

Large-Scale Levee Setback Playbook

Based on the Missouri River L-536
Levee Setback Project Partners' Experience



Acknowledgments

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- Atchison County Levee District #1
- Headquarters U.S. Army Corps of Engineers
- Omaha District, U.S. Army Corps of Engineers
- Kansas City District, U.S. Army Corps of Engineers
- Missouri River Recovery Program
- USDA Natural Resources Conservation Service Missouri
- USDA Natural Resources Conservation Service, Headquarters
- Missouri Department of Conservation
- Missouri Department of Natural Resources
- Missouri State Emergency Management Agency
- Northwest Missouri Regional Council of Governments

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**The views expressed in this paper are those of the author and do not necessarily reflect the official policy or position of the United States Army Corps of Engineers, the Department of the Army, Department of Defense, or the United States Government.*

Large-Scale Levee Setback Playbook:
Based on the Missouri River L-536 Levee Setback Project Partners' Experience.

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USACE: pages XIII, XV, 1-06, 1-08, 2-24, 2-26, 4-38

Acronyms

ACLD	Atchison County Levee District #1
BSNP	Bank Stabilization and Navigation Project
CDBG	Community Development Block Grant
EA	Environmental Assessment
EAA	Easement Administrative Actions
EDA	U.S. Economic Development Administration
ESA	Endangered Species Act
EWPP-FPE	Emergency Watershed Protection Program - Floodplain Easements
FEMA	Federal Emergency Management Agency
FWCA	Fish and Wildlife Coordination Act
HUD	U.S. Department of Housing and Urban Development
L-536	Left bank of Levee Unit 536
LERRD	Lands, Easements, Right-of-Ways, Relocations, and Disposal
LoMor GI	Lower Missouri River Flood Risk and Resiliency General Investigation
MDC	Missouri Department of Conservation
MoDNR	Missouri Department of Natural Resources
MOU	Memorandum of Understanding
MRRP	Missouri River Recovery Program
NEPA	National Environmental Policy Act
NGO	Non-governmental organization

NHPA	National Historic Preservation Act Section 106
NIMS	National Incident Management System
NLD	National Levee Database
NNBF	Natural and Nature-Based Features
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWD	Northwestern Division (of USACE)
NWMORCOG	Northwest Missouri Regional Council of Governments
PIR	Project Information Report
PL 84-99	Public Law 84-99, also known as Flood Control and Coastal Emergency Act
RMA	USDA Risk Management Agency
SEMA	Missouri State Emergency Management Agency
SHPO	State Historic Preservation Office
THPO	Tribal Historic Preservation Office
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WIIN	Water Infrastructure Improvements for the Nation Act
WRDA	Water Resources Development Act (1986 and amended)
WRP	Wetland Reserve Program

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Executive Summary

In March 2019, abnormal weather patterns in Nebraska, Iowa, and South Dakota caused record-setting flooding along the Missouri River, resulting in widespread catastrophic damage throughout the river valley. The Large-Scale Levee Setback Playbook (Playbook) documents how, after a historic flood, a multi-agency team worked together to complete a highly complex \$100 million levee setback after floodwaters destroyed most of the left bank of Missouri River Levee Unit 536 (L-536) in northwestern Missouri. The Playbook also serves as a guide for others to use in pursuing similar nature-based solutions that enhance flood resiliency.

The Playbook is organized in four distinct but complementary sections:

SECTION 1: The Story

tells the story of the historic flooding in 2019 and provides an overview of the scope and benefits of the setback, the partners involved, and project milestones.

SECTION 2: The Challenges

dives deeper into the L-536 setback project, identifying the challenges—big and small—that project partners encountered and overcame through collaborative problem solving.

SECTION 3: The Recommendations

provides recommendations from the lessons learned during the L-536 setback regarding legislation, regulation, policies, and practices that can better support levee setbacks.

SECTION 4: The How-To Guide

illustrates a process for levee sponsors considering or pursuing a similar project, as well as identifying helpful pre-disaster planning efforts.

The development of the Playbook was supported by The Nature Conservancy with experience-based contributions from project partners involved in the L-536 setback project, a nature-based solution to reduce flood risk to the community by reconnecting more than 1000 acres to the riverward floodplain and restoring more than 400 acres of wetlands.

L-536 Project Partners

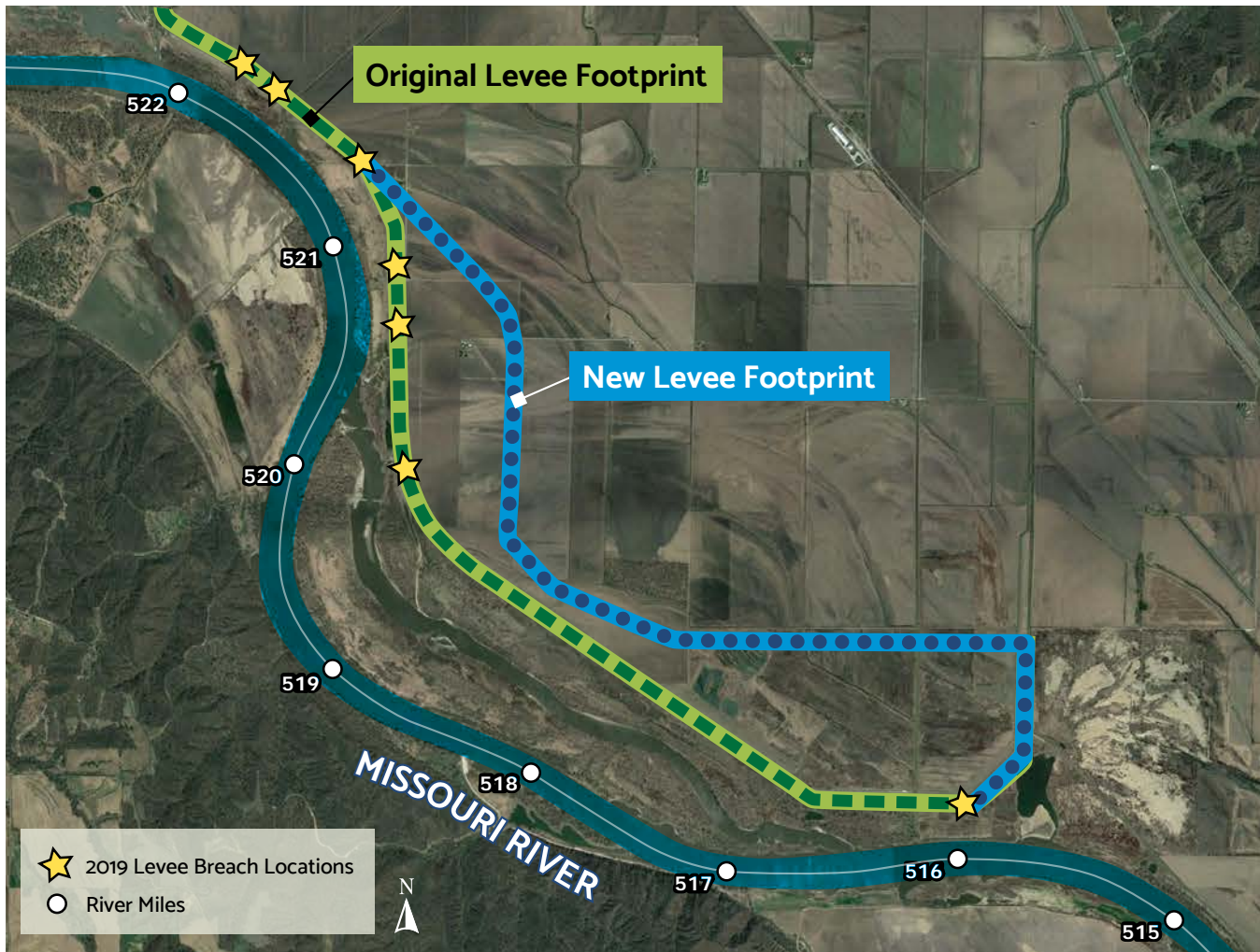
- Atchison County Levee District #1
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- Missouri Department of Natural Resources
- Missouri State Emergency Management Agency
- Northwest Missouri Regional Council of Governments

Executive Summary

KEY TAKEAWAYS

Section 1: The Story

- L-536 experienced five full and two partial breaches and significant crest damages over 10 miles of levee during the record-setting Missouri River flooding in March 2019.
- Atchison County Levee District (ACLD) had maintained and operates its levee systems to U.S. Army Corps of Engineers (USACE) standards, making L-536 eligible for rehabilitation assistance under Public Law 84-99.
- A large-scale levee setback was determined to be the least cost, technically feasible rehabilitation alternative to restore flood protection per USACE criteria.
- The additional hydrologic, geologic, environmental, and economic benefits associated with the setback were instrumental in bringing partners together, providing ACLD much needed real estate and funding support.
- Reconnected more than 1000 acres of floodplain and 400 acres of new wetlands providing high value habitat for fish and wildlife.
- Construction of the L-536 setback was substantially completed in summer 2021.



The L-536 Rehabilitation Includes:

- An in-line repair of inlet breach of 400 linear feet
- An in-line repair of a partially breached section of 1,800 linear feet
- An in-line repair of 4,700 feet of erosion to the crest, slopes, and berms
- A new 25,400-foot portion of the levee setback approximately 5 miles long to eliminate four breaches in the levee
- Drainage structure replacements
- Relief well abandonments and levee ramp construction
- Reconnected and restored over 1000 floodplain acres

Executive Summary

KEY TAKEAWAYS

Section 2: The Challenges

- The leadership and dedication of ACLD board members to the levee setback rehabilitation alternative was essential to the project success.
- L-536 project partners demonstrated the power of multi-agency collaboration, working together to overcome a variety of challenges in pursuit of a shared vision. The trust established, adaptability, and problem-solving skills of project partners proved to be keys to success from the project start through construction.
- Real estate requirements, and associated funding needs, were the most complex and time-intensive components of the project.
- USACE utilized a flexible construction contract that ensured flood protection would be restored, regardless of whether real estate could be secured for the setback footprint. The base contract was awarded for in-line repairs to the existing levee (both beyond and within the planned setback), with an option to construct the setback if real estate was secured.



Executive Summary

KEY TAKEAWAYS

Section 3: The Recommendations

- Recommend USACE clarify existing policy or seek new legislation to facilitate construction of levee setbacks, such as tracking repetitive loss data, allowing real estate acquisition for levee setbacks under PL 84-99, and emphasizing levee setbacks for flood risk management that create sustainable flood risk management projects in an era of changing climate and increasingly severe flooding.
- Recommend NRCS improve its ability to support levee setbacks through its Emergency Watershed Protection Program - Floodplain Easements and Wetland Reserve Easement programs by early collaboration with USACE on identifying potential setback locations, ranking and prioritizing levee setbacks, as well as incorporating flexibility in easement administrative actions and easement approval processes.
- Recommend additional project efficiencies through inter-agency processes, such as establishing cooperative agreements between federal agencies, supporting levee sponsor real estate requirements, and developing and maintaining regional memorandums of understanding between the USACE and NRCS for implementing the emergency provision for joint interest in the same project location.
- Recommend incentives in the form of increased funding for federal and state participation in levee setback projects, as well as crop insurance premium discounts and discounted lending rates for participating landowners to increase and support participation in future setback projects.

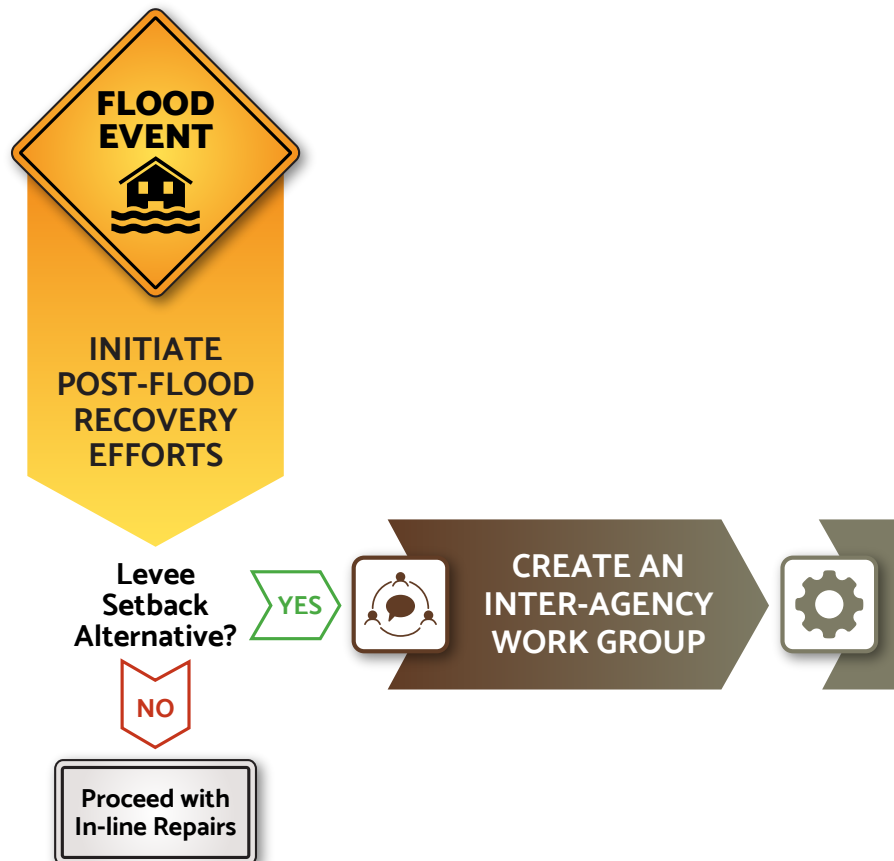


Executive Summary

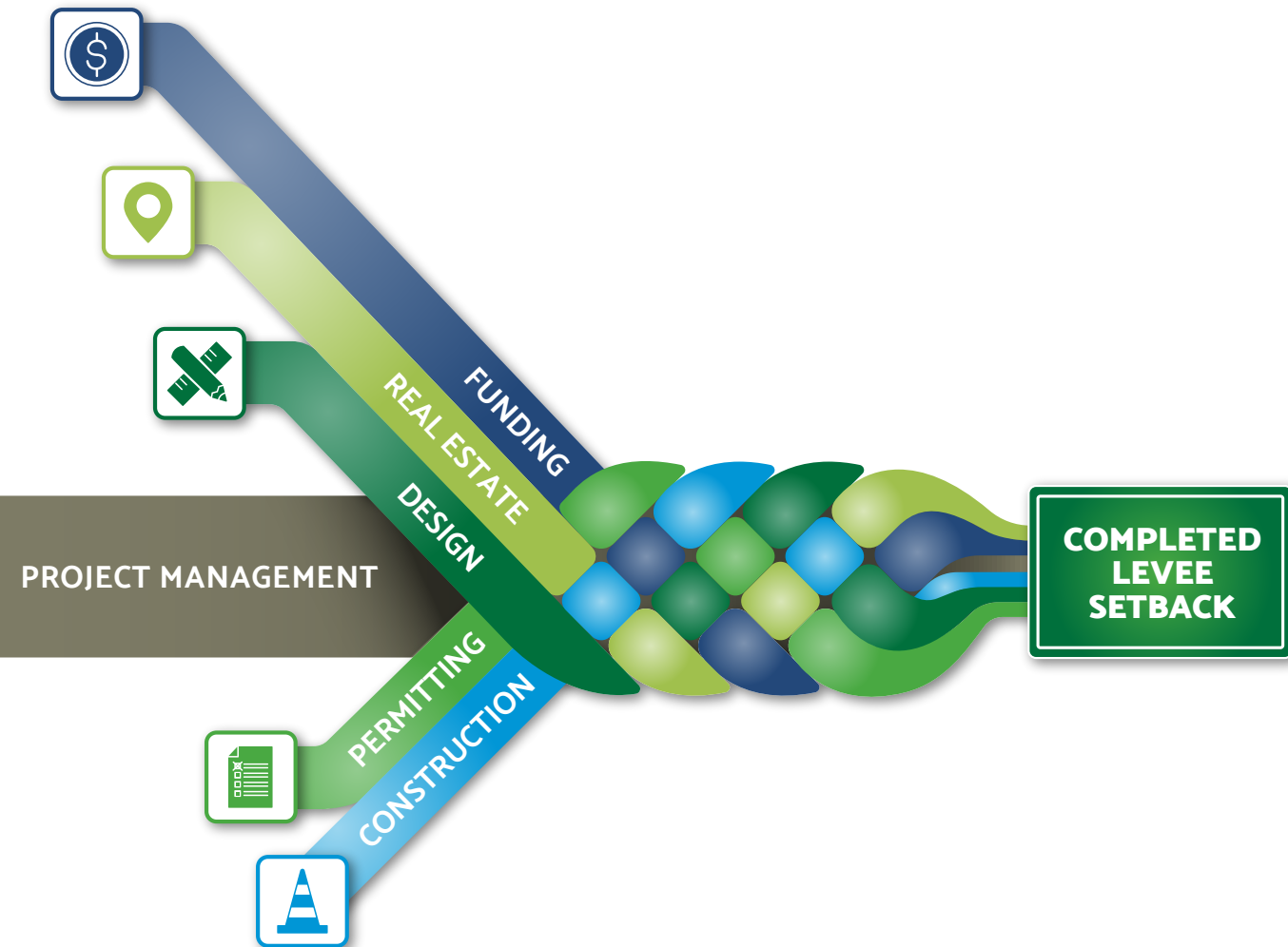
KEY TAKEAWAYS

Section 4: The How-To Guide

- The how-to guide provided in this section is based on the L-536 experience, documenting the actions taken and providing tips and best practices for those pursuing similar efforts.
- There is tremendous value in pre-disaster planning because any activities that can be done pre-disaster enhance coordination efforts, save time when time is of the essence post-disaster, and may facilitate securing critical funding resources.



- Post-disaster recovery efforts are not a linear, step-by-step process; rather, things happen simultaneously and seemingly out of order as compared to a traditional USACE civil works project.
- A large-scale levee setback is a complex effort, but it is achievable when project partners work together to pursue a shared goal.



