergency operations. Engineering and Construction and Planning will benefit from rapid hazard predictions that allow many fast and accurate realizations. These estimates with uncertainty can be used in project design or long-term risk and resilience assessment. CHRPS is a unique product providing comprehensive coastal response predictions for hurricanes that are both fast and have high accuracy. The inputs are very simple while the outputs are robust, covering dominant coastal storm responses that vary in time and space.

More Information

The URL for the Coastal Hazards System is <u>https://chs.erdc.dren.mil.</u> The CHRPS predictions are listed as a project within the web tool. The CHRPS standalone PC tool is available to USACE Districts. For further information on CHS and CHRPS, please contact Dr. Jeff Melby, Jeffrey.A.Melby@usace.army. mil, 601-634-2062, or Dr. Jay Ratcliff, Jay.J.Ratcliff@usace.army.mil, (504) 862-2958. Figures on page 9.







Figure 2 – CHRPS prediction (or "save") points within the New Orleans area colorcoded to depict relative surge values for a storm simulation.



Figure 3 – CHRPS timeseries surge data provided at a selected save point for a given storm simulation.

South Carolina Flood Response

By Sean McBride, Charleston District



Cars are seen washed off a road after a dam collapsed in Columbia, SC, during the historic rain event in October 2015. Photo by Sara Corbett.

Just how much water is 11 trillion gallons* exactly? It's roughly 636,000 16'x32' swimming pools. It's 130,370 Rose Bowls filled to the top. It's onethird of Lake Tahoe. It's also enough to end the drought in California. But those 11 trillion gallons of water actually came in the form of rain pouring down on the state of South Carolina, crippling most counties with epic flooding.

The damage sustained across South Carolina is yet to be completely determined. The flooding devastated farms, ruined homes, shut down businesses, forced highway closures and so much more. Additionally, many dams and canals were breached and washed away, sending even more water where it wasn't supposed to go.

That's where the Charleston District stood in to aid FEMA in response and recovery efforts from the storm. Per Homeland Security Presidential Directives, FEMA is the lead federal agency in disaster response, with the primary mission of reducing the loss of property and protecting the nation from all hazards. FEMA accomplishes this mission by building a comprehensive national incident management system by consolidating existing emergency response plans into a single, coordinated national response plan with government support from all levels. The Corps of Engineers' role is to serve as the lead federal agency for public works and engineering. The Charleston District had six engineers, working alongside SC Department of Health and Environmental Control officials, inspect 682 dams in South Carolina over the course of two weeks, to ensure public safety and the protection of property. The engineers determined the extent of the damage done to the dam and prioritized which dams could be saved or fixed quickly versus the ones that were totally washed out. The inspection results were entered into a DHEC mobile app, along with photos, so the data points could be tracked using coordinates.

The District's coastal engineers supported FEMA's Preliminary Damage Assessment Teams in performing damage assessments on non-federal engineered beaches to capture the levels of damage and erosion along the coast of S.C.

The District's regulatory office issued an emergency permit to the City of

Columbia to allow them to create a dam within the in-breached Columbia Canal in order to raise the water elevation for the water treatment plant's water intake. Without this work, the intake pipes would not have had the needed water for treatment and distribution of drinking water to the public. This emergency dam work also allowed for repairs of the downstream breach in the canal levees. Additionally, the Charleston District had employees who volunteered to be liaison officers in select city and county emergency operations centers to help expedite the needs of local officials in a timely manner. The Emergency **Operations Center at District** headquarters was also buzzing, ensuring that logistics of operations across the state moved smoothly.

"Our emergency management team really rose to the occasion with this flooding event," said Gilbert Dent, chief of emergency management. "Our team worked non-stop across the state to do our part in protecting people and helping the public get their lives back to normal as quickly as possible."

The District also partnered with the Jacksonville District for the flood response mission as they aided the recovery efforts through the use of unmanned aerial systems to help assess the condition of four breached dams, the municipal airport and the canal in the Columbia area. After obtaining all of the appropriate authorizations, the UAS team launched the "eBee" with the goal of acquiring, processing and providing high-resolution images to give decision makers a point-of-view they wouldn't normally have.

The effects and recovery from this event will be seen over a long period of time, but the Charleston District will continue to be community partners with whatever is needed. *water estimates conducted by Ryan Maue of USA Today

The USACE National Hurricane Program

By Thomas Laczo, Baltimore District



The National Hurricane Program (NHP) is a multi-agency partnership between the Federal Emergency Management Agency (FEMA), USACE, and the National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center (NHC). The mission of NHP is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, and respond to hurricanes. The NHP has three main goals: to provide tools and resources to plan, prepare for, and protect against hurricanes at the local, state, regional and national levels, to deliver comprehensive hurricane evacuation training and technical support to state and local emergency managers (EMs) and to federal agency partners, and to provide real-time information and technical assistance to support Federal/State/Local hurricane decision making.

