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USACE FOCUSES ON RECOVERY FROM 2011 MIDWEST FLOODING

By Charles Dervarics

Thanks to quick action and well-laid operational plans, the U.S. Army Corps of Engineers (USACE) and its many local, state, and federal partners helped avoid catastrophic damage to life and property in the record-setting Midwest floods of 2011. But cleanup and repairs from the flooding continued in earnest throughout 2012 as USACE worked to address damages and vulnerabilities identified on various components of the Mississippi River and Tributaries (MR&T) and Missouri River flood risk reduction systems.

"In past two years, we've experienced historic Mississippi River extremes, going from highest water level in history in 2011 to the lowest water level in history in 2012," said Scott Whitney, regional flood risk manager for the USACE Mississippi Valley Division (MVD). "For comparable flood levels, you had to look back to 1973 and 1927 and from a drought perspective 1988 or way back to the 1930s Dust Bowl."

With this wide variation in weather patterns, one essential requirement for USACE is to employ a multilayered strategy to assess flood problems, develop short- and long-term solutions, and convey information to the public in a timely way. This was especially important across the 35,000-square-mile Lower Mississippi River floodplain, where a comprehensive system of levees, channels, floodways, and tributary reservoirs were designed to safely convey the waters of the mighty Mississippi. "Our primary goal from a flood risk management perspective is to provide risk-informed protection for the lives and livelihoods of our citizens and industry," Whitney said.

BATTLING THE MISSISSIPPI RIVER

Caused by snowmelt and record storms in spring 2011, the flooding across the midwestern United States was particularly acute in the Mississippi River basin. With 3,800 miles of levees, embankments, and floodwalls from Cape Girardeau, Mo., to Venice, La., alone, the 2011 flood tested the system like none before, Whitney said. Yet despite damage in the region, no mainline MR&T levees failed and they are credited with preventing more than \$230 billion in damage in 2011 – \$612 billion in damage has been prevented since the early 1930s. With a current investment of nearly \$14 billion, that is roughly a \$44 return on every \$1 invested. Since its inception in 1928, the MR&T project has evolved into one of the largest, most comprehensive, and most successful flood risk reduction systems in the world.

In planning its immediate response to the disaster, he said, USACE organized Operation Watershed, focusing on three core endeavors during the flood period:

- **Current ops** – an emergency operations unit dealt with current flood-fight events in real time, helping to safely pass the flood waters while also working closely to assist and inform local and state officials with appropriate flood-response actions necessary to ensure the safety and security of human lives, homes, cities, and businesses;
- **Future ops** – a futures unit looked ahead 24 to 48 hours for near-term threats or consequences as floodwaters continued down the river toward New Orleans, La.; and
- **Recovery ops** – a recovery unit planned for damage assessments, post-flood evaluations, interagency collaboration, and construction repairs.

"Experience has shown effective and timely response to and recovery from such a natural disaster requires an aggressive and a comprehensive approach involving experienced professionals and well-established and proven operational plans," Whitney said. "We began organizing and mobilizing our recovery teams even as flood waters were still rising to ensure protocols and tools for timely assessments, evaluation, collaboration, preparedness, and repair."

"Effective recovery is about focusing your efforts to purposely and aggressively reduce the system's flood risk by triaging damage repairs in a purposeful and prioritized fashion. Where you cannot affect immediate repairs, you look for a variety of measures to incrementally reduce or mitigate risk until full repair can be achieved," Whitney said. "A history of recurrent flooding has taught us that we must remain vigilant and ensure we look at the full life cycle of flood risk management, including the four primary stages of preparedness, response, recovery, and mitigation."

ASSESSING DAMAGE

After dealing with immediate response needs to protect life and property, USACE conducted an extensive damage assessment of levees, floodwalls, floodways, channels, and reservoirs in the Mississippi River basin. For this process, engineers relied on physical data collection (during and after flood), historical analysis, and a detailed examination of repair options, according to Whitney.

USACE experts also classified repair projects into four categories, with Class 1 projects representing those that posed the



Memphis District (Tenn.) team members form a sandbag relay line with city of Memphis employees during the flood of 2011 to ring a sand boil at the Ensley berm near the USACE Ensley Engineer Yard just south of Memphis. Sand boils occur when water under pressure wells up through a bed of sand, making it look like it is boiling.

greatest threat to human life/safety, requiring immediate action. Classes 2 and 3 were projects with significant economic and human safety risk that could worsen without near-term action. Class 4 were low-priority, non-critical repairs.

Through this framework, the MVD rank-ordered 143 projects requiring critical (Class 1-3) repairs at a cost of \$1.04 billion, plus 262 non-critical (Class 4) projects costing another \$543 million. Until Congress and the Obama administration provided more than \$1.7 billion in the Disaster Relief Appropriations Act, 2012, (enacted Dec. 23, 2011) to fund much of this work, USACE diverted funds from other civil works projects in June through December 2011 to begin tackling the highest-priority projects right away, Whitney said.