01

Missouri River L-536 Levee Setback Story

Large-Scale Levee Setback Playbook

In March 2019, abnormal weather patterns in Nebraska, Iowa, and South Dakota caused record-setting flooding along the Missouri River, resulting in widespread catastrophic damage throughout the river valley. The Large-Scale Levee Setback Playbook (Playbook) documents how, after this historic flood, a multi-agency team worked together to complete a highly complex \$100M levee setback after floodwaters destroyed most of the left bank of Missouri River Levee Unit 536 (L-536) in northwestern Missouri. The Playbook also serves as a guide for others pursuing similar nature-based solutions that enhance flood resilience. It is organized in four distinct but complementary sections.

SECTION 1: The Story

tells the story of the historic flooding in 2019 and provides an overview of the scope and benefits of the setback, the partners involved, and project milestones.

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provides recommendations from the lessons learned during the L-536 setback regarding legislation, regulation, policies, and practices that can better support levee setback projects.

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illustrates a process for levee sponsors considering or pursuing a similar project, as well as identifying helpful pre-disaster planning efforts.

The development of the Playbook was supported by The Nature Conservancy with experience-based contributions from project partners involved in the L-536 setback project, a nature-based solution to reduce flood risk to the community by reconnecting more than 1000 acres to the riverward floodplain and restoring more than 400 acres of wetlands.

Key Takeaways of Section 1

- L-536 experienced five full and two partial breaches and significant crest damages over 10 miles of levee during the record-setting Missouri River flooding in March 2019.
- Atchison County Levee District (ACLD) had maintained and operates its levee systems to U.S. Army Corps of Engineers (USACE) standards, making L-536 eligible for rehabilitation assistance under Public Law 84-99.
- A large-scale levee setback was determined to be the least cost, most technically feasible rehabilitation alternative to restore flood protection per USACE criteria.
- The additional hydrologic, geologic, environmental, and economic benefits associated with the setback were instrumental in bringing partners together, providing ACLD much needed real estate and funding support.
- Reconnected more than 1000 acres of floodplain and 400 acres of new wetlands providing high value habitat for fish and wildlife.
- Construction of the L-536 setback was substantially completed in summer 2021.

The Story

Defining a Large-Scale Levee Setback

The L-536 project is commonly referred to as a levee “setback” because of the physical relocation of the levee away from the river—literally setting the levee back away from the river as compared to its original alignment—to reconnect the historic floodplain. However, Public Law 84-99 defines this project, and similar large-scale multi-mile projects, as a “realignment.”

In March 2019, more than a foot of snow covered frozen ground throughout most of the Midwest—atypical conditions for the season. Starting on March 13, 2019, a historic “bomb cyclone” departed Colorado and moved across the Plains states, triggering severe storms, flooding, and a blizzard, resulting in rapid snowmelt runoff combined with several inches of rainfall that the frozen land could not absorb. The result was catastrophic: record-setting flooding of all major river systems in Nebraska, Iowa, and South Dakota, all of which drain into the Missouri River. Floodwaters inundated the Missouri River valley. The Missouri River at Brownville, NE, approximately 12 miles upstream of the L-536 project area, hit the all-time record on March 16, 2019, at 45.73 feet (see Figure 2). Highwater conditions persisted along portions of the Missouri River for many months (see Figure 3).

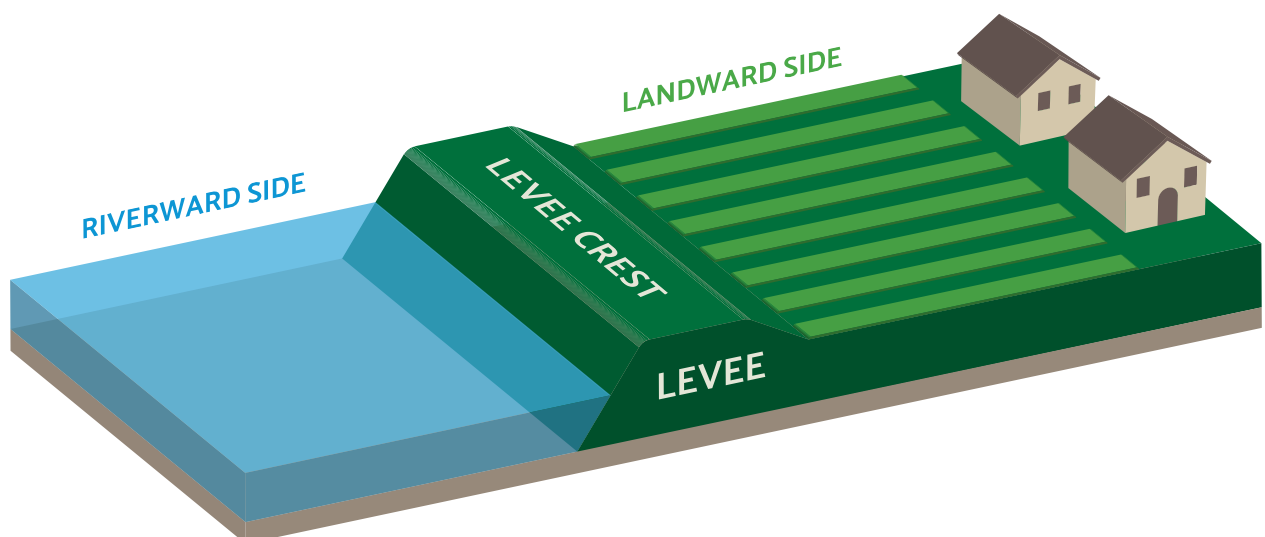
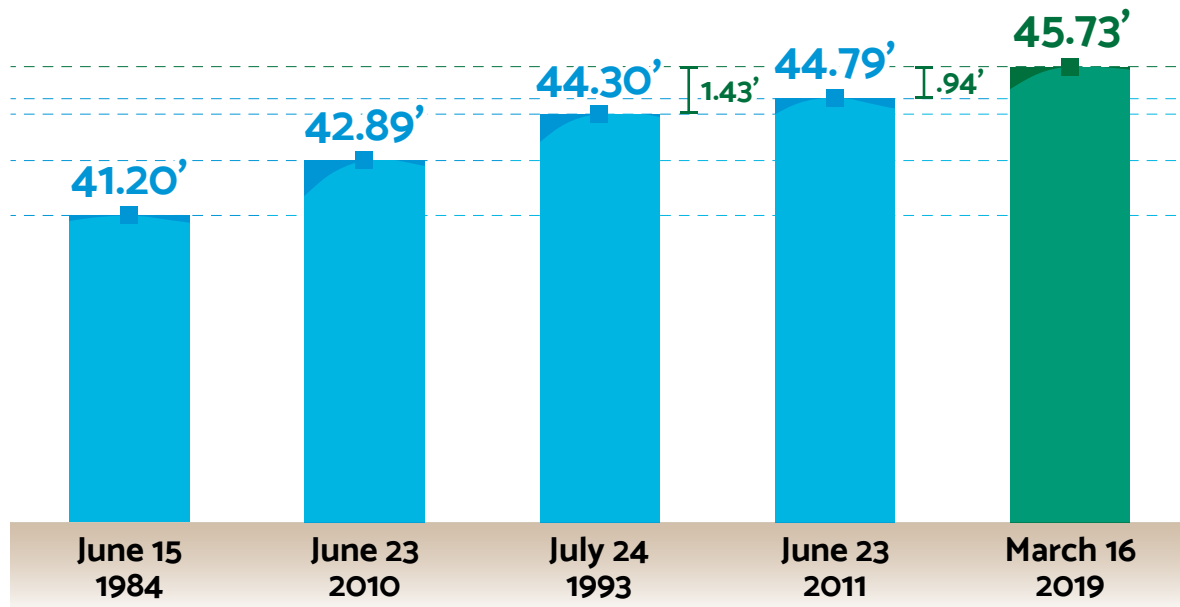


Figure 1: Levee diagram.

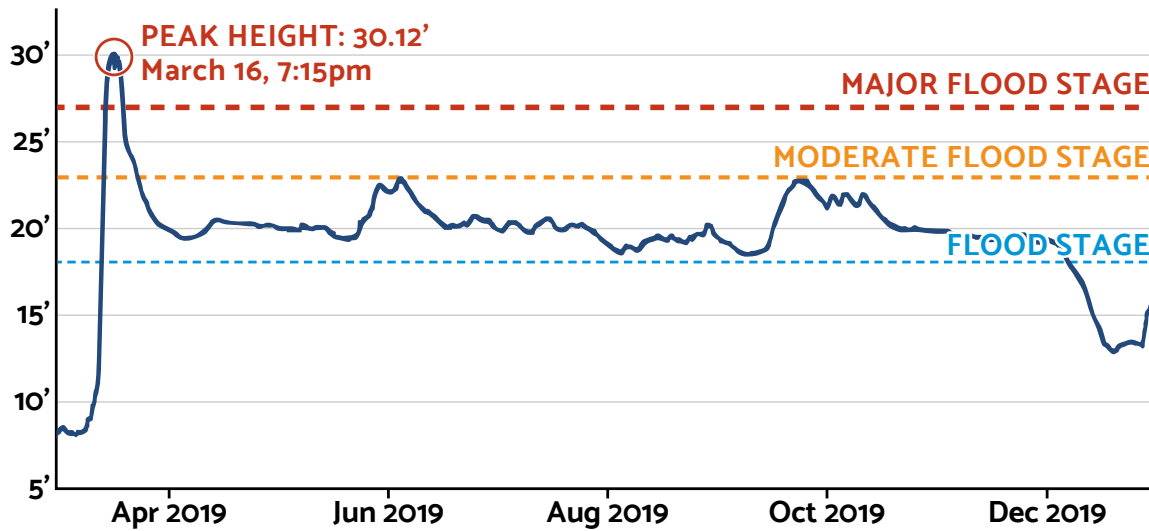
Historic Crests of Missouri River at Brownville, NE



Source: NOAA's National Weather Service Advanced Hydrologic Prediction Service

Figure 2.

2019 Missouri River Gage Height at Nebraska City, NE



Source: U.S. Geological Survey, 2021, National Water Information System data available at <https://waterdata.usgs.gov/monitoring-location/06807000/>

Note: Limited data available for the Missouri River gage at Brownville. Data provided for the nearest upstream gage at Nebraska City

Figure 3.

More than one hundred levees breached or overtopped, flooding 1.2 million acres. Interstate highways closed for months, along with 470 county and local roadways in the region. When the storm passed and officials assessed the damage, Atchison County in northwestern Missouri was left with:

56,000 acres
underwater

\$25M (est.) in lost
ag revenue

166 homes flooded

278 citizens forced
to evacuate

1,295 agricultural
buildings flooded

14 commercial
businesses underwater

216 days of US Hwy 136
bridge closure

121 miles of road destroyed

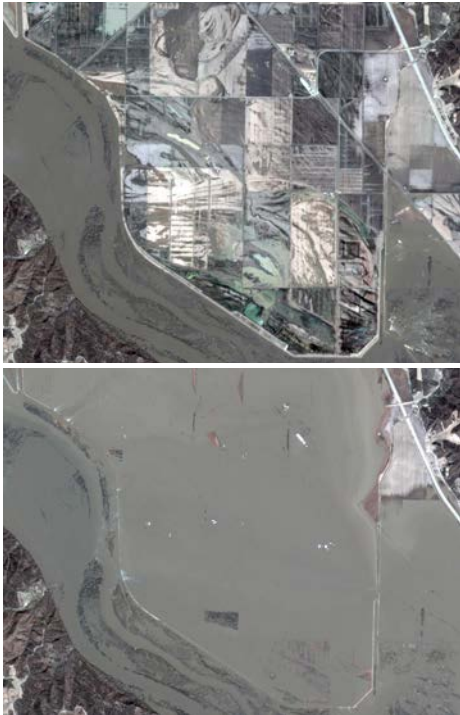
187 approx. miles of I-29 closed
between St. Joseph and Omaha

Major disruption of
BNSF railroad

Source: Atchison County Levee District

“Every flood event seemed to get worse...and 2019 was exponentially worse than all the others combined.”

- Ryan Ottmann, Atchison County Levee District Board Member



Satellite imagery of L-536 taken before (top) and during (bottom) the March 2019 flood.



Flood damage to MO-111 following March 2019 flooding in Atchison County, MO.



One of the five L-536 breaches in Atchison County, MO, in 2019.

The Atchison County Levee District #1 (ACLD), in northwestern Missouri, is one of the largest levee districts in the country (Figure 4). It is responsible for managing Missouri River Levee Units L-561, L-550, and L-536, which are located in Atchison and Holt Counties on the left bank of the Missouri River from approximate river mile 533 to 561. Originally designed and constructed in the 1950s by the U.S. Army Corps of Engineers (USACE), the three levee units consist of 54 miles of earthen levees, landside seepage berms, several toe drains, 300 relief wells, and 23 interior drainage structures.

Severe floods flowed through the ACLD in 1952, 1984, 1993, 2010, 2011, but none impacted the district as significantly as the March 2019 event. L-536 experienced five full and two partial breaches and significant crest damage.

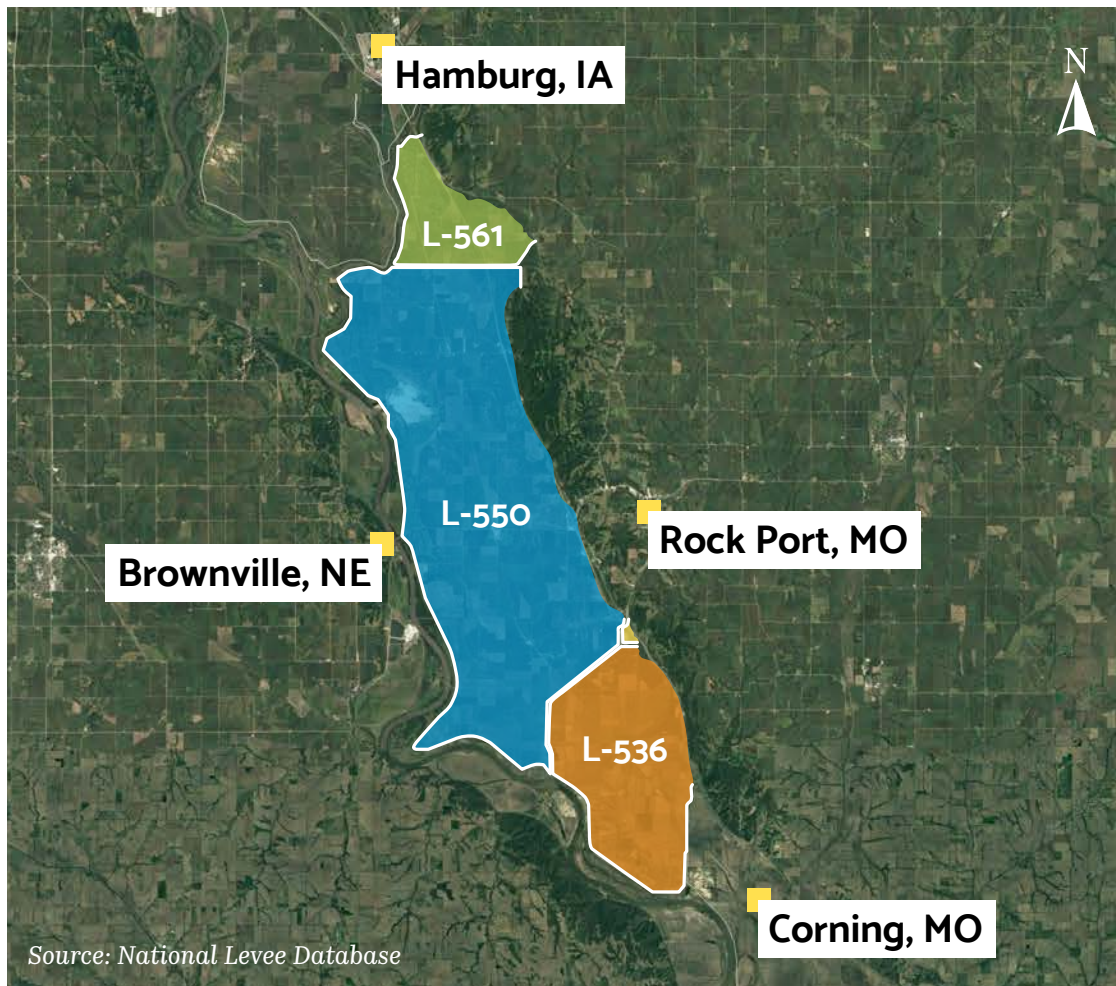


Figure 4: Atchison County Levee District System map.



Helicopter view of L-536 damage following the March 2019 flood event.

ACLD operates and maintains its levee units to USACE standards, making them eligible for rehabilitation assistance following a flood event. After previous floods, ACLD worked with USACE to identify and implement the least cost, technically feasible alternative for construction, which was often to repair the levee “in place,” or within its original alignment. However, the extent of the 2019 flood, along with memories of damages from recent flood events, prompted the ACLD Board of Directors to look holistically at its entire levee system. Embracing this systematic approach, ACLD began considering a large-scale levee setback to mitigate future damages to disaster-prone areas based on hydrologic data, and modernize the levee system, establishing a landward side slope that meets current USACE levee design standards.

Initially, ACLD considered pursuing a levee setback at L-550 because it had experienced extensive damages in previous floods. However, because L-550's breaches were contributing to the flooding of US Interstate 29 (I-29), a major regional transportation corridor, USACE began constructing immediate in-line repairs at L-550. Preliminary damage assessments also indicated levee damages between the breaches were not significant or widespread enough to justify total reconstruction. Collectively, the impacts to infrastructure, the millions of dollars already being invested in repair efforts, and the lack of widespread damage along L-550 eliminated a large-scale levee setback as the least cost, technically feasible alternative. Note: USACE beginning repairs almost immediately is a function of PL 84-99, which serves as an emergency vehicle to design and construct levee repairs to restore flood risk reduction as soon as possible.

Meanwhile, 14 miles downstream at L-536, the levee damages were determined to not be contributing to the flooding of I-29. The extended highwater conditions experienced throughout the Missouri River Valley prevented USACE from accessing L-536, delaying the damage assessment and subsequent repairs—however, initial damage assessments did indicate more widespread damage along L-536. With a little extra time, ACLD was able to consult with USACE-Omaha District, as well as with the impacted property owners, about the possibility of a setback option. In turn, the extra time enabled USACE-Omaha District to discuss the setback option with USACE national headquarters, including the Chief of Engineering. From this discussion, levee setback alternatives were included and evaluated as part of the Project Information Report (PIR).