"The mission of NHP is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, and respond to hurricanes."

The USACE National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRM) – Hurricane Program Office is operated at the USACE Baltimore District. Through an interagency agreement, USACE conducts and manages Hurricane Evacuation Study (HES), Post Storm Assessments (PSAs), the

operation and maintenance (O&M) of the HURREVAC software decision-support tool, and supports the delivery of NHP training courses. The Hurricane Program Office gets support from: Honolulu District, New England District, New York District, Philadelphia District, Baltimore District, Norfolk District, Wilmington District, Charleston District, Savannah District, Jacksonville District, Mobile District, New Orleans District, and Galveston District. USACE contributes funding from the Floodplain Management Services Program (FPMS) to support the development and delivery of HES, HURREVAC Operations and Maintenance, training, technology modernization, and interagency coordination.

In coming years, NHP initiatives are focused on expanding the training *Continued on page 13.*



of the program, increasing efficiency of the Hurricane Evacuation Study (HES) process, refreshing the HES portfolio more frequently, integrating and modernizing the decision support technology platform, increasing the use of Sea, Lake and Overland Surges from Hurricanes (SLOSH) data for planning and operations, and ensuring the continuation of Post-Storm Assessments (PSAs).

The figures above show HURREVAC graphics on Friday September 2, 2016, when a number of storms were active in both the Atlantic and Pacific Basins. These screens are showing past and forecast tracks, current storm location, storm watches and warnings, wind speeds, forward speeds and direction and which Advisories the forecast is based on. In addition to the maps screen, HURREVAC can be used to view text products and produce reports to support emergency management decisions.

POC: Carla Quinn, Baltimore District



Other Important Information

Events

This listing is for information only and is not a complete list of FRM-related meetings. These meetings are not endorsed by the Corps of Engineers unless specifically stated. If we have failed to list a conference/meeting/symposium that would be of interest to the Flood Risk Management community, please forward the conference details to us.

17-21 October 2016 - 3rd European Conference on Flood Risk Management - Lyon, France - http://floodrisk2016.net

13-17 November 2016 - Annual American Water Resources Association Conference - Orlando, FL - http://awra.org/index.html

30 November-2 December 2016 – World Ocean Council Sustainable Ocean Summit – Rotterdam, Netherlands – <u>https://www.ilago.ovh/sustainableoceansummit/</u>

10-15 December 2016 – 8th National Summit on Coastal and Estuarine Restoration and 25th Biennial Meeting of the Coastal Society – New Orleans, LA – https://www.estuaries.org/Summit

17-20 April 2017 - National Hurricane Conference - New Orleans, LA

24-26 April 2017 – 2nd International Conference on Coastal Cities and their Sustainable Future – Cadiz, Spain – <u>witconferences</u>. com/coastal2017

30 April-5 May 2017 – Association of State Floodplain Managers 41st Annual Conference – Kansas City, MS - <u>http://floods.org/</u> index.asp?menuID=223&firstlevelmenuID=181&siteID=1

5-7 Sept 2017 - 7th International Conference on Flood Management - Leeds, UK - http://www.icfm7.org.uk/

5-9 November 2017 - Annual American Water Resources Association Conference - Portland, OR - http://awra.org/index.html

Be sure to check out floods.org for the dates of state conferences and training opportunities: <u>http://www.floods.org/n-calendar/</u>calendar.asp?date=3/12/2016

FRM Statements of Need: Submitting "Statement of Need" is the first step in the process of a concept becoming a requirement for research and development. If USACE District personnel have problems or situations they feel should be addressed by research, the Flood Risk Management Gateway, <u>http://</u> <u>operations.usace.army.mil/flood.cfm</u>, is the place to submit these research Statements of Need (SoNs).

Past issues of this newsletter, various links, news items, and presentations, are all available on the Flood Risk Management Gateway, <u>https://</u> <u>operations.erdc.dren.mil</u> Check it out! This newsletter is a product for and by the Flood Risk Management Community. The views and opinions expressed in this unofficial publication are not necessarily those of the U.S. Army Corps of Engineers or the Department of the Army.

If you would like to submit an article or an idea for an article for the next edition of the newsletter, or if you have any comments or questions about articles in this edition, please email **Stephanie.N.Bray@usace.army.mil.**