Thanks to the congressional supplemental appropriations, “we were able to sustain a continued and aggressive repair strategy through the 2012 construction season,” he noted. At this point, USACE reports that flood repairs in the MVD are about 40 percent complete. Current plans call for completing all projects by spring 2014.

Much to the agency’s relief, there was little flooding in spring 2012, and in fact, the region has remained in a drought state for much of the year. Such weather brings both pluses and minuses, Whitney noted. On the plus side, the good weather allows landside crews to work without rain-related delays. However, wa-

terside crews had a near constant battle to remove the excessive sedimentation in channels and harbors needed to maintain navigation and also had restricted access to shorelines where repairs were made from floating platforms.

Whitney said one top priority in the region was the rebuilding of the intentionally activated fuse-plugs at the upper and lower ends of the specially designed Birds Point-New Madrid (BP-NM) Floodway. The BP-NM Floodway is one of four “relief valves” purposely designed to make room for the river under extreme flood events. This was the first time in the 80-plus-year history of the MR&T that three of the system’s four floodways had to be concurrently operated and only the second time the BP-NM Floodway and Morganza floodway were operated. While the operation of the BP-NM Floodway spread flood waters across 130,000 acres of prime farm land, it is credited with reducing flood peaks by up to 4 feet for downstream communities and reducing intense pressure on the adjacent mainline levee that serves to protect more than 2.5 million developed flood plain acres.

POST-FLOOD EVALUATION

The MR&T post-flood evaluation was a concentrated multidisciplinary effort to investigate and document the performance of the MR&T system and how the entire

ENCOURAGING PARTNERSHIPS

During the rise and fall of floodwaters, teams of engineering specialists and levee district personnel carefully inspected, analyzed, and documented the nature and extent of flood-related vulnerabilities and damages throughout the region. Early rough-order-of-magnitude repair estimates were on the order of \$2 billion to return levees, floodways, channels, and structures to pre-flood conditions. "The path to recovery was strewn with challenges at nearly every turn, such as funding, Mother Nature, endangered species, LERRDs [lands, easements, rights-of-way, relocations, and disposal areas], NEPA [National Environmental Policy Act], etc., that promised to impede the repair process unless the region was able to come together for collaborative and innovative solutions," explained Whitney.

USACE districts have close working relationships with local levee districts and state/federal officials; however, the magnitude and regional nature of this recovery challenge required a higher level of collaboration and perspective. This recognition prompted the creation of the Interagency Recovery Task Force comprised of senior-level representatives from 10 federal agencies and governor-appointed representatives from seven states. Launched during the height of the flooding in May 2011, this task force continued to meet for months, holding eight meetings during the past year. "The primary intent of this forum was to establish an integrated, collaborative, and holistic approach to repairing flood risk management and navigation systems damaged by the historic 2011 flood," Whitney said.

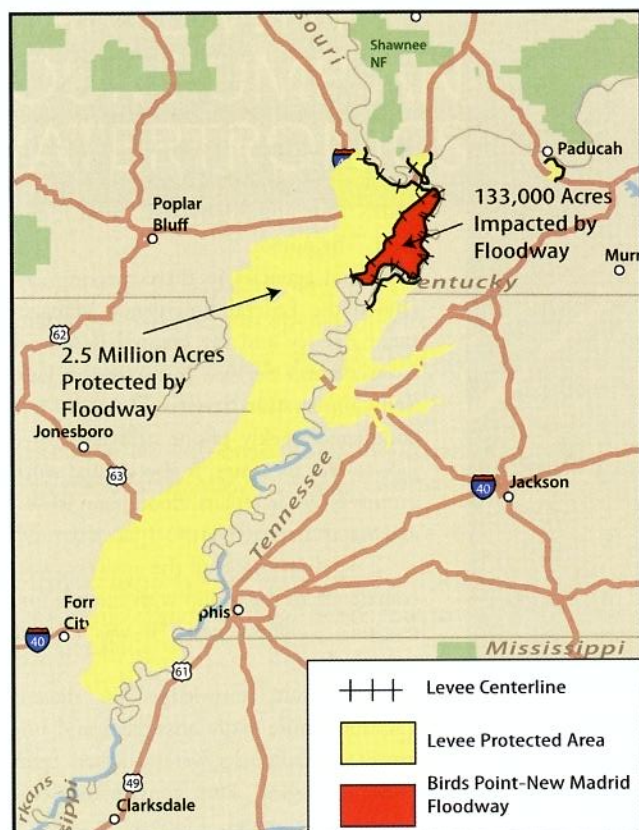
Aside from regular local and regional meetings, USACE also provided real-time updates on repairs via its newly created Regional Flood Risk Management, providing comprehensive access to documents, meeting minutes, videos, pictures, maps, and regularly updated project repair status information. "The process would not have gone as smoothly had we not had the task force and multiple layers of interagency communication and collaboration," he added.