Unable to access L-536 to fully assess the severity of damages, USACE completed a cost estimate based on past flood events for similar levee systems for use in the post-disaster PIR. The results of the assessment determined that the most cost effective and technically viable alternative for the L-536 levee was to construct a partial levee setback, rather than in-line repairs to the existing levee footprint.



Public Law 84-99 - Levee Rehabilitation and Inspection Program

Under Public Law (PL) 84-99, USACE manages a levee rehabilitation and inspection program that provides levee sponsors with technical and damage repair assistance. Flood fighting assistance is provided to all levee sponsors who request it. However, rehabilitation assistance following a flood event is only provided to levee sponsors that operate and maintain their levee systems to USACE standards.

Levee sponsors may only use rehabilitation assistance to construct the least cost, technically feasible repair alternative to restore a levee system to pre-disaster conditions. However, additional improvements can be made, at the levee sponsor's expense.

The L-536 Rehabilitation Includes:

- An in-line repair of inlet breach of 400 linear feet
 - An in-line repair of a partially breached section of 1,800 linear feet
 - An in-line repair of 4,700 feet of erosion to the crest, slopes, and berms
 - A new 25,400-foot portion of the levee setback approximately 5 miles long to eliminate four breaches in the levee
 - Drainage structure replacements
 - Relief well abandonments and levee ramp construction
 - Reconnected and restored over 1000 floodplain acres
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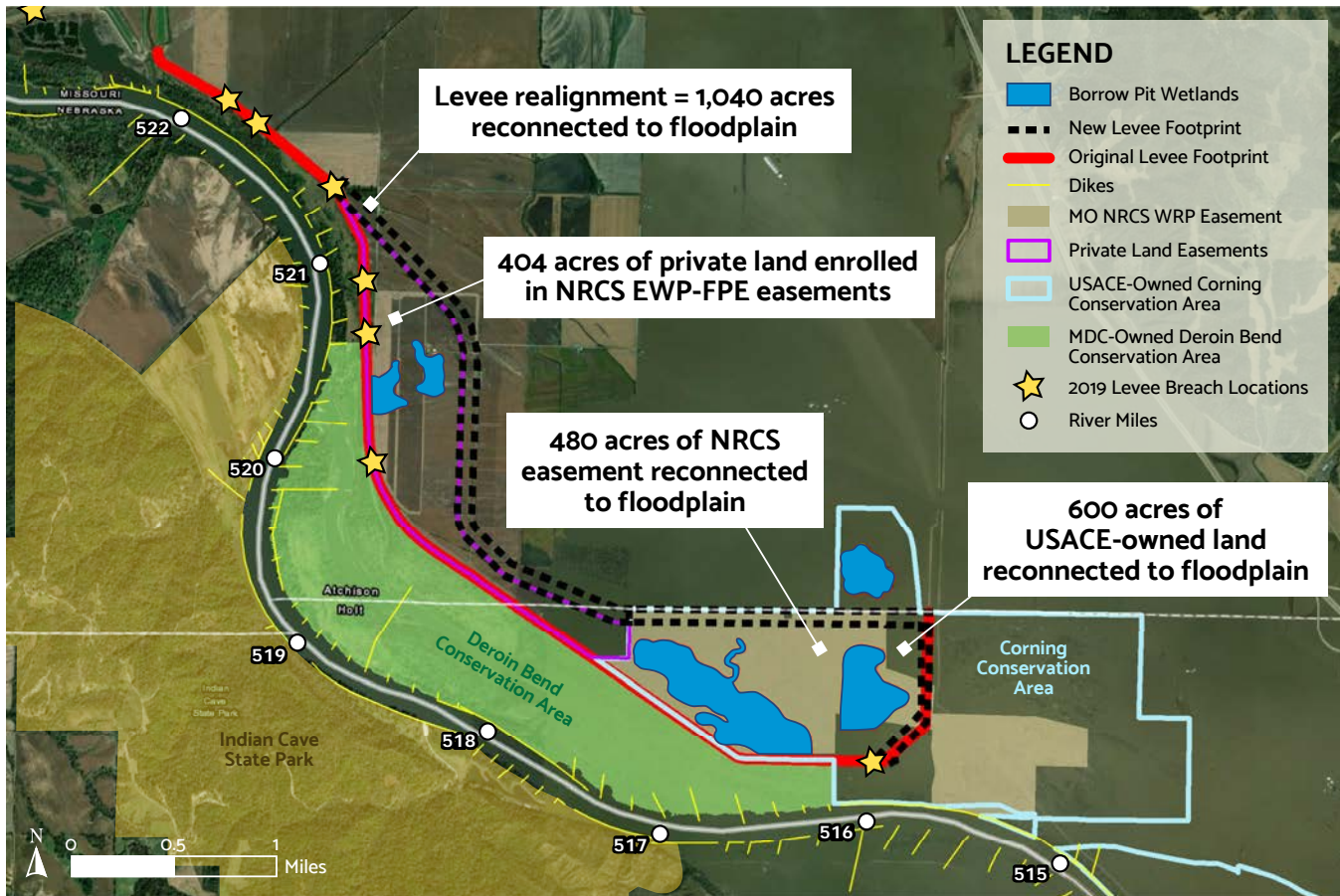


Figure 5: L-536 Levee Rehabilitation

Project Benefits

The newly built levee will protect critical transportation infrastructure, including a large section of I-29, Highway 111, and the Burlington Northern Santa Fe (BNSF) Railroad line. It also protects buildings and farmland in the region and could help reduce the costs associated with operation and maintenance of the levee, and future flood response activities. Beyond this, and instrumental in bringing project partners to the table, the L-536 setback also provides secondary hydrologic, geologic, environmental, and economic benefits:



Hydrologic and Geologic

- Increased conveyance, reducing water surface elevation in excess of 0.8 feet for the 100-year flood stage: reduced velocities within the immediate reach of the levee setback
- Reduced overtopping velocities and erosion damages using USACE's design standard for landward levee slopes of 5 horizontal:1 vertical
- Levee located on more suitable foundation soils, on higher ground, away from historic levee damages, which can reduce future underseepage and the associated levee foundation damage during a flood event



Environmental

- Over 400 acres of new wetlands from converted borrow pits and 1,040 acres of reconnected floodplain
- Use of expanded floodplain for growth of native fish; rare, declining, and species of conservation concern observed after past large-scale levee setback construction along the Missouri River
- Increased ability for floodplain production of macroinvertebrates and young fish as prey base to support local food webs
- Increased groundwater recharge
- Improved water quality by filtering agricultural runoff
- Connected to adjacent conservation land to create a habitat complex more than 7,000 acres in size (setback acres, Corning Conservation Area, Deroin Conservation Area, NRCS easements, Indian Cave State Park)



Economic

- Reduced levee repair, rehabilitation, and replacement activities, reducing levee operation and maintenance cost.
- Reduced flood risk to nearby transportation and infrastructure, lessening need for emergency operations
- More flood resilience for landward buildings and cropland
- Local jobs created during the construction phase

The Partners

The L-536 setback was successfully implemented thanks to the partnership among federal, state, and local government entities, landowners, as well as nongovernmental organizations. The partners directly involved with the planning, design, and construction of the L-536 setback are shown below:



Atchison County Levee District #1 (ACL D)

ACL D is the levee sponsor responsible for maintaining L-536. By maintaining the levee to USACE standards, ACL D was eligible for PL 84-99 rehabilitation assistance and was responsible for providing land (levee footprint) and borrow material (with which to construct the new levee) for the levee setback project. ACL D was also responsible for coordinating the setback with area landowners. Though not required by PL 84-99, the ACL D Board felt it was important to compensate landowners for land that would become riverward of the new levee. ACL D worked with project partners to find a funding solution to cover the riverward real estate costs and led those activities with landowners.



**US Army Corps
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United States Army Corps of Engineers (USACE)

Through congressional direction, USACE is vested with the authority and responsibility to provide technical assistance and post-flood recovery activities to repair flood damaged levees. Numerous departments at the Omaha District level (i.e., Emergency Management, Planning, Engineering, Construction, Contracting, and Real Estate) were heavily involved in every aspect of the setback project. USACE completed environmental law compliance activities, provided construction funding, and oversaw construction. The USACE HQ Office was regularly consulted and assisted with the decision to move the project forward. Additional partnership with USACE's Missouri River Recovery Program (MRRP) allowed the MRRP's Corning Conservation Area to be incorporated into the land that would become a part of the riverward side of the setback levee.



Natural Resources Conservation Services (NRCS)

The USDA's NRCS was directly involved at the state and national level in utilizing the Emergency Watershed Protection Program - Floodplain Easements (EWPP-FPE), which was congressionally funded by a federal disaster allocation for the 2019 floods in parts of the Mississippi Basin. Private land associated with the levee setback qualified for this voluntary easement program. As an easement program, landowners still retain ownership of their land but sell all development and most land management rights to NRCS. Valuing the easement based on pre-flood disaster land values, this NRCS program was key for compensating the landowners riverward of the new levee. The NRCS headquarters acted as an agency point-of-contact for the NRCS-USACE Regional Memorandum of Understanding (MOU), and Easement Administrative Actions (EAA). NRCS also holds Wetland Reserve Program (WRP) easements on the USACE-owned Corning Conservation Area.



The Nature Conservancy (TNC)

During the 2019 Missouri River flooding, TNC was contacted by USACE - Omaha District about its potential interest in assisting with real estate acquisition for the setback project. TNC acted as facilitator for the project to discuss partner roles, identify and resolve problems, and organize sub-groups to address larger project challenges, including working with the levee sponsors and landowners to identify real estate options. As part of the project's ultimate funding strategy, TNC purchased the residual (recreational) fee title value of the riverward private lands enrolled in NRCS EWPP-FPE, lands under the old levee, and some additional lands needed for mitigating impacts to an existing NRCS WRP easement.



Missouri Department of Conservation (MDC)

MDC provided a land conservation grant to TNC for partial funding to purchase the residual fee title value of the new riverward land after it was enrolled in NRCS EWPP-FPE. The initial financial approval was to be a 20% match of the US Economic Development Administration (EDA) grant that project partners pursued to acquire the riverward lands. Though the EDA grant was ultimately not awarded, the MDC grant matched State Emergency Management Agency (SEMA) flood recovery funds. As the setback location is adjacent to MDC's Derooin Bend Conservation Area, MDC will manage the newly reconnected floodplain land. MDC advocated for the levee setback's long-term economic sustainability and the positive impacts a project like this could have across the nation.



Missouri Department of Natural Resources (MoDNR)

MoDNR operated as the state agency facilitator for the project. MoDNR assisted with the gaps in the project related to real estate funding, real estate coordination with TNC, and real estate appraisals. Additionally, MoDNR's close coordination with the multi-agency team helped expedite permit requests as needed. MoDNR served as co-chair of the Governor's Flood Recovery Advisory Work Group (FRAWG), which included a wide range of members tasked with providing recommendations to the Governor for flood recovery that would lead to innovative actions to improve future flood protection and resilience. The L-536 project was both recommended for continued support and held up as a model flood risk management solution.



Missouri River Recovery Program (MRRP)

The MRRP is a USACE program managed by the Omaha and Kansas City Districts. MRRP has two missions: 1) to identify and implement actions that will avoid a finding of jeopardy for federally listed species covered under a US Fish and Wildlife Service Biological Opinion and 2) implement the Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project (Mitigation Project) as authorized by the Water Resources Development Act (WRDA) 1986 and amended. USACE purchases land and constructs habitat under the MRRP. Under the MRRP, USACE owns the 1,880-acre Corning Conservation Area, located where the new levee alignment was constructed. Prior to USACE ownership, the conservation area was enrolled in the NRCS Wetlands Reserve Program, creating an overlap of federal agency real estate interests.



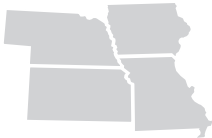
Missouri State Emergency Management Agency (SEMA)

SEMA established its recovery support functions during the 2019 flooding. Through that process, SEMA partnered with the Governor's FRAWG, and alongside MoDNR, recommended large-scale levee setback projects to state leadership. From funds allocated by the state legislature to assist levee districts with recovery from the 2019 floods, SEMA provided funds for real estate acquisition for the new levee footprint, the new riverward land (matching MDC funds), and relocation of utilities.



Northwest Missouri Council of Governments (NWMORCOG)

The NWMORCOG, or COG, is one of 19 regional planning commissions established to resolve common community problems on a regional basis. The ACLD's land appraisal consultant contacted the COG for help in determining potential funding sources, which played an important role assisting ACLD coordinate with local government and helping project partners with grant applications, environmental assessment, and economic impact information. COG provided significant assistance in the preparation of the U.S. Economic Development Administration (EDA) Federal Disaster Recovery grant application, which was ultimately unsuccessful, and coordination with EDA's regional staff.



Landowners

All five private landowners within the setback footprint whose agricultural operations were impacted, chose to participate in discussions with ACLD and USACE regarding potential levee setbacks. These landowners participated in the L-536 levee setback project by enrolling portions of their impacted farmland into a voluntary NRCS Emergency Watershed Protection Program - Floodplain Easements (EWPP-FPE). In addition, they chose to sell the residual interest on their land, after the land was fully enrolled in the easement program.



Other Agencies

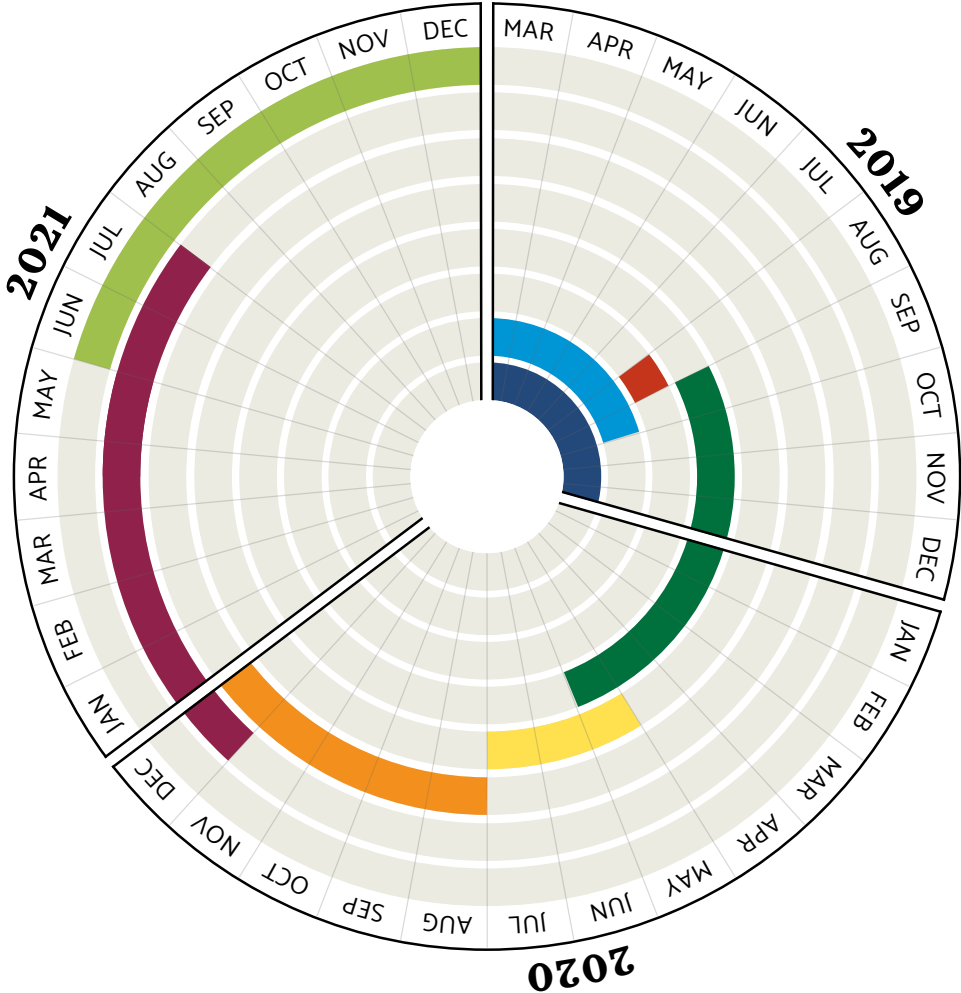
The US Fish and Wildlife Service (USFWS), Missouri State Historic Preservation Office (SHPO), and Tribal Historic Preservation Office (THPO) were all involved during the permitting and environmental compliance process. Early and often coordination with these agencies resulted in productive relationships and greatly facilitated the project advancing past potential roadblocks.

NRCS-USACE Regional Memorandum of Understanding (MOU)

Prior to this project, NRCS Central Region and USACE Northwestern Division developed a Regional MOU to promote the effective coordination and communication between the two agencies where their geographic boundaries overlap.

A provision within the Regional MOU allows one agency to initiate construction under emergency conditions to prevent or reduce imminent risk to life, health, property, or severe economic losses. This emergency provision allowed USACE to initiate levee rehabilitation while concurrently working through the NRCS EAA process for an NRCS easement impacted by the levee construction.

L-536 Setback Timeline and Milestones



- Flooding Began and Continued for Months
- Damage Assessment and USACE/ACLD Coordination
- Multi-Agency Meeting in St. Joseph, MO
- Pursuing L-536 Setback, Multi-Agency Coordination Begins
- In-Line Repairs Begin, Final Steps to Start Setback Construction
- Setback Construction, Significant Coordination Continues
- Construction Completion, Coordination Continues
- Overall Project Completion

Over the course of nearly three years, the L-536 setback was driven by numerous project partners. While it's common to view a completed project linearly—seeing logical actions neatly follow each other—this complicated undertaking required partners to orchestrate their own roles, as well as shared efforts, all at the same time. To make visible the process that brought this levee setback from flooding to the finish line, this part of Section 1 details the steps that occurred, tracking general project management, design, permitting, construction, funding, and real estate.

Flooding Began and Continued for Months



March 2019 - December 2019

- “Bomb cyclone” departs Colorado on March 13
- Historic crests observed on Missouri River, including at Brownville, NE, on March 16
- USACE deploys flood-fighting assistance along Missouri River
- Floodwaters persist along river for many months

Damage Assessment and USACE/ACLD Coordination

 **March 2019 – September 2019**



PROJECT MANAGEMENT

- ACLD submits formal application for PL 84-99 levee rehabilitation assistance
- L-536 breaches were not contributing to Interstate 29 flooding, deemed not high priority to close
- USACE conducted site visits with ACLD to discuss repair alternatives and assess damage
- ACLD discussed options with landowners
- Due to continued high water, damage assumptions documented in a PIR prepared in May 2019; in June 2019, USACE received funding from HQ to begin design and environmental compliance activities
- USACE finished DRAFT alternatives assessment, including levee setback alternatives

Multi-Agency Meeting in St. Joseph, MO

 **August 2019**



PROJECT MANAGEMENT

- TNC convened meeting with prospective partners to discuss setback opportunities at L-550, but focus shifted to L-536 setback because it was not the least cost, technically feasible alternative for L-550
- Attendees included TNC, USACE, ACLD, NRCS (MO and NE), MDC, and MoDNR

Pursuing L-536 Setback, Multi-Agency Coordination Begins



September 2019 – May 2020



PROJECT MANAGEMENT

- ACLD meets with County Commissioners in November 2019 to discuss levee setback option
- Weekly coordination calls initiated by TNC included USACE, ACLD, NRCS, MDC, MoDNR, SEMA, NWMORCOG, EDA, and others as needed



FUNDING

- TNC pursues \$1M EDA grant to fund acquisition of riverward EWPP-FPE lands; MDC provides 20% match funds for grant



REAL ESTATE

- TNC began partnering with ACLD on real estate acquisition responsibilities
- USACE and MO NRCS coordinated EWPP-FPE application ranking metrics to include criteria that supported flood resilience; there was not enough initial EWPP-FPE funding for all L-536 applications, MO NRCS requested additional funding from NRCS HQ, which was granted
- Landowners begin submitting applications for NRCS EWPP-FPE easements in fall 2019
- Setback alignment design impacted existing NRCS WRP easement; compensation for impact results in an additional real estate acquisition item requiring NRCS's EAA process



DESIGN

- USACE draft alternatives assessment concluded levee setback as least cost, technically feasible alternative
- Iterative setback alignment refinement between USACE, ACLD, and landowners
- Setback alignment largely finalized by USACE, ACLD, and landowners in April 2020

(continued on next page)



PERMITTING

- NEPA documentation begins, NRCS signs on as a Cooperating Agency



CONSTRUCTION

- USACE begins developing construction contracts for in-line repairs with setback as a contract option in case the necessary real estate could not be secured
- ACLD obtained real estate for in-line repairs in April 2020, allowing for award of the overall construction contract in May 2020

In-Line Repairs Begin, Final Steps to Start Setback Construction

 **May 2020 - July 2020**



PROJECT MANAGEMENT

- July 2020 established as a due date for setback to begin to beat March 2021 flood season



FUNDING

- MoDNR provides grant to TNC partners to pay for real estate appraisals



REAL ESTATE

- TNC established purchase agreement contracts with landowners to acquire the residual fee title after NRCS EWPP-FPE enrollment process is completed
- Team begins NRCS EAA process to compensate for expected WRP impacts
- EWPP-FPE applications reach NRCS “intent to purchase” milestone; in July 2020 all landowners agree to accept NRCS easement offer, meeting construction deadline
- ACLD secures permanent construction easement for the levee setback footprint, NRCS compensation acres, and all other needed temporary construction easements by July 2020



PERMITTING

- Setback construction methods begin to be developed, triggering detailed environmental law coordination for wetland impacts, tree clearing, borrow locations, etc.
- Permitting coordination remains ongoing through construction



CONSTRUCTION

- Construction contract awarded in May 2020
- Upstream in-line repairs began in June 2020
- To prevent construction site from flooding, a temporary sand ring levee is constructed around Breach F (within setback alignment) in June 2020
- With real estate secured for new levee footprint, setback contract option is awarded at the end of July 2020

Setback Construction, Significant Coordination Continues



August 2020 – December 2020



PROJECT MANAGEMENT

- USACE, MRRP, ACLD, NRCS, TNC, MDC, and County Roads coordinate to ensure public access to state and federal lands riverward of setback, finalized in November 2020



FUNDING

- Due to changes in levee design, team is unable to meet the EDA grant deadline for disaster recovery funding; pursued a much smaller, more competitive pool of EDA grants, denied in December 2020
- MoDNR coordinates SEMA funding for ACLD to remove old utility lines impacted by the setback construction and replace with new lines adjacent to the levee setback

(continued on next page)



REAL ESTATE

- USACE's MRRP provides permission to construct on Corning Conservation Area in August 2020
- Team shifts borrow excavation focus to MRRP and NRCS conservation land due to close proximity to the project and ability to produce over 300 acres of habitat features from borrow pits; USACE, MRRP, NE NRCS, MO NRCS, MDC, and many others begin ongoing borrow collaboration
- Policy waiver from NRCS HQ is sought to allow material excavation on EWPP-FPE land prior to easement enrollment process finalization; waiver was agreed to and signed in November 2020



PERMITTING

- MoDNR expedites dredge permit approval in October 2020



CONSTRUCTION

- Levee setback construction begins August 2020
- All in-line breaches closed by August 2020, work continues throughout year
- Team learns previous assumptions about location of borrow material were largely incorrect
- USACE executes novel sand berm construction method by directly discharging sand dredged from the Missouri River into cells located on the landward side of the setback levee toe
- Eight heated winter enclosure structures (i.e., climate controlled tents) are erected during very cold winter to dry and process clay

Construction Completion, Coordination Continues



December 2020 – Summer 2021



FUNDING

- MoDNR and SEMA coordinate funding to replace the failed EDA grant application, MDC grant provided matching funds, finalized March 2021

**REAL ESTATE**

- Efforts to process the EWPP-FPE applications and NRCS EAA remain ongoing

**CONSTRUCTION**

- All in-line repairs substantially complete by January 2021
- Setback levee fully closed and provided level of protection for spring season by February 2021
- 24-hour construction operations began in January 2021 and March 2021. Clay placement, levee, face and crest was complete in March 2021 and seepage berm largely complete in May 2021
- Borrow pit wetlands grading and seeding began May 2021
- Setback levee and wetland construction substantially completed in summer 2021

Overall Project Completion

**June 2021 – December 2021****PROJECT MANAGEMENT**

- Project partners document efforts, creating large-scale levee setback Playbook

**REAL ESTATE**

- Surveys conducted for NRCS EWPP-FPE lands
- Surveys conducted for mitigation acres required for NRCS Easement Administrative Action (EAA)
- Appraisals and title work completed for TNC land purchases
- Closings for NRCS EWPP-FPE lands
- Closings for TNC land purchases

**PERMITTING**

- Permitting finalized

02

Challenges Encountered

Large-Scale Levee Setback Playbook

In March 2019, abnormal weather patterns in Nebraska, Iowa, and South Dakota caused record-setting flooding along the Missouri River, resulting in widespread catastrophic damage throughout the river valley. The Large-Scale Levee Setback Playbook (Playbook) documents how, after this historic flood, a multi-agency team worked together to complete a highly complex \$100M levee setback after floodwaters destroyed most of the left bank of Missouri River Levee Unit 536 (L-536) in northwestern Missouri. The Playbook also serves as a guide for others pursuing similar nature-based solutions that enhance flood resilience. It is organized in four distinct but complementary sections.

SECTION 1: The Story

tells the story of the historic flooding in 2019 and provides an overview of the scope and benefits of the setback, the partners involved, and project milestones.

SECTION 2: The Challenges

dives deeper into the L-536 setback project, identifying the challenges—big and small—that project partners encountered and overcame through collaborative problem solving.

SECTION 3: The Recommendations

provides recommendations from the lessons learned during the L-536 setback regarding legislation, regulation, policies, and practices that can better support levee setback projects.

SECTION 4: The How-To Guide

illustrates a process for levee sponsors considering or pursuing a similar project, as well as identifying helpful pre-disaster planning efforts.

The development of the Playbook was supported by The Nature Conservancy with experience-based contributions from project partners involved in the L-536 setback project, a nature-based solution to reduce flood risk to the community by reconnecting more than 1000 acres to the riverward floodplain and restoring more than 400 acres of wetlands.

Key Takeaways of Section 2

- The leadership and dedication of ACLD board members to the levee setback rehabilitation alternative was essential to the project success.
- L-536 project partners demonstrated the power of multi-agency collaboration, working together to overcome a variety of challenges in pursuit of a shared vision. The trust established, adaptability, and problem-solving skills of project partners proved to be keys to success from the project start through construction.
- Real estate requirements, and associated funding needs, were the most complex and time-intensive components of the project.
- USACE utilized a flexible construction contract that ensured flood protection would be restored, regardless of whether real estate could be secured for the setback footprint. The base contract was awarded for in-line repairs to the existing levee (both beyond and within the planned setback), with an option to construct the setback if real estate was secured.

Pursuing the Levee Setback Alternative

Levee District Leadership

The leadership and dedication of the ACLD Board was essential to the project's success. They understood that the levee setback protected the immediate and long-term needs of their community. ACLD's persistent pursuit of the levee setback alternative to restore pre-disaster levels of flood protection, as well as enhance flood resilience set the stage for unprecedented partnership among agencies with similar goals.

A federal levee categorized as “active” in the Rehabilitation and Inspection Program (RIP) is eligible for assistance in repairing damage caused by a flood event. Repairs are limited to restoration to pre-flood levels of protection.

Extended Highwater Conditions

Floodwaters were slow to recede throughout the Missouri River Valley, persisting until December 2019. These extended highwater conditions prevented USACE from fully accessing L-536 for damage assessment. Therefore, USACE was unable to conduct a traditional on-site damage assessment for the Project Information Report (PIR). Instead, USACE staff used videos, photos, and pre-flood GIS mapping to develop the initial damage assessment. The PIR for L-536 indicated extensive and widespread damage. It wasn't until floodwaters had fully receded at the end of 2019 that detailed damage assessments and levee repair designs could be developed.

Least Cost, Technically Feasible Alternative

The L-536 setback was able to be constructed under authority of the PL 84-99 program because the setback was the least-cost, technically feasible alternative for repairs. Had repairs in-place been determined to be the least cost, technically feasible alternative, ACLD would have been required to provide the differential in costs between the in-line repairs and the levee setback.

L-550 was also significantly damaged during the flood event, and USACE initiated in-line repairs at the major breaches as floodwaters were still receding. These breach closures precluded the opportunity to consider a levee setback for L-550 because USACE was already investing millions of dollars for the levee repairs.

Costs for all previous work on the levee, including PL 84-99 rehabilitation from prior floods and damages, are considered sunk costs, and are not used in the economic analysis and justification for determining the least cost, technically feasible alternative after new flood damage. Repetitive loss and future flood damages are generally not considered during the economic evaluation.

“The problem in this type of situation is that, for all agencies, this isn’t what we do everyday. There’s really no playbook you can pull out and say when this levee is breached, you call these agencies, and they take these steps. On a project of this scale, you have to figure it out as you go along—that’s a lot more difficult than it sounds.”

– **Jim McGuire, Missouri Department of Conservation**

Extended Timeline

Due to the extent of damage and scale of proposed repairs, USACE and ACLD decided to wait an extra year to conduct repairs: planning was to be completed in 2019, construction was to be completed in 2020, and the setback levee was to be ready by March 2021. This left the area without flood protection for a full season, but project partners, including adjacent landowners, were committed to the holistic approach of the levee setback alternative.

Inter-Agency Communication and Collaboration

Each partner agency played a different role in the levee setback project, looking at the solutions through their own respective lenses, authorities, and goals. In addition, not all partners fully understood the role other partners played and if, how, or when processes were intertwined. TNC was able to guide weekly meetings, develop a timeline template, and facilitate regular communication and collaboration among the partners, thereby keeping the highly complex multi-agency project moving forward. Upon completion of the setback, project partners documented their efforts and developed a baseline project management plan for others to use for a similar effort (see Playbook Section 4).

Voluntary Landowner Participation

ACLD board members were committed to seeing the project through. They worked tirelessly to keep landowners informed and engaged in the project. This relationship development contributed to the landowners entering voluntary conservation easements and shouldering financial risk, due to the timing issues and delayed compensation (discussed in the following Real Estate Requirement section), while the team worked to make the setback a reality. The landowner's trust of the project partners and understanding of the real estate process was critical to the project's success.

“The importance of communication and willingness of partners to collaborate cannot be overstated for this project. We had a group of partners that were committed to the goal of setting back this levee. Each person looked for ways to decrease barriers within their own organizations, and we refused to let any challenge prevent us from reaching our goal.”

- Jennifer Hoggatt, Missouri Department of Natural Resources

Real Estate Requirements

Real estate was a complex and important component of the levee setback project. USACE only needed the real estate for the setback levee footprint to begin construction. However, community support for the setback necessitated a plan for purchasing the land that would become riverward of the setback levee. Through extremely close coordination between project partners, real estate for the setback levee footprint was purchased prior to the riverward land. Purchase options signed by all landowners to sell their land was the trigger for ACLD providing real estate easements to USACE for the required certification of the new levee footprint. This allowed USACE to begin the setback construction by the August 1, 2020, deadline. Even though landowners wouldn't be compensated for their riverward lands until late 2021, all parties moved forward together.

Fair Market Value of Lands

Most agencies and all non-governmental organizations are bound by appraisal standards that value land “as is.” In the case of lands adversely impacted by repetitive losses due to flooding, the “as is” value is often considered “recreational value” or “wasteland value” instead of pre-flood “agricultural value.” NRCS, however, is able to assess its easement value based on pre-flood agricultural values. As a result, NRCS EWPP-FPE provided the landowners the greatest compensation for their lands.

Understanding Land Ownership Relative to Original Levee Alignment

Levee sponsors hold the levee easements placed on the property. However, documents from the 1950s were unclear if the land was purchased as part of the payment for the easement. Deeds and title searches may shed light on ownership. Regardless, having a title company confirm ownership of the old footprint will be important in finalizing the real estate of a levee setback.

Early Landowner Outreach

The L-536 levee sponsors hired a consultant with a real estate background before floodwater receded who provided ACLD with landowner outreach efforts as well as investigated various funding programs. Early and frequent landowner outreach is critical to success.

Timing Issues and Delayed Compensation

In a typical real estate deal, the seller and buyer agree on the acres to be purchased, as well as the purchase price at the beginning of the agreement, memorializing the details in a legal document. Between the time the legal document is signed until the time the real estate deal is closed, due diligence is conducted. Examples of due diligence include surveys to determine accurate legal descriptions and total acres, title searches to confirm ownership and determine clear title with no liens or encumbrances on the property, and appraisals to determine fair market value of the property. When all the due diligence is completed as spelled out in the legal document, both parties can move to close the deal, transferring ownership in exchange for payment.

Real Estate Bought and Sold

Footprint of the New Levee

Required by USACE, procurement is the responsibility of the levee sponsor.

Footprint of the Old Levee

The ribbon of land under the old levee restored to floodplain. While not required to be purchased, management and use of the land by the owner is limited due to its narrow shape. Because of its limited use and shape, it was valued as “wasteland.” As a result, in the case of L-536, all landowners chose to sell their interest to TNC.

New Riverward Land

Land between the new levee and the river. The owners can choose to keep the land or sell it. In the case of L-536, all the landowners elected to sell not only an easement to NRCS but also the residual interest to TNC. This sale was driven by the goals of the landowners, but is not a requirement for a setback.

New Landward Land

Land now protected by the new levee. Purchasing an interest in this land is not critical to establishing a levee setback. In the case of L-536, four of the five landowners elected to sell an NRCS easement on their land. The fifth chose to continue to farm their land.

NRCS Mitigation Acres via NRCS Easement Administrative Action

Construction impacts to existing NRCS WRP land required the levee district to mitigate for those impacts by providing acres through a complex process called an Easement Administrative Action (EAA). This type of real estate may or may not exist at other sites considering setback alternatives.

In the case of L-536, there were two buyers: NRCS for the conservation easement and TNC for the residual interest. The residual interest cannot be purchased until after the easement is placed because residuals are, by definition, the remaining interest on the land post-easement. As a result, TNC could not buy the residual interest before NRCS closed on its easements. In addition, some of the landowners desired to use the Internal Revenue Service's 1031-Exchange, as a means of deferring capital gains taxes, which required all real estate closings to occur near the same time.

NRCS has a detailed easement acquisition process that takes 12 to 18 months. The process begins when a landowner applies for this voluntary program. Due diligence is then done by the NRCS. Not all landowners who apply for the program receive an offer to purchase an easement from NRCS, nor is the landowner obligated to accept the NRCS offer even though they voluntarily applied. As a result, until the offer is made and accepted and the deal is closed, it's uncertain that the easement will be placed. If a landowner chooses to sell their property without an NRCS easement, it could significantly reduce the amount of time between event and sale, but it is unlikely landowners would receive pre-flooding agricultural land values.

Delayed Appraisals and Land Values

Land value appraisals have a shelf-life between three months to one year prior to the scheduled real estate closing, meaning the estimated fair market value is relevant for only that time. As a result, the real estate closing process needs to factor in when an appraisal should be ordered and when it should be completed. For L-536, obtaining appraisals to determine land values was impossible due to high water and the long time frame until closing. TNC instead contracted an appraiser to conduct a comparative market analysis to give a baseline range of values. Landowners had to agree to a level of uncertainty and estimated value as placeholders while signing the agreement to sell. This uncertainty was lessened by including language in the documents that allowed insertion of the appraised value of the property in the final contract as well as pre-defined out clauses for the landowners should either party not agree on the final sale price.

There are a variety of logistical considerations related to riverward real estate acquisition, including but not limited to:

- the amount of time a landowner has to wait from the loss caused by the flood event to the time they are able to sell the interest in their land
- landowners having to agree to sell prior to knowing the final number of acres to be sold, the final configuration of acres to be sold, or the final sales prices
- the upfront cost of due diligence and uncertain or delayed reimbursement

From the acquiring entities' perspective, due diligence has to be closely coordinated and planned in advance.

The Corning Conservation Area

The Corning Conservation Area is an 1,880-acre mitigation project, designed to enhance fish and wildlife habitat along the Missouri River. The area is (1) owned in fee title by USACE- Kansas City District under the MRRP, (2) has an NRCS WRP easement on part of the property, and (3) has day-to-day management activities conducted by MDC under a land management partnership agreement. This area is managed for a variety of game and non-game species of fish and wildlife. All three agencies need to ensure close coordination when a construction or management action is being proposed.