The USACE and Mississippi River Commission, working hand in hand with its strong partners, continue to keep an ear to the past, maintain a hand on the present, and project a steady voice for the nation's bright and productive future. Visit the website for additional details and resources: www.mvd.usace.army.mil/Missions/FloodRisk-Management/RegionalFloodRiskManagementProgram.aspx

MISSOURI RIVER CLEANUP

Elsewhere, record snowfall in the Rocky Mountains in early 2011 combined with near-record spring rainfall in the region to produce high water levels in the Missouri River basin that lasted through October 2011. As a result of this flooding, 72 levees were eligible for federal assistance in completing minor to major repairs.

Of the 66 levee rehabs that opted for federal assistance, 52 are complete, said John Leighow, chief of the readiness and contingency operations division at the USACE Northwest Division. Most levees will have been completed by the onset of flood season (Spring 2013), although there may be additional work



Birds Point-New Madrid Floodway.

Mississippi River Watershed was managed as a system during the historic Mississippi River Basin flood event that extended from March through July 2011. The purpose of this evaluation was to (1) assess MR&T system performance, (2) identify and prioritize recapitalization requirements for system components necessary to repair the MR&T system for future events, and (3) assess effectiveness or areas of improvement for water-control communication and coordination across the watershed. The resulting documentation and data sets will be valuable resources for system management, operation, and improvements. They will also serve as reference guides for future flood risk management.

With more than a year of intensive data collection, evaluation, writing, and review, three key documents were produced as part of the MR&T post-flood evaluation: a 50-page "Flood-Fight Handbook," a 350-page "Main Technical Report" with appendices, and a 32-page "Summary Report." These documents are intended to serve as educational tools and reference points for citizens, decision-makers, and future flood fighters. Facts, figures, and lessons learned from the 2011 flood serve to hasten and guide endeavors to rebuild and improve the MR&T project, ensuring continued safety and security of citizens' lives and livelihoods. Copies of these reports can be accessed via MVD's Regional Flood Risk Management website.



Bonnet Carré Spillway, located about 12 miles west of New Orleans, La., is shown in operation during the 2011 Mississippi River flood. The spillway allows water from the river to flow into Lake Pontchartrain and on to the Gulf of Mexico.

on stabilizing berms that continues. For USACE-operated projects, the damage was more extensive to spillways and gates and repairs could stretch into FY 2015.

Some of the most challenging problems along the Missouri River were caused by miles of seepage, in which the long-standing high water worked its way down into the ground and established multiple pathways to the other side of the levees. To fully identify the breadth of damage, extensive geotechnical investigations were conducted that included the use of electrical currents to analyze the quality of the ground.

Similar to the Mississippi River basin work, USACE engineers working on Missouri River repairs utilized a four-phase analysis system that ranked top priorities from Class 1 through Class 4. Within all the levees, regardless of priority, a variety of approaches are used to “fix” the damaged levee including seepage mitigation blankets, levee setbacks, and non-structural alternatives. “We are always looking at flood plain management,” said Leighow, and setbacks are “one of the tools in your tool bag as you collaborate with others on a rehabilitation project.”

USACE also convened a Missouri River Flood Task Force with state and federal agencies and Indian tribes. After Congress

approved funding last December, the repair process moved ahead swiftly, Leighow said. Until that time, USACE worked with the Office of the Assistant Secretary of the Army for Civil Works to reallocate funds from other projects for repairs. “Our philosophy was, ‘fund it and fix it,’” he noted.

Federal agencies in these meetings included the Federal Emergency Management Agency and the Natural Resources Conservation Service, formerly the U.S. Soil Conservation Service. The task force conducted weekly phone calls and three face-to-face meetings. It also created work groups on levee repairs, flood plain issues, and water management.

“If we didn’t have all the answers, we’d come back to the group with more information,” Leighow said. “It was a great united effort.”

As a result, knowledge was shared, questions more easily answered, and unexpected roadblocks were attacked from multiple angles. This constructive collaboration represents a long-term plus for the future. “Throughout this process,” Leighow said, “there was a strong focus on collaborative problem solving.”

PREPARING FOR THE NEXT FLOOD

To combat future flooding, USACE has organized a series of teams under an initiative called Operation Watershed Recovery. Key processes include:

- A System Performance Evaluation Team is seeking answers to key questions on system performance. It will make recommendations for future studies and improvements.
- A Damage Assessment Team ranks the most important ongoing repair needs.
- An Interagency Task Force will examine system needs from a regional perspective.

In addition, at the national level, USACE has convened a team of external reviewers to look holistically at how the Missouri, Ohio, and Mississippi rivers work together. As part of this process, reviewers will examine the possible need for additional floodway systems as part of a comprehensive protection strategy.