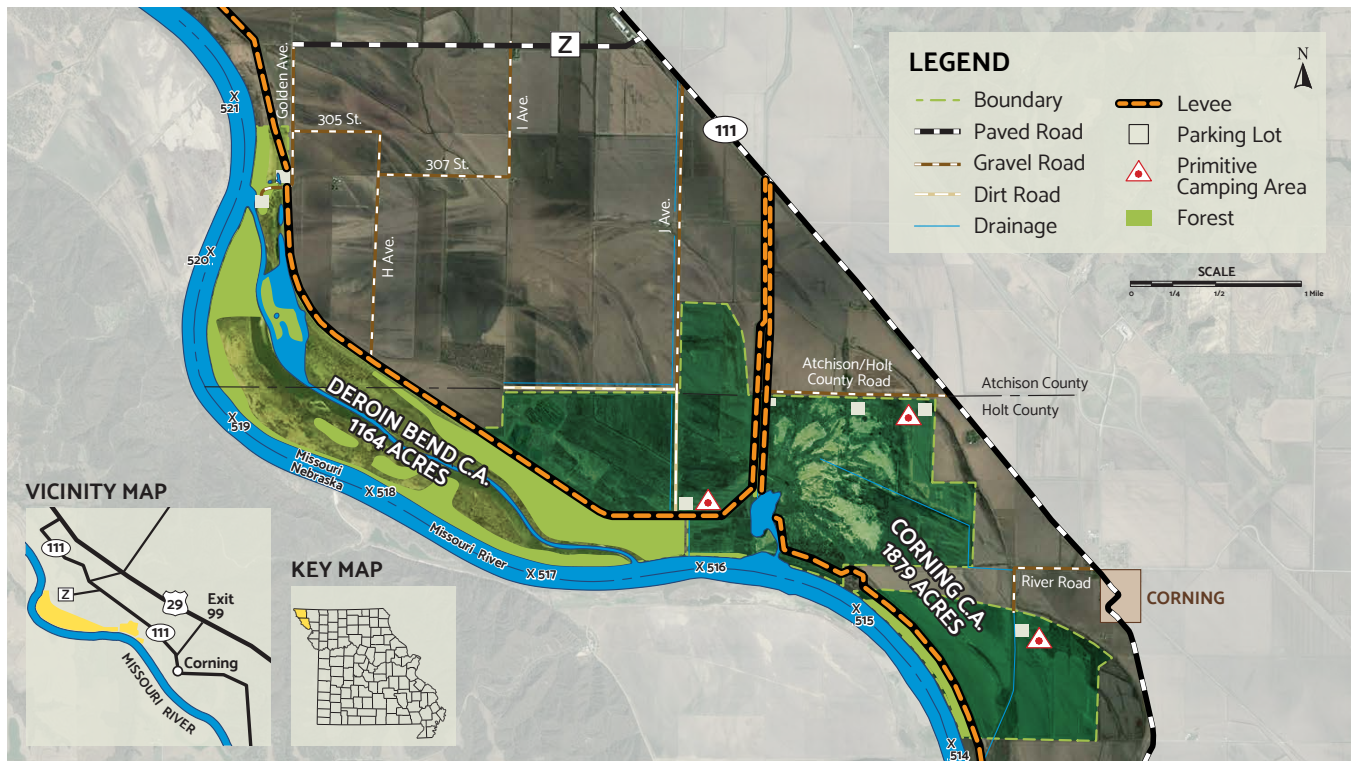


Figure 6: Deroin Bend and Corning Conservation Areas map before levee setback.

Riverward Lands Ownership and Management

Riverward lands are lands between a levee and the river. They are considered unprotected and should likely be used as recreational land. Determining who will own and manage the riverward lands is a factor to consider.

Landowners involved in the L-536 setback did not wish to keep their riverward lands. TNC purchased these lands and will own them for several years, with the intention to eventually transfer ownership to MDC. During TNC's ownership, MDC will manage the land as an extension of their Deroin Bend Conservation Area and will continue to do so upon transfer.

Riverward Land Access

The setback levee cuts off access to the riverward lands but access must be provided to all landowners and included in the levee design and all legal descriptions. Ideally, the access points should utilize existing public rights-of-way. For L-536, access points were negotiated between the levee sponsor (tasked with maintaining the levee), the county road commissioners (tasked with maintaining the roads and rights-of-way), TNC and MDC (as the riverward landowners requiring access), NRCS (as the holder of the mitigation acres), and USACE (as the builder of the access ramps).

NRCS Mitigation Acres via Easement Administrative Action (EAA)

Construction impacts to the existing NRCS WRP easement required mitigation and a headquarters-level Easement Administrative Action (EAA) to allow design and construction of the proposed levee setback alignment on the Corning Conservation Area. This is a requirement of NRCS and is the levee sponsor's responsibility. Typically, the mitigation acres must be at least a 1:1 ratio of acres impacted in both ecological quality as well as financial fair market value. In the case of L-536, 53 acres were impacted and 53 "equivalent" acres had to be acquired and placed into an NRCS easement to compensate. The 53 acres to be mitigated are a combination of the old levee footprint together with acreage on the landward side that one of the landowners was willing to sell. This requirement had to be met even though 640 acres of better functioning wetlands and floodplains were gained when 53 acres were lost. Providing mitigation acres required four additional appraisals and four review appraisals, adding to the time delays and complexity of the real estate process. The Missouri NRCS, ACLD, TNC, and USACE worked with the national NRCS headquarters to process the EAA. An emergency clause of the regional NRCS-USACE MOU was enacted to allow work to proceed with the setback alignment on WRP easement before the EAA was completed.

Real Estate Process Inefficiencies

Each agency has its own processes for surveying, appraisal, title work, environmental inspections, permitting, and other due diligence. Some of these processes, like title work and surveying, can be streamlined through coordination and information sharing. Land surveys were conducted by three agencies: USACE, NRCS, and TNC. USACE conducted a metes and bounds survey for the footprint of the setback levee and an elevation survey during construction, checking the dimensions of the levee. NRCS and TNC conducted metes and bounds surveys, checking the legal boundaries of each parcel. Land surveying efforts could be coordinated, with completed surveys shared for use by all project partners. A refined survey of the legal boundaries would still need to be conducted to calculate actual final acres to be purchased, but the original legal boundaries would have been identified, lessening the work for later.

Funding

Under PL 84-99, it is the levee sponsor's responsibility to provide all real estate required for construction, which includes the levee footprint and borrow source, (the material to construct the new levee).

Though not required by PL 84-99, ACLD and project partners were committed to compensating the landowners who no longer wished to own riverward land that would not be protected by the new levee. This left ACLD responsible for securing 138 acres for the new levee footprint and more than 400 acres for the riverward lands, at a cost of \$3.5M. This posed one of the biggest project challenges because not only was the real estate cost well beyond the financial means of ACLD, the levee setback alternative could not be constructed without the necessary real estate.

Real estate funding was ultimately provided through a combination of NRCS EWPP-FPE, state funds from SEMA, MDC, and TNC:

- Landowners agreed to participate in the voluntary NRCS conservation easement program and have a permanent conservation easement placed on their properties.
- TNC offered to purchase residual (recreational) interest on their riverward lands.
- NRCS, USACE, and MDC restored the riverward lands as a floodplain and conservation area.
- MDC will manage the riverward lands through an agreement with TNC with the intention that ownership will be transferred to MDC.

Lack of Funding Resources

Missouri River Recovery Program

The MRRP is a program that has previously helped with land acquisition in support of a large-scale levee setback, L-575 along the Missouri River. But the MRRP has not had funding approved for land acquisition due to limited appropriations since 2011.

U.S. Economic Development Administration Federal Disaster Recovery

After the March 2019 flood event, the U.S. Economic Development Administration (EDA) provided federal disaster recovery funding to make flood control infrastructure improvements to protect businesses and make areas more resilient to future natural disasters. NWMORCOG quickly reached out to EDA because they had money to help with disaster relief and there was critical infrastructure in the L-536 project area, such as Interstate 29, highway bridges, and railroads.

Project partners initially thought this funding could be used to purchase riverward real estate. Unfortunately, due to the complexity and timing of the setback process, the application preparation took longer than anticipated and EDA's special disaster funding was not available by the time the application was submitted. The smaller pot of EDA's regular funding was not awarded for the project. The grant application was not competitive due to the job creation award criteria. To take advantage of the less restrictive disaster funding, that did not include job creation and retention requirements, project partners would have needed to secure their real estate strategy earlier.

Community Development Block Grant

The U.S. Department of Housing and Urban Development (HUD) allocates Community Development Block Grant (CDBG) funding to states, which establish their own priorities and evaluation criteria. Project partners initially considered pursuing CDBG funding, but recognized the limited chance of award because the state adjusted its CDBG priorities, deprioritizing flood recovery projects due to the amount of disaster recovery funding being made available by other agencies.

CDBG funding was reconsidered during the team's initial EDA funding pursuit, as CDBG funds are a great source for match dollars. However, this funding source would have been limited to the intended use of the EDA dollars, which had been identified initially for the levee footprint real estate, not the riverward land. CDBG funding was ultimately not used because the new levee footprint had yet to be determined and project partners could not apply for funding with an unknown footprint.

Funding Gaps

Not many funding programs are set up to support levee setbacks, leaving levee sponsors to find their own solution to fill the funding gap. Figure 7 shows the funding breakdown for the L-536 setback project.

Funding Sources

Total Levee Construction Cost: ~\$103.5M

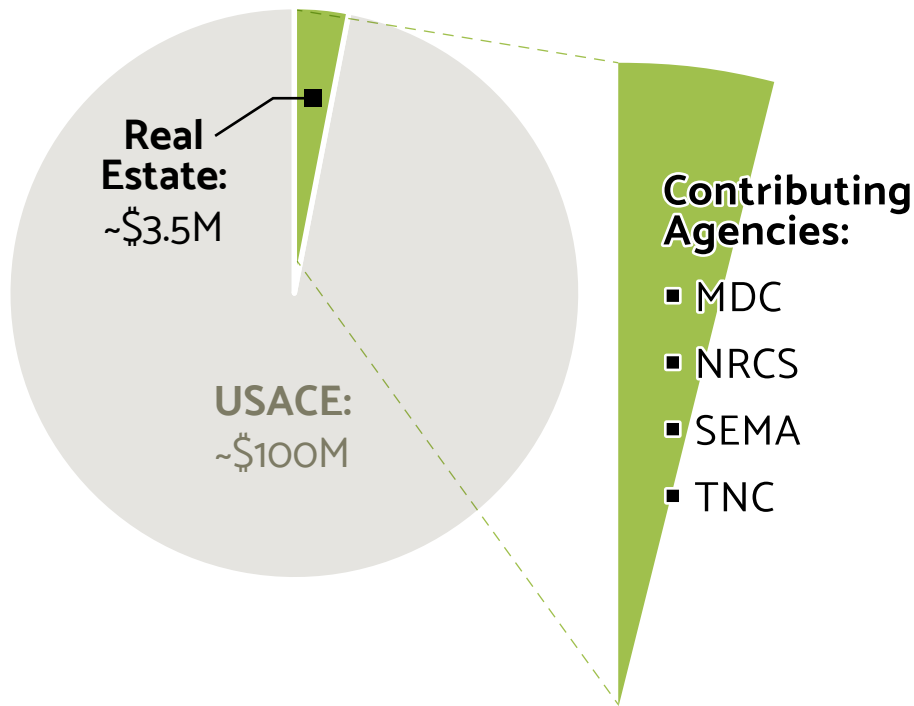


Figure 7.

Filling the Funding Gap on L-536

NRCS FPE

NRCS administers Emergency Watershed Protection Program - Floodplain Easements (EWPP-FPE), a congressionally-funded program that provides funding to purchase conservation easements after federally declared disasters to restore, protect, maintain, and enhance the functions of floodplains while conserving their natural values. The state NRCS office develops a ranking system and landowners can apply to enroll in the program. If selected, the landowners continue through an enrollment process and are compensated for the easement on their land. The process typically takes 12 to 18 months.

After the 2019 flood, Missouri NRCS developed ranking metrics that prioritized applications that could result in flood risk reduction or flood resilience benefits (like levee setbacks). Missouri NRCS made two EWPP-FPE funding requests in order to select as many applications as possible, which helped ensure funding for all L-536 applications.

MDC

MDC's innovative Land Conservation Partnership Grant program provided funding to acquire land riverward of the new levee alignment. MDC is funded through a state sales tax, which allows for significant flexibility in its funds. This flexibility allowed funding to fill a critical gap for the project.

SEMA

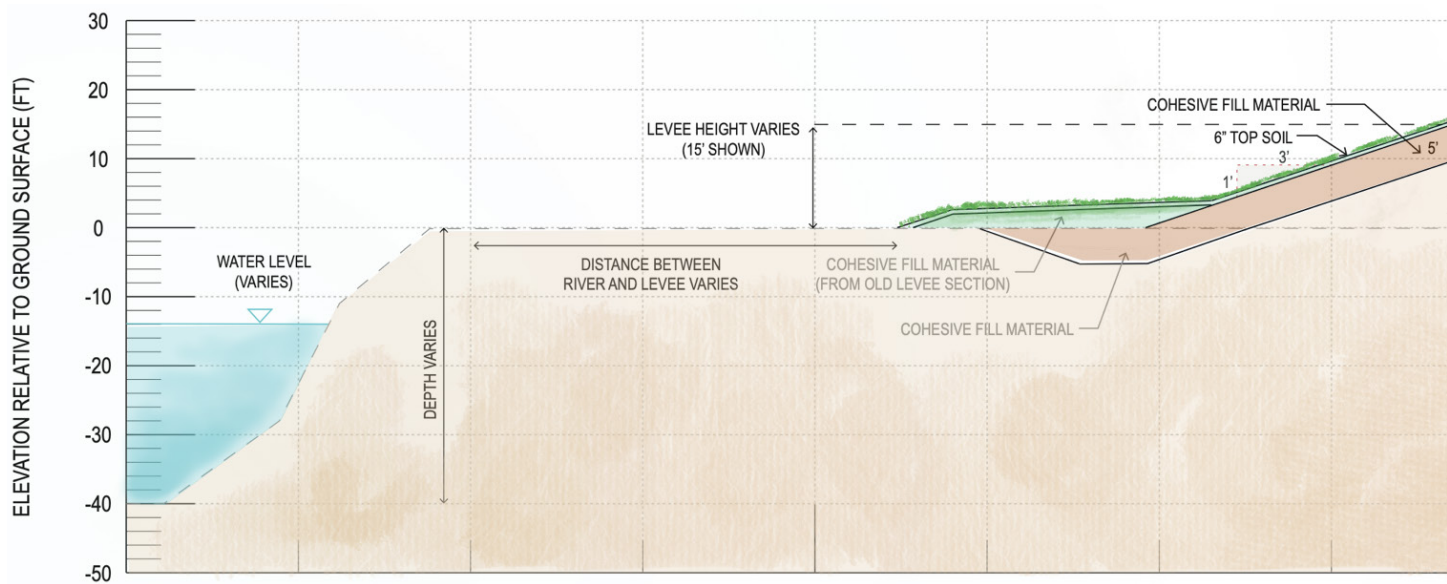
In response to the 2019 flooding, the Missouri Governor and Legislature recognized the need for additional funding to help with recovery statewide. This funding was allocated to SEMA for administration and oversight. As a state appropriation of general revenue, this funding had significant flexibility and could be used in a variety of ways to fulfill the intent of helping local levee districts recover from flooding. Funding was provided to support purchasing the new levee footprint and riverward lands.

TNC

As a non-profit conservation organization, TNC contributed staff time and funding to conduct real estate work, including working with landowners to establish real estate purchase options, contracting for appraisals, title work, surveys and pursuing grants to fill the gap for land acquisition funding.

Design

A unique aspect of the L-536 large-scale levee setback was that the 2019 spring flooding left the area with no flood protection. The scale of the damage to the entire levee and complete lack of flood protection complicated the design process. In addition to the levee being devastated, seven full/partial breach locations also caused significant scouring of the levee foundation and destroyed seepage berms, relief wells, and interior drainage structures. The damage was so extensive that repairs in-place were estimated as being more expensive than rebuilding the levee on a new foundation. Contingency actions for flood fighting during construction were considered, but fortunately were never needed.



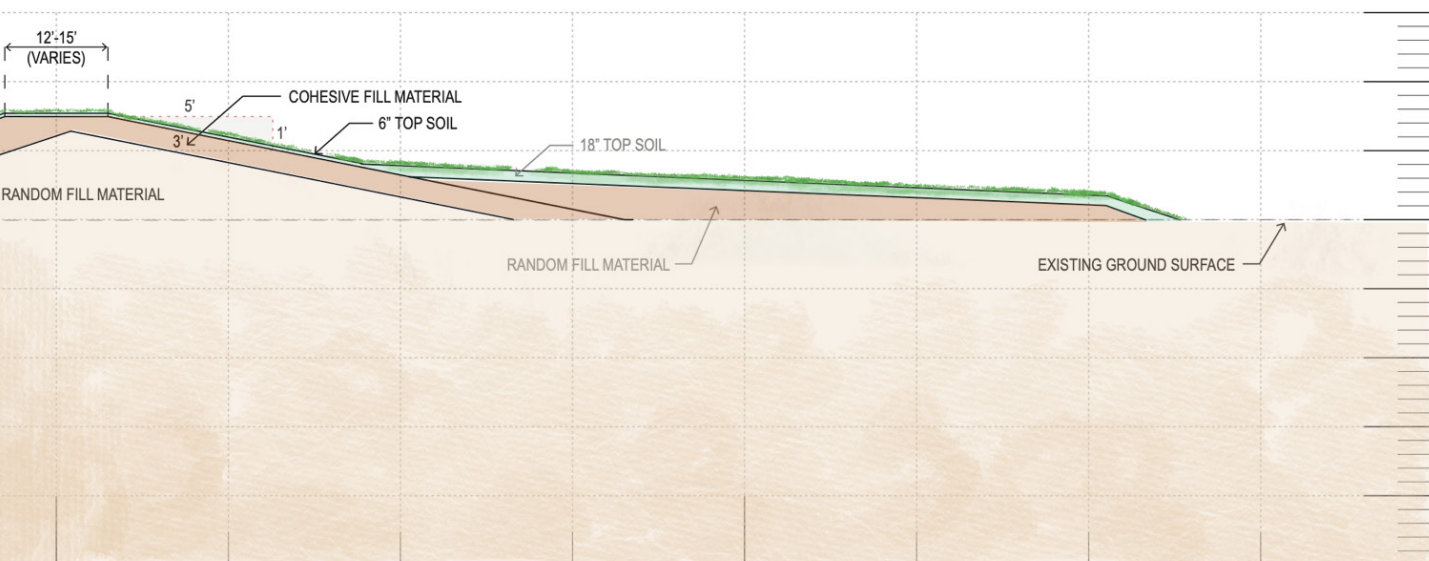
LEVEE SETBACK
TYPIC

Image based on

Figure 8: USACE levee design template.

Levee Design Templates

While USACE-Omaha District waited for floodwaters to recede, they utilized digital elevation models to create engineering design templates for the placement of the levee with its height, side slopes, and seepage berms so that quantities could be determined, expediting the final design of repair alternatives (Figure 8).



CROSS SECTION REPAIR

USACE levee design plans

Permitting

Like any other large-scale construction effort, permitting and environmental law compliance were critical aspects of the project. USACE complied with all applicable laws and regulations. Due to the state of emergency associated with this levee setback, much of the permitting coordination occurred simultaneously with the design, easements, and other construction tasks. The USACE final report for permitting and compliance was completed post-construction. The section below describes the permitting process followed by the L-536 setback team. Section 4 of the Playbook describes a general permitting process necessary for any levee setback.

NEPA Compliance

The team used the Programmatic EA to begin with, and concurrently developed tiered EA (under ER 200-2-2, USACE emergency NEPA implementation procedures) with NRCS as the cooperating agency. This enabled all other agency coordination and environmental law compliance actions to be completed in real time.

Complying with Process of Multiple Agencies

When conducting permitting and environmental reviews, the importance of project partner coordination cannot be understated. In some cases, the same process and coordination may be conducted by different agencies, presenting an opportunity for a condensed, streamlined process. For example, during this project, both USACE and NWMORCOG conducted redundant National Historic Preservation Act Section 106 coordination. Letters were sent separately requesting reviews of project changes. While not a major problem, USACE and NWMORCOG could have sent one letter to simultaneously satisfy both agencies. Eventually, USACE led the remainder of the Section 106 coordination and shared information with other relevant agencies.

Non-Linear Project Development

The project's emergency nature necessitated permitting to occur simultaneously with planning, design, and construction. The impacts to wetlands and water resources were self-mitigating, no cultural or historic resources were located on site, and no threatened/endangered species were impacted by construction, generally minimizing the concern at L-536 as progress continued.

Environmental Law Compliance on L-536 Setback

National Environmental Policy Act (NEPA)

- Completed Programmatic Environmental Assessment (EA) for all 2019 flood-related construction
- Finalized an L-536 specific tiered EA as per ER 200-2-2, paragraph 8
- NRCS signed on as Cooperating Agency

Clean Water Act

- 404(b)(1) report, 401 water quality certification from MoDNR prior to wetland filling
- USACE complied with all 404 permit requirements
- L-536 project was self-mitigating

Endangered Species Act (ESA)

- Completed bat survey prior to tree removal
- Incorporated pallid sturgeon conservation measures by avoiding dredging at certain locations and establishing specific times for dredging

Migratory Bird Treaty Act

- Coordination with USFWS before any tree removal
- Conducted nesting surveys prior to tree removal
- Established tree removal avoidance time frames and nesting tree distance buffers prior to /during construction

Fish and Wildlife Coordination Act (FWCA)

- Conducted constant coordination with USFWS, MoDNR, and MDC

National Historic Preservation Act Section 106 (NHPA):

- Repeated coordination with Missouri SHPO and Tribes on new borrow sites/levee impacted lands

NRCS Easement Coordination

- Coordinated EWP easements process for the new alignment along with the levee repair schedule
- Assisted with WRP impacts and EAA process
- Significant NRCS headquarters coordination and approvals

Missouri River Recovery Program (MRRP)

- Received MDC and MRRP land manager input during new borrow site identification
- Frequently worked with landowners

Construction Permits

- National Pollutant Discharge Elimination System (NPDES) Permit
- Dredging permit from MoDNR

Construction

Most projects of this scale require several years of planning and design before construction begins. As planning and construction occurred concurrently with the L-536 setback, project partners had to be quicker in defining variables that could affect the schedule, such as securing the necessary real estate for construction to begin.

After a year of planning, design, and coordination, a contract for construction was in place as of May 19, 2020, with construction substantially completed in summer 2021.

Contracting

USACE utilized a unique contract tool only available during large-scale disasters: a Rapid Disaster Infrastructure contract. In order to be prepared for unavailable real estate, the L-536 contract was set up with the upstream in-line repairs as the base contract award, with an option to complete the remaining repairs as a setback. Structuring the contract this way provided USACE the means to ensure flood protection would be restored, regardless of whether levee sponsors were able to secure real estate for the setback footprint. ACLD successfully secured the footprint real estate in the days leading up to the deadline to initiate a setback, allowing the levee setback contract option to be exercised.



Crews conduct excavation work on the L-536 setback project, October 2020.

Borrow/Construction Material

All construction borrow material necessary for levee rehabilitation must be provided by the levee sponsor as part of the Lands, Easements, Right-of-Ways, Relocations, and Disposal (LERRD) requirements of PL 84-99. The borrow material could include sand deposited onto the floodplain by floodwaters or below surface material located within the floodplain. Many of the pre-construction assumptions regarding borrow location and availability ended up being incorrect, severely limiting the amount of material the sponsor thought they would be able to provide. For example, it was assumed that the old levee contained suitable clay material, but it actually contained very little. However, if it is advantageous to the conservation program's goals and mission, material can come from conservation land. MRRP and NRCS approved excavation from the Corning Conservation Area and Brownville Wildlife Management Area.

As the team continued looking for suitable clay material for levee construction, coordination among project partners (USACE, Missouri NRCS, NRCS headquarters, ACLD, and property owners) enabled the use of borrow from the riverward side to begin before landowners were enrolled in the EWPP-FPE easement program. The majority of the material for L-536 was excavated from MRRP and NRCS conservation grounds, saving considerable time and effort in locating and transporting suitable borrow material.

When sand also became difficult to find, the USACE construction management team worked to implement a dredge operation, dredging sand from the Missouri River to construct a significant portion of the seepage berms.

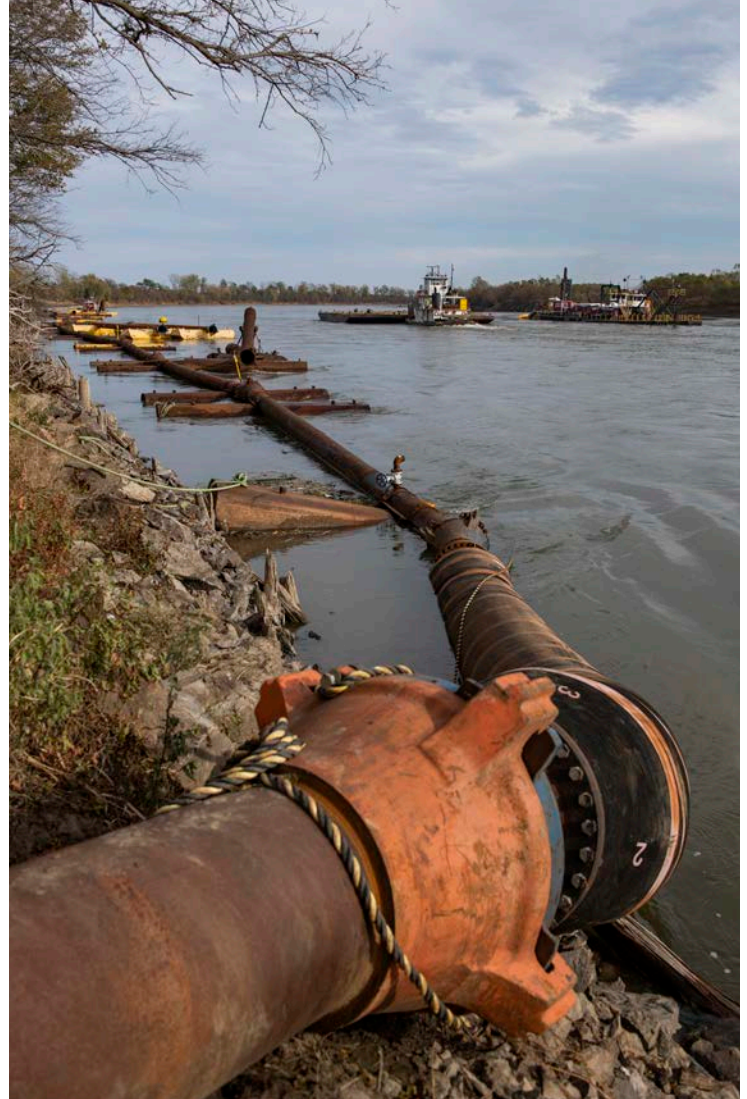
In hindsight, additional geotechnical investigation prior to construction would have supported a more proactive borrow site identification, as well as allowed for additional site identification and cost optimization.



Dredging work along the Missouri River, October 2020.



Levee composition work at L-536, September 2020.



Dredging work along the Missouri River, October 2020.

Weather Considerations

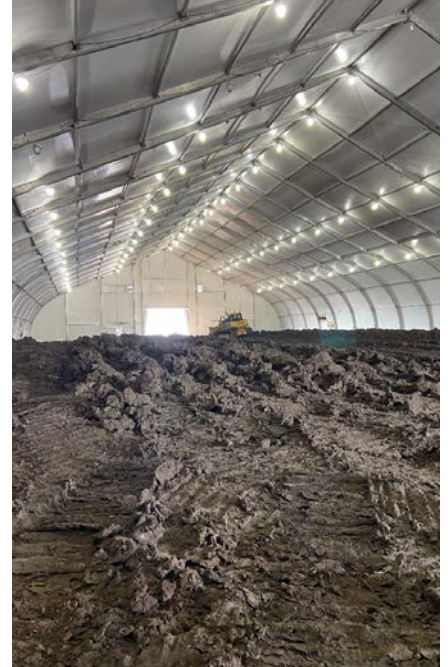
A polar vortex in winter 2020/2021 brought extreme cold temperatures that dipped below -25 degrees Fahrenheit and threatened to halt construction efforts. The project team used huge heated winter tents to keep clay material thawed and to allow construction to keep progressing.

Construction Permits

After miscommunication, the contractor failed to apply for a return flow permit for the placement of dredge material. However, because of the close communication among project partners, MoDNR was able to expedite the permit, preventing costly construction delays.

Levee District Unexpected Expenses

Levee sponsors are responsible for the land encompassing the levee setback footprint, including roadway and utility easements. Early coordination with the county commissioner eliminated county road concerns, but midway through the project, ACLD received a large bill for the relocation of a utility's transmission lines. ACLD mentioned this unexpected cost to project partners, who worked to help offset it. MoDNR was able to secure a portion of SEMA's legislature-allocated flood recovery funding to cover this cost.



Warming tents were used to thaw the project's clay material during the last quarter of construction, Winter 2021.

03

Recommended Modifications to Existing Legislation, Regulation, Policy, and Practices

Large-Scale Levee Setback Playbook

In March 2019, abnormal weather patterns in Nebraska, Iowa, and South Dakota caused record-setting flooding along the Missouri River, resulting in widespread catastrophic damage throughout the river valley. The Large-Scale Levee Setback Playbook (Playbook) documents how, after this historic flood, a multi-agency team worked together to complete a highly complex \$100M levee setback after floodwaters destroyed most of the left bank of Missouri River Levee Unit 536 (L-536) in northwestern Missouri. The Playbook also serves as a guide for others pursuing similar nature-based solutions that enhance flood resilience. It is organized in four distinct but complementary sections.

SECTION 1: The Story

tells the story of the historic flooding in 2019 and provides an overview of the scope and benefits of the setback, the partners involved, and project milestones.

SECTION 2: The Challenges

dives deeper into the L-536 setback project, identifying the challenges—big and small—that project partners encountered and overcame through collaborative problem solving.

SECTION 3: The Recommendations

provides recommendations from the lessons learned during the L-536 setback regarding legislation, regulation, policies, and practices that can better support levee setback projects.

SECTION 4: The How-To Guide

illustrates a process for levee sponsors considering or pursuing a similar project, as well as identifying helpful pre-disaster planning efforts.

The development of the Playbook was supported by The Nature Conservancy with experience-based contributions from project partners involved in the L-536 setback project, a nature-based solution to reduce flood risk to the community by reconnecting more than 1000 acres to the riverward floodplain and restoring more than 400 acres of wetlands.

Key Takeaways of Section 3

- Recommend USACE clarify existing policy or seek new legislation to facilitate construction of levee setbacks, such as tracking repetitive loss data, allowing real estate acquisition for levee setbacks under PL 84-99, and emphasizing levee setbacks for flood risk management that create sustainable flood risk management projects in an era of changing climate and increasingly severe flooding.
- Recommend NRCS improve its ability to support levee setbacks through its Emergency Watershed Protection Program - Floodplain Easements and Wetland Reserve Easement programs by early collaboration with USACE to identify potential setback locations, rank and prioritize levee setbacks, as well as incorporate flexibility in easement administrative actions and easement approval processes.
- Recommend additional project efficiencies through inter-agency processes. These include establishing cooperative agreements between federal agencies, supporting levee sponsor real estate requirements, and developing and maintaining regional memorandums of understanding between USACE and NRCS to implement the emergency provision for joint interest in the same project location.
- Recommend incentives to increase and support participation in future setback projects including increased funding for federal and state participation in levee setback projects, as well as, crop insurance premium discounts and discounted lending rates for participating landowners.

U.S. Army Corps of Engineers (USACE)

Under Public Law 84-99 (PL 84-99), the US Army Corps of Engineers (USACE) offers a levee rehabilitation program that provides levee districts with technical and financial assistance after a flooding disaster. While PL 84-99 provides myriad benefits to levee districts and regions that qualify, areas of the program, from its corresponding legislation to on-the-ground policies, could be modified. The following recommendations pertain to USACE programs related to levees along the Missouri River and elsewhere.

1

Track and report repetitive loss data.

Currently, the PL 84-99 program does not report repetitive damages that occur to levee systems. Tracking repetitive damages and making the information publicly available through the National Levee Database (NLD) would identify levee systems that have incurred significant damages from prior flood events, a key metric for inclusion in local hazard mitigation planning, and help direct limited funding toward the most critical infrastructure needs.

- Make publicly available comprehensive historic damage data on levee segments, and give the data to levee sponsors, state emergency management, NRCS, and DNR agencies to strengthen local planning and increase awareness of where levee setbacks could be considered.

LEGISLATION | REGULATION | **POLICY** | PRACTICE

USACE Support of Natural and Nature-Based Features

As documented in USACE authority (e.g., Section 1176 WIIN 2016, Section 1184 WRDA 2018) and regulations (e.g., EM 1110-2-1913), USACE will consider natural and nature-based features (NNBF) during project design, including during rehabilitation assistance. Finding opportunities to incorporate NNBFs can result in long-term flood risk management and flood resilience benefits to local communities. USACE reports, such as “Levee setbacks: An innovative, cost-effective, and sustainable solution for improved flood risk management,” showcase the engineering, economic, and ecological benefits of setbacks. Because of their successful implementation, USACE’s Engineering With Nature initiative supports levee setbacks as a viable alternative to in-line levee repairs following significant flood damage.

2

Allow real estate acquisition through the PL 84-99 program for levee setbacks.

Under the PL 84-99 program, real estate for levee repairs or setbacks is the responsibility of the levee sponsor. For large-scale levee setbacks, the amount of real estate required for a new levee footprint and riverward lands is typically beyond the financial capacity of a small rural community or levee sponsor. Real estate for the levee footprint and riverward lands are critical acquisitions that provide flood resilience and reduce repetitive loss, ultimately saving government funds.

- Under the PL 84-99 program, allow USACE to acquire **riverward land** for levee setback projects or to reimburse land acquisition by another entity associated with a setback project.
- Under the PL 84-99 program, allow USACE to acquire **levee footprint** for levee setback projects or to reimburse land acquisition by another entity associated with a setback project.

LEGISLATION | REGULATION | POLICY | PRACTICE

3

Develop implementation guidance for nature-based and nonstructural alternatives under PL 84-99.

Develop and publish implementation guidance in conjunction with two related pieces of legislation: 2014 Water Resources Reform and Development Act (Section 3029) and the 2016 Water Infrastructure Improvements for the Nation Act (WIIN) (Section 1176). This guidance should consider levee setbacks, similar to Missouri River L-536, which increase the size of the reconnected floodplain, as a nonstructural alternative.

- Currently, USACE considers the complete removal of levees to be a nonstructural alternative through the PL84-99 program. The evacuation of the natural floodplain, or increase in the size of the reconnected floodplain through a levee setback project, should be considered as a nonstructural alternative.
- The restoration of the natural floodplain is significant in the conveyance of flood water. For levee systems which have known pinch points, a levee setback should be considered as a nonstructural alternative for its benefits in reducing flood risk.

LEGISLATION | REGULATION | POLICY | PRACTICE

4

Provide 100 percent federal funding for non-federal levee setback implementation.

When a non-federal levee system is identified through a flood assessment as a preferred location for a levee setback, waive the non-federal cost-share for everything except the new levee footprint LERRDs, to incentivize levee setbacks as a flood risk reduction strategy. The non-federal levee must be in good standing within the PL 84-99 program at the time of the levee setback.

- Make non-federal levee setback projects eligible for 100 percent federal funding rather than the existing 80 percent federal and 20 percent non-federal cost share.
- Incorporate all current USACE levee design and construction standards into the non-federal levee setback.
- The new levee footprint LERRDs for the non-federal levee setback should continue to be a non-federal responsibility.
- Cost share all post-setback rehabilitation assistance to the non-federal levee system, containing a levee setback, to 80 percent federal and 20 percent non-federal.

LEGISLATION | REGULATION | POLICY | PRACTICE

5

Provide funding through the Missouri River Recovery Program (MRRP) for real estate acquisitions for levee setbacks.

The MRRP has existing authority to purchase lands that conserve and develop habitat along the Missouri River. Levee setbacks expand the amount of riverward floodplain habitat and create significant ecological benefits.

- Provide the MRRP with \$4 million in annual funding to support land acquisition, including purchasing land that could facilitate a levee setback when it would also benefit the MRRP mission. Update annual funding based on future pre-disaster levee setback assessments.
- MRRP, in collaboration with levee districts and project partners, should conduct outreach when funding has been secured for real estate acquisition to build trust, share information with the public about federal agencies' ability to purchase lands when willing sellers are present, and demonstrate how MRRP can contribute to improved preparedness for recovery and preparation for future floods.

LEGISLATION | REGULATION | POLICY | PRACTICE

6

Extend limits of land surveying efforts.

Currently USACE completes topographic and metes and bounds surveys for the new levee footprint and constructed levee. This surveying effort should be coordinated with project partners and the limits of metes and bounds survey extended to include the full legal description of the parcels impacted by the levee setback, both riverward and landward. Extending the survey limits and sharing survey results will maximize efficient use of resources as well as decrease overall project timing.

LEGISLATION | REGULATION | POLICY | **PRACTICE**

7

Conduct flood risk management studies emphasizing levee setbacks.

The Lower Missouri River Flood Risk and Resiliency General Investigation (LoMoR GI) Study (Sioux City, IA to St. Louis, MO) should assess potential levee setback projects. A comprehensive, multi-levee district approach to ongoing or future USACE GI studies could identify levee systems vulnerable to severe damage and failure.

- Track when levee setbacks have been evaluated and formally document the hydraulic and environmental benefits of reducing stages, as well as improving conveyance. Create a publicly accessible database and repository of the information and findings.
- Work with federal and state agencies, as well as levee districts and local governments, to identify repetitively damaged infrastructure (vehicle, rail) located within the 500-year floodplain that would benefit from potential levee setback projects.

LEGISLATION | **REGULATION** | POLICY | PRACTICE

8

Include repetitive losses and potential economic benefits in PL 84-99 rehabilitation alternatives analysis.

In accordance with ER 500-1-1; Civil Emergency Management Program, Chapter 5-2 (h) Alternative Plans, any alternative plan which is an increased cost over the least expensive to the federal government will be borne by the sponsor. Typically, PL 84-99 only includes construction costs for levee repair in today's dollars and looks to select the least cost, technically feasible, alternative project based upon damages from a single flood event. Repetitive loss and future flood damages are generally not considered during the economic evaluation.

- USACE should consider repetitive losses and potential economic benefits (i.e., reduced future repair and O&M) of levee setbacks in detail during economic evaluation and select a project alternative based on a consideration of potential benefits in addition to construction costs.

LEGISLATION | **REGULATION** | POLICY | PRACTICE

Natural Resources Conservation Service (NRCS)

For the L-536 levee setback, NRCS utilized the Emergency Watershed Protection Program – Floodplain Easements (EWPP-FPE) for land on the newly riverward side of the levee setback. This voluntary easement program was fundamental in compensating landowners whose land became unprotected after construction. The following recommendations would improve the NRCS’s ability to support levee setbacks.

1

Develop flood resilience ranking criteria for EWPP-FPE applications.

Encourage NRCS state offices to develop EWPP-FPE application-ranking criteria that consider applications contributing to improved flood risk management through actions like levee setbacks.

- Collaborate with USACE on the identification of potential levee setback locations based upon repetitive levee damages and river conveyance improvements.
- Prioritize easement selection, focal areas, and funding where levee setbacks are occurring.
- NRCS HQ ensure state EWPP-FPE funding is available for the full amount of applications contributing to levee setbacks to be selected.

LEGISLATION | REGULATION | **POLICY** | PRACTICE

2

Modify NRCS easement administrative actions for levee setbacks.

Levee setback projects create significant ecological benefits, but may result in relatively minor impacts to existing easement land created under prior NRCS easement programs. The requirement to compensate NRCS for minor easement impacts can create an expensive real estate acquisition burden on the levee sponsor. For nature-based solutions such as levee setbacks, create mitigation flexibility through NRCS easement administrative actions regarding impacts to existing conservation easements for mutually beneficial outcomes.

- Allow for an amount of conservation easement impact during a levee setback that will not require mitigation when associated with significant conservation land gains and ecological benefits. For example, waive mitigation requirements if the impacted area is less than a certain percent (to be determined by NRCS) of the total easement parcel(s) acreage associated with the setback project.

LEGISLATION | REGULATION | POLICY | PRACTICE

3

Expedite easement approval processes in post-disaster recovery efforts.

NRCS easements are an important financial resource to compensate landowners whose lands were significantly damaged by floods and are willing to participate in a levee setback. However, the time frame from disaster to landowner enrollment and compensation is significant and can be a deterrent for landowner participation.

- Shorten easement enrollment process from typical two-year time frame to less than 12 months in post-disaster recovery efforts. Delegate some NRCS decision making from HQ to state offices to expedite approval process in disaster-recovery efforts.
- Using a process like the Federal Emergency Management Agency's National Incident Management System (NIMS), create additional staffing capacity during disaster recovery to assist state staff in expediting response, program establishment, and conservation easement enrollment.
- The EWPP-FPE program requires landowners to contact NRCS, as the levee sponsor cannot do this for them. Add flexibility to allow landowners to collaborate with levee sponsors and project partners through establishment of a signed third party agreement, allowing levee sponsors or other project partners to drive NRCS coordination through the enrollment process.
- Save landowner time and federal funds by sharing key due diligence items (such as title searches, surveys, legal descriptions, etc.) amongst partners.

LEGISLATION | REGULATION | POLICY | PRACTICE

Inter-Agency

The key to large-scale levee setbacks is inter-agency collaboration. No one group can manage it on their own—this type of project requires the dedicated efforts of many groups working in tandem. The following recommendations focus on bolstering inter-agency efforts before and during the levee setback process.

1

Create a federal agency cooperative agreement and action plan specific to levee setbacks.

- Develop, document, and share agency-specific processes, roles, and responsibilities specific to levee setbacks. On a state-by-state basis, extend this federal cooperative agreement to include appropriate state agencies prior to flood events.
- When a disaster occurs and a levee setback is determined as the best option, the inter-agency work group acts as a rapid response team, in full collaboration with each other and state and local partners.

LEGISLATION | REGULATION | **POLICY** | PRACTICE

2

Support levee sponsors in real estate requirements.

- Develop a joint NRCS-USACE fact sheet for state natural resources agencies, illustrating the full measure of real estate requirements for implementing a levee setback project.
 - USACE should identify and define PL 84-99 real estate requirements for potential levee setback projects (lands, easements, right-of-ways, relocations, and disposal, or LERRDs).
 - NRCS should create landowner resources describing process and compensation for enrolling in conservation easement programs that may be used for levee setback.
- States should provide disaster recovery funding resources that can be multi-allocated and provide matching funds which are often required by other funding sources. Missouri's Governor and Legislature realized the need for and value in having flexible state funding available during the 2019 flood recovery. The funding proved critical during this project to ensure progress did not slow or stop.

LEGISLATION | **REGULATION** | **POLICY** | PRACTICE

3

Update and maintain regional MOU between USACE and NRCS.

The Regional NRCS-USACE MOU provided multiple opportunities to implement the emergency provision for joint interests in the same project vicinity. This was extremely useful in addressing damaged levees and rehabilitation alternatives. Close coordination between USACE and NRCS was facilitated by the actions established in the Regional MOU. As the 2019 flood repairs wrapped, USACE and NRCS compiled a list of useful updates. The Regional MOU should be renegotiated and updated by USACE and NRCS.

- Establish permitting and environmental law compliance lead when an agency invokes the emergency clause of an Regional MOU.
- Standardize use of a 3rd party EWPP-FPE policy waiver between NRCS, USACE, and landowners for borrow material, like the novel waiver utilized on L-536 for similar, future construction efforts.
- Help ensure early and often coordination between all involved parties when an Easement Administrative Action is triggered, especially during use of the Regional MOU emergency provision. Establish clear expectations, roles and responsibilities, and mutually agreed upon timelines (if possible).
- Refine Regional MOU with lessons learned from the L-536 project to serve as a model for other NRCS states/USACE Districts to follow where real estate interests overlap.

LEGISLATION | REGULATION | **POLICY** | PRACTICE

4

Increase funding for levee setbacks.

The funding needs of a large-scale levee setback far exceed the capacity of a typical rural levee sponsor, necessitating a multi-prong funding approach. Request additional federal and state funding to support large-scale levee setback projects.

- Review US Department of Commerce Economic Development Administration programs and make recommendations for supporting levee setback projects.
- Review the US Department of Housing and Urban Development Community Block Development Grant (CDBG) program and state-level prioritization process.
 - Revise evaluation criteria for potential projects under the National Objective 3.4: Urgent Need, eliminating the single-funding source criteria or revising to accommodate large-scale levee setbacks.
 - Create flexibility in state-level prioritizations to support large-scale disaster recovery efforts.
- Explore use of FEMA mitigation funding (Building Resilient Infrastructure for Communities) or post-disaster Public Assistance or Hazard Mitigation Grant program funding for assessment (hydrologic study to model and measure flood risk of levee setback) and potential construction of levee setbacks in the vicinity of vulnerable communities to reduce flood risk.
- The Federal Highways Administration (FHWA) directs funding to states for construction, maintenance, and repair of interstates and highways across the country. Many transportation corridors are at risk of significant flooding and damage due to their proximity to vulnerable levee systems. Recommend FHWA, through the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, provide funding to state Department of Transportation agencies for fair market appraisal and land acquisition in support of levee setback projects which will result in more resilient transportation corridors.
 - Support provisions in the 2021 pending Federal Highway reauthorization bills that would enable funding for levee setback work. The provisions call out the need to plan for and enhance the resilience of transportation infrastructure and provide new funding and grants directed at resilient infrastructure work.

LEGISLATION | REGULATION | POLICY | PRACTICE

5

Increase incentives for participation in levee setbacks.

Create a crop insurance levee setback incentive program for landowners.

- The USDA Risk Management Agency (RMA) administers the U.S. crop insurance program. Flooding of cropland is a potential risk associated with farming which landowners are insured against. If the risk of flooding is high, for example in the vicinity of repetitively damaged levees, then the associated crop insurance premiums paid by farmers will also be high. If the flood risk is low, or nonexistent, then the insurance premium will also be lower.
 - Engage in multi-agency discussion to determine if resilience provided by a levee setback equates to crop insurance financial benefits for landowners.
 - For those landowners who elect to participate in a levee setback, provide a one-or-two year extension to the five-year crop insurance benefits rule for any other farmland they own.

Create discounted lending rate for landowners participating in levee setbacks.

- The USDA Farm Services Agency (FSA) makes loans to support farm operations. Because the levee setback can protect farmlands behind the new levee, increasing the value of landward farms, collateral for the FSA improves. In addition, loan loss rates on lands from repetitive losses can be decreased with levee setbacks by removing those high impact lands out of production. Creating non-purchase price related incentives for farmers to participate in levee setbacks will improve FSA's serviceability and financial condition of any levee setback participants who continue to farm other lands.
 - Engage the USDA's Farm Services Agency to create incentives for levee setback participants for other farmlands they own, for example, reducing lending rates by 25 basis points.

Create levee setback program with Internal Revenue Service.

- The Internal Revenue Service (IRS) provides due diligence service to the NRCS by reviewing and approving applicants' Adjusted Gross Income requirements. Because levee setbacks can reduce the amount of repetitive losses, they provide a better investment for taxpayers and the federal government.
 - Encourage Internal Revenue Service to expedite NRCS Adjusted Gross Income analysis in the case of levee setbacks.
 - Engage the Internal Revenue Service to give levee setback participating landowners a tax credit, refund, or favorable basis to decrease capital gains taxes when they sell their interests or to extend the amount of time they need for a 1031-exchange.

LEGISLATION | REGULATION | POLICY | PRACTICE

04

A How-To Guide to Levee Setbacks

Large-Scale Levee Setback Playbook

In March 2019, abnormal weather patterns in Nebraska, Iowa, and South Dakota caused record-setting flooding along the Missouri River, resulting in widespread catastrophic damage throughout the river valley. The Large-Scale Levee Setback Playbook (Playbook) documents how, after this historic flood, a multi-agency team worked together to complete a highly complex \$100M levee setback after floodwaters destroyed most of the left bank of Missouri River Levee Unit 536 (L-536) in northwestern Missouri. The Playbook also serves as a guide for others pursuing similar nature-based solutions that enhance flood resilience. It is organized in four distinct but complementary sections.

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illustrates a process for levee sponsors considering or pursuing a similar project, as well as identifying helpful pre-disaster planning efforts.

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Key Takeaways of Section 4

- The how-to guide provided in this section is based on the L-536 experience, documenting the actions taken and providing tips and best practices for those pursuing similar efforts.
- There is tremendous value in pre-disaster planning because any activities that can be done pre-disaster enhance coordination efforts, save time and money post-disaster, and may facilitate securing critical funding resources.
- Post-disaster recovery efforts are not a linear, step-by-step process; rather, things happen simultaneously and seemingly out of order as compared to a traditional USACE civil works project.
- A large-scale levee setback is a complex effort, but it is achievable when project partners work together to pursue a shared goal.

A Note to Levee Sponsors

Pursuing a large-scale levee setback is a significant but achievable effort, and the levee sponsor is vital to the effort.

The role a levee sponsor plays in a large-scale levee setback can be challenging, especially during and after a disaster, often with a limited budget and volunteer staff. The levee sponsor's actions significantly influence the vision and momentum of a large-scale levee setback. The levee sponsor must develop an understanding of the system-wide impacts of a levee setback, articulate a goal and vision that brings partners to the table, and be a consistent advocate for the benefits a setback offers the community and environment.

Under pre-disaster (proactive) circumstances, a large-scale levee setback is a complex project to implement. In an oversimplification of a typical civil works project, first funding would be in place to trigger the planning and design of the setback, which would inform the permitting process. Real estate would then be secured before the project moved into construction (see Figure 9). This process would occur in as little as five years or over decades, depending on the project's circumstances.

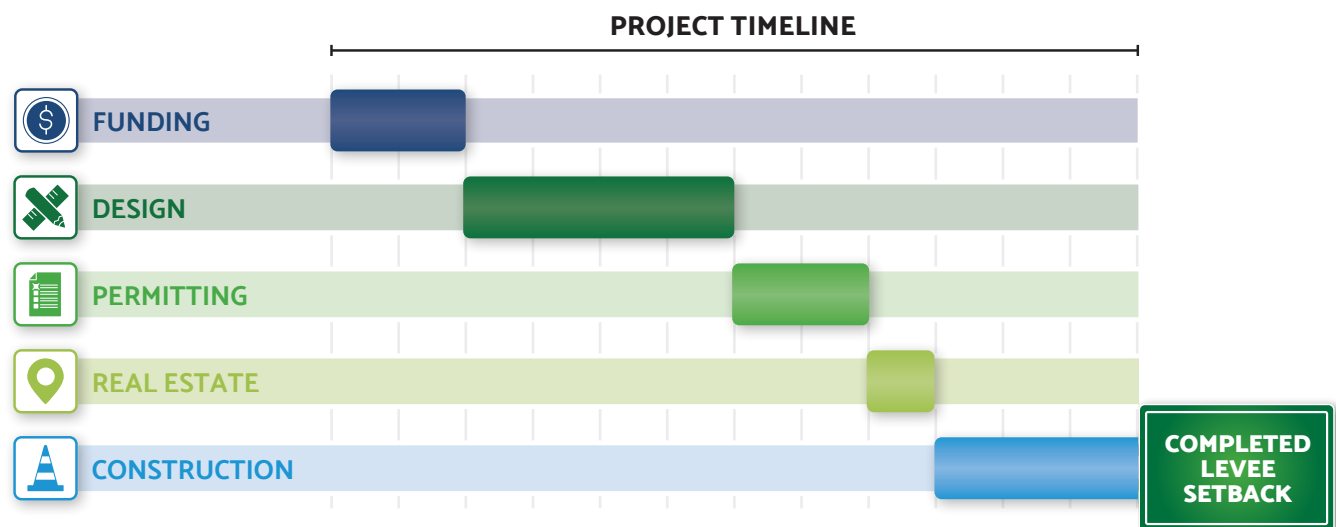


Figure 9: Pre-disaster (proactive) project timeline example

In post-disaster rehabilitation circumstances, the process is compressed in order to restore flood protection as soon as possible. Illustrated as an interwoven process (see Figure 10), the accelerated schedule necessitates individual project components be completed concurrently. Ideally, this process would be completed before the next flood season (i.e., one year); however, for large-scale projects, two years is a more likely scenario, as it was for the L-536 setback.



Figure 10: Post-disaster project timeline example

Throughout this section, L-536 project partners outline the process and share best practices for navigating the compressed and interwoven levee setback process. The following how-to guide is broken into three sections:

1. **Pre-disaster actions** that lay the groundwork for a smoother post-disaster levee rehabilitation effort (or identify the process for a pre-disaster setback project).
2. **Post-disaster actions** for levee sponsors and project partners to use as a baseline project management plan for a similar effort.
3. **Summary of project components** and corresponding best practices, timeline variables, project resources, and levee sponsor key actions.

While the process of pursuing and achieving a large-scale levee setback is complicated, know that it is possible through collaboration and partnership.

Pre-Disaster Planning

L-536 setback project partners felt the pressure from the compressed schedule of a post-disaster levee rehabilitation project. This illuminated the significant value pre-disaster planning could have on post-disaster recovery efforts: any activities that can be done pre-disaster save time and coordination efforts when time is of the essence. A levee setback could be planned, designed, and constructed pre-disaster, thereby mitigating potential future damages and eliminating time constraints associated with post-disaster recovery efforts.

Incorporate Pre-Flood Assessments into State and Local Hazard Mitigation Planning Efforts

Hazard mitigation plans (HMPs) developed by local governments, often with assistance from a Regional Council of Government or Regional Planning Commission, are required by the Federal Emergency Management Agency (FEMA) to be eligible to apply for funding for pre- and post-disaster recovery and mitigation.

Explore USACE Programs that Could Support Levee Setback Projects Outside of the PL 84-99 Program

While the L-536 setback was constructed under authority of the PL 84-99 program, there are other USACE programs or authorities that can support a levee setback study, design, and construction.

Section 205 and General Investigations (GI) programs are two potential avenues for pursuing levee setbacks with USACE. These programs require a non-federal cost-share sponsor (e.g., levee sponsor or other partnering entities) to help share the cost of the study, design, and construction phases of the project. The non-federal project sponsor is still responsible for Land, Easements, Rights-of-Way, Relocation, and Disposal Areas (LERRDs). Modifications to an existing federally constructed levee without the participation of the USACE requires a USACE Section 408 review, often a responsibility of a levee sponsor or project proponent to develop.

KEY ACTIONS

- A** Increase collaboration among local, state, and federal partners outside of a disaster.
- B** Conduct tabletop levee damage/failure exercises that simulate disaster response and recovery as a part of levee emergency preparedness planning and hazard mitigation planning. These efforts increase pre-disaster partner collaboration and could identify opportunities for a levee setback project.
- C** Integrate repetitive flood damages into local HMPs. Identify levee segments where pre-disaster mitigation actions might provide long-term benefits.
- D** Identify potential levee setback locations before disasters occur to ensure a setback is an alternative considered in post-disaster evaluations through collaboration between USACE and levee sponsors.
- E** Include conceptual levee realignments in local HMPs to:
 - Secure eligibility for FEMA Hazard Mitigation Grant Program funding for pre- or post-disaster efforts through collaboration with local governments, levee districts, and USACE.
 - Have a “shelf ready” project that could be implemented quickly under the PL 84-99 program if or when a severe flood event occurs and causes significant levee damages.
- F** Determine land ownership, land rights, and easements along the existing levee as well as potential setback alignments prior to a flood event.
- G** Engage landowners and vulnerable entities pre-flood about the impacts of potential levee failure to them and their land. Illustrate the benefits of a setback to identify mutually beneficial setback scenarios if a disaster were to occur, or even proactively pre-disaster.
- H** Develop a “Participation Option” program/tool to help align and orient landowners prior to a flood event as a means to help determine which setback sites align best with landowner interests. While the form of the Participation Option can vary, it is generally an agreement between the landowner and levee sponsor that confirms the landowners’ willingness to consider a levee setback assuming terms and conditions determined at a later time are agreeable. Such an agreement suggests a willingness by both parties that a setback levee on their land is a viable discussion point should the need arise due to disaster or repetitive losses.
- I** Proactively develop conceptual engineering design templates for locations identified for potential setback by the local sponsor and partners.

Pursuing a Levee Setback Post-Disaster

Figure 11 illustrates the key components of a levee setback pursued under PL 84-99. The interwoven project components highlight that in a post-disaster rehabilitation, many efforts are conducted simultaneously and out of the typical order generally followed in a pre-disaster (proactive) setback effort. This amplifies the need for strong project management and continued communication among project partners.

An overview of the eight project components are described below, with specific action items detailed in the following pages.

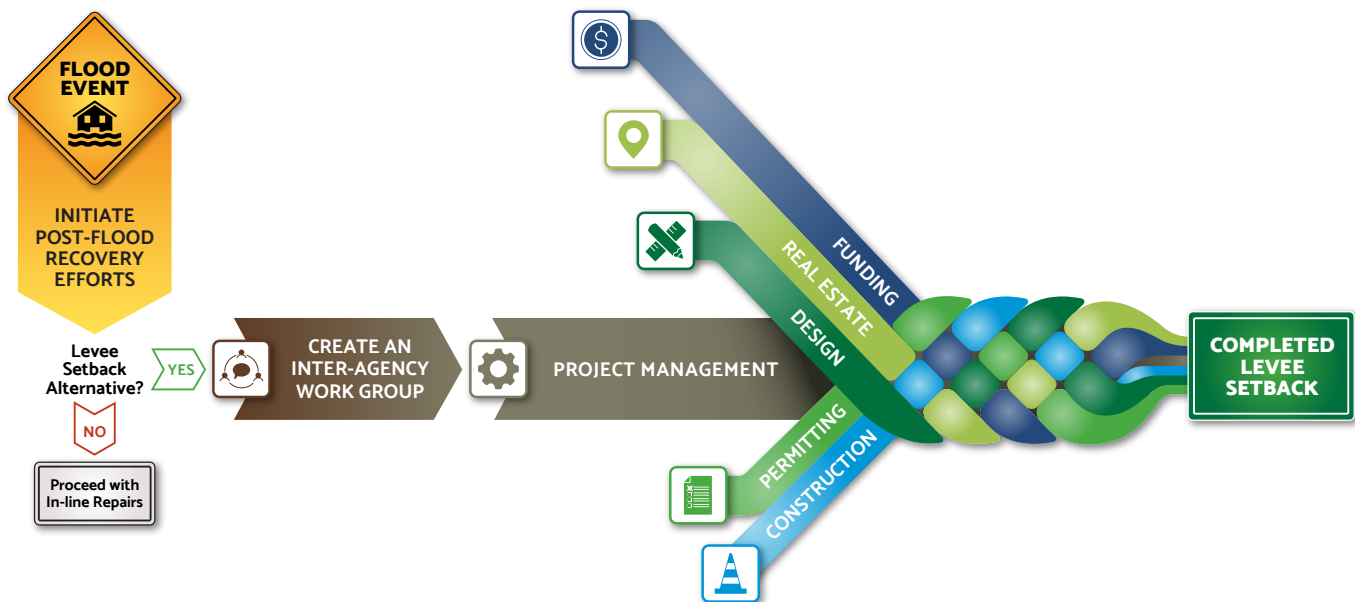


Figure 11: Interwoven project components of post-disaster levee setback

INITIATE POST-FLOOD RECOVERY EFFORTS

Following a disaster, levee damage or breach, USACE and levee sponsors initiate post-flood recovery efforts through damage assessments and evaluation of levee rehabilitation alternatives. Under PL 84-99, USACE provides rehabilitation assistance to construct the least cost, technically feasible rehabilitation alternative to restore pre-disaster flood protection. Additional improvements can be made at the levee sponsor's expense.

CREATE AN INTER-AGENCY WORK GROUP

Upon the decision to pursue a levee setback alternative, establishing an inter-agency work group is critical to the project's success. The inter-agency work group provides all project partners a voice and a shared understanding of the roles and procedures of each agency involved in the project.

PROJECT MANAGEMENT

Due to the accelerated and interwoven nature of project development, project management is a necessary component of a large-scale levee setback project. Regular coordination and collaboration among project partners has significant positive impacts on the project, including the development of a master project management plan that outlines project goals and milestones and identifies what project elements are contingent on other elements. For example, design informs real estate requirements, which in turn informs sponsor funding needs and influences the construction schedule. Project management, through routine coordination meetings, builds trusted working relationships between project partners and accountability for project action items.

FUNDING

Closely tied to real estate components of a large-scale levee setback, the funding approach can make or break a project. USACE covers the cost of planning, design, and construction, while levee sponsors are responsible for the real estate requirements (described in the real estate section), borrow material sourcing and utility relocations. These costs are often beyond the means of levee sponsors, making the need to identify and secure adequate funding, in a short time frame, a major hurdle to overcome.

REAL ESTATE

Real estate can be one of the most critical and time-consuming efforts related to a large-scale levee setback. For PL 84-99 levee rehabilitation efforts, the levee sponsor is responsible for acquiring lands for the new levee footprint, securing borrow material (the material used to construct the new levee), and utility relocations (as applicable). Though not a USACE requirement, levee sponsors may also decide to compensate landowners for the new riverward lands from those who no longer wish to own riverward lands and then develop a plan for the long-term management of these lands. Voluntary participation by affected landowners may determine the feasibility of a levee setback alternative.

DESIGN

Under its PL 84-99 authority, USACE will conduct the planning and design for the least cost, technically feasible rehabilitation alternative.

PERMITTING

Permitting and environmental law compliance should be initiated and coordinated early on in a large-scale levee setback project. Inter-agency coordination is critical to efficient permitting and environmental law compliance activities, as there are opportunities to eliminate redundant efforts among project partners. Under its PL 84-99 authority, USACE serves as the lead agency for permitting and environmental law compliance related to the setback levee. Due to the emergency nature of PL 84-99, the permitting process may not be completed until after the setback levee is constructed.









CONSTRUCTION

Under its PL 84-99 authority, USACE will construct the least cost, technically feasible rehabilitation alternative. Construction is usually the culmination of many preceding moving parts; however, in a disaster-recovery project, the path to construction is accelerated and can begin before the design, permitting, and land acquisition are complete to restore the system and reduce risk to lives and assets. The levee setback construction process and schedule are most significantly impacted by real estate acquisition, the availability and proximity of suitable borrow materials, and weather conditions.

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
S	<p>2 Apply for rehabilitation assistance within 30 calendar days from the date the floodwaters recede fully to back within the bank</p> <ul style="list-style-type: none"> » Indicate a setback may be desired, if determined to be technically feasible 								
U	<p>3 Conduct damage assessment, develop Project Information Report (PIR), and conduct economic analysis for PL 84-99 emergency assistance in accordance with current regulations</p> <ul style="list-style-type: none"> » Evaluate repair alternatives, determining which is the least cost, technically feasible alternative » Inform levee sponsors of real estate acquisition required to support a levee setback 								
U	<p>Planning/Design Milestone: PIR Initiated for Least Cost, Technically Feasible Determination</p>								
S	<ul style="list-style-type: none"> » Determine preliminary cost of in-line repairs » Determine preliminary least cost, technically feasible alternative 								
U	<p>4 Initiate real estate needs assessment</p> <ul style="list-style-type: none"> » Determine potential levee setback alignment » Confirm land ownership along existing and potential alignment » If there is a strong likelihood of setback rehabilitation alternative, initiate title search » Reach out to affected or potentially affected landowners to determine willingness to participate in setback (or activate the “Participation Option”) » Consider hiring a landowner outreach consultant 								
S									
L									

RESPONSIBLE & SUPPORTING PARTNERS

ACTION ITEM		PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p>	<p>5 Initiate funding needs assessment</p> <ul style="list-style-type: none"> » For levee footprints (old and new) » For borrow material » For utility impacts » For new riverward lands (depending on landowner needs) 								
	<p>6 Identify potential project partners</p>								
	<p>7 Decide whether to pursue levee setback alternative</p> <ul style="list-style-type: none"> » If not pursuing, proceed with in-line repairs » If pursuing: <ul style="list-style-type: none"> - Create inter-agency work group (Steps 8-10) - Complete land title search to determine land ownership along setback alignment and lands to become riverward of the setback levee 								
One Month Post-Disaster									
<p>U</p> <p>S</p>	<p>8 Organize an inter-agency work group to support project activities that are outside of USACE's authority, including but not limited to land acquisition and easements</p> <ul style="list-style-type: none"> » Identify local, state, and federal agency representatives, NGOs, and consultants » Recruit new partners as needs are identified 								

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
									
U S P	9 Establish group framework and communication protocol <ul style="list-style-type: none"> » Designate lead convener/facilitator for the inter-agency work group » Draft group charter to clarify purpose of group and shared vision » Schedule regular coordination meetings/calls » Identify a lead person for each agency involved that has leadership support to facilitate multiple processes within agencies » Create a shared, cloud-based project folder for file sharing » As possible, meet onsite with work group 			■					
U S P	10 Create and maintain relationships with any established state or federal Inter-agency Levee Flood Task Force			■					
U	Design Milestone: Setback Alignments Identified and Communicated with Levee District <ul style="list-style-type: none"> » Determine support for potential setback » Identify requirements for potential levee setback project » Finalize PIR report 					■			
U S P L	11 Identify quantity of private acres needed for project <ul style="list-style-type: none"> » Levee footprints (old and new) » Riverward lands » Mitigation lands (if applicable) <p>TIP! Consider hiring a landowner outreach consultant to support real estate processes.</p>				■	■	■		

	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p> <p>P</p> <p>L</p>	<p>12 Identify potential real estate conflicts and determine if they affect setback viability or timeline</p> <ul style="list-style-type: none"> » Verify willingness of impacted landowners to participate and ability to acquire necessary LERRDs; decide whether to continue pursuing levee setback » Any required mitigation acres for impacts to conservations easements » Hazardous and toxic waste sites, cultural/historic sites, and environmental concerns » Impacts to utilities, pumps, public services, pipelines, roads, and rights-of-way 	■			■	■	■		
<p>U</p> <p>S</p> <p>P</p>	<p>13 Identify funding needs for:</p> <ul style="list-style-type: none"> » Levee footprints (old and new) » Riverward lands, if requested by landowners » Mitigation acres (if needed) » Utility impacts (if needed) » Borrow material » Construction (if not under PL 84-99) » Real estate consultant (optional) » Grant writer (optional) <p>TIP! There are a variety of expenses related to the real estate process that levee sponsors are responsible for, such as boundary surveys, title searches, appraisals, and acquisitions. Project partners may be available to provide financial assistance for such expenses.</p>	■			■	■			■

RESPONSIBLE & SUPPORTING PARTNERS

ACTION ITEM

	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p> <p>P</p> <p>14 Develop funding approach (See resources on page 4-18)</p> <ul style="list-style-type: none"> » Confirm all local, state, and federal disaster-, mitigation-, and environmental-related funding resources » Investigate and coordinate with any grant programs and NGOs that may support the effort » Evaluate viability of funding strategy, decide whether to continue pursuing levee setback <p>TIP! Consider enlisting a grant writer to provide insight on potential funding sources, how funding sources could be complementary or in conflict, and support grant application development.</p>					■			
<p>U</p> <p>S</p> <p>P</p> <p>15 Develop a unified permitting strategy (See step 40)</p> <ul style="list-style-type: none"> » Identify the lead permitting agency » Initiate environmental law compliance activities and coordination early (SHPO/Tribes, USFWS, EPA, floodplain administrator, etc.) 							■	
<p>U</p> <p>S</p> <p>P</p> <p>16 Establish timelines/schedules</p> <ul style="list-style-type: none"> » Create and update project schedule, regularly sharing with inter-agency work group; consider using web-based software for group members to access/view anytime » Identify critical paths for each agency, communicate any slack in schedule 				■	■	■	■	■
<p>U</p> <p>S</p> <p>F</p> <p>17 Develop interim emergency preparedness plans for period without flood protection</p>						■		

RESPONSIBLE & SUPPORTING PARTNERS

	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p> <p>P</p>	<p>18 Conduct regular outreach and project updates</p> <ul style="list-style-type: none"> » Provide regular updates to the inter-agency working group to maintain a transparent and collaborative process » Create a strategy to keep landowners aware of project progress » Inform and provide project updates to local community and political leaders <p>TIP! Levee sponsor communication with local community and political leaders is critical to project support and success.</p>			■					
<p>U</p> <p>P</p>	<p>19 Complete initial metes and bounds survey of impacted lands</p> <ul style="list-style-type: none"> » Create maps based on survey data and preliminary alignment » Share results with project partners 	■			■	■			
<p>U</p> <p>S</p> <p>L</p>	<p>20 Follow up with affected or potentially affected landowners</p> <ul style="list-style-type: none"> » Discuss participation options (if in place) » Verify if landowners want to own or sell all or parts of impacted property » Confirm participation of impacted landowners; decide whether to continue pursuing levee setback 	■			■	■			
<p>S</p> <p>P</p> <p>L</p>	<p>21 Gather legal descriptions and confirm legal ownerships</p>	■			■				

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
U S P L	22 Confirm real estate to be acquired » Categorize real estate: old levee footprint, new levee footprint, new riverward land, new landward land, and mitigation acres » Identify who will purchase each real estate category » Identify short- and long-term ownership and management » Identify needed access points (as applicable)	■			■	■			
	23 If unsure of the value of lands to be acquired or need a third party assessment to address fairness concerns for landowners, contract a comparative market analysis to determine purchase price pending final appraisal » Otherwise, if a baseline generic price isn't needed, initiate preliminary appraisals of real estate to be acquired	■			■	■			
	24 Draft options to purchase real estate, present to landowners, collect signed options » If applicable, landowners submit NRCS applications » If using an NRCS conservation easement, have landowners sign NRCS documentation to allow sharing of information with levee sponsor and project partners	■			■	■			
	25 Work to secure funding for new levee footprint	■			■	■			
	26 Work to secure funding for riverward and/or landward lands, as requested by landowners	■			■	■			

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
 	27 Work to secure funding for mitigation acres (if needed)								
 	28 Work to secure funding for utility impacts								
 	29 Work to secure funding for borrow material								
 	30 Work to secure funding for construction (if not under PL 84-99)								
 	31 Negotiate with title company for shared research, separate insurance								
3-4 Months Post-Disaster									
 	32 Initiate title work that can be shared among project partners » Order title search on new footprint, old footprint, and new riverward and landward lands								
 	33 Negotiate and secure necessary real estate » Determine if an agreeable land acquisition deal can be made; decide whether to continue pursuing levee setback								
	Planning/Design Milestone: Initial Cost Estimate Developed for Setback and In-Line Repairs Submitted for USACE Div/HQ Approval								
	Planning/Design Milestone: Setback Design								

RESPONSIBLE & SUPPORTING PARTNERS

ACTION ITEM

	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p> <p>34 Setback design</p> <ul style="list-style-type: none"> » Create project area maps, include parcel ownership, public and conservation-owned lands, easements, utilities, rights-of-way, public services » Design milestones can include concept, 30%, 60%, 90%, and final designs, which can be coordinated with the sponsor » Assess interior drainage needs » Identify rights-of-way access needs » Identify building material quantities required for setback construction 								
<p>U</p> <p>S</p> <p>P</p> <p>L</p> <p>35 Borrow material identification and coordination</p> <ul style="list-style-type: none"> » Utilize conservation lands through agreement with NRCS for dredge and borrow to limit cost to levee sponsor » Consider how to increase incidental environmental benefits » Consider post-construction rehabilitation requirements and permitting clearances, for borrow sites » Map and create a property owner database of available borrow sites » Propose using landowner ground for borrow and obtain clearance with NRCS (if applicable) or other agencies with agreements in place » Put agreements in place with private landowners to ensure borrow locations are available as a permitting mitigation strategy <p>Tip! Have contingency borrow areas identified in case current borrow sites do not contain enough suitable material.</p>								

RESPONSIBLE & SUPPORTING PARTNERS

ACTION ITEM		PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>U</p> <p>S</p> <p>P</p>	<p>36 Utility coordination</p> <ul style="list-style-type: none"> » Identify all utilities to be removed/relocated, or avoided, early in the process » Estimate the levee sponsor costs related to utilities » Share information and involve a wide variety of local interest, such as county commissioners, electrical co-ops, rural water systems, floodplain administrators, etc. of the design to avoid utility and infrastructure issues <p>Tip! Have a funding strategy to ensure impacts to utilities do not hinder the construction schedule.</p>	■			■	■	■	■	
<p>U</p> <p>S</p> <p>P</p>	<p>37 Infrastructure coordination</p> <ul style="list-style-type: none"> » Identify vehicular and rail infrastructure required for replacement, relocation, and/or avoidance, early in the process » Identify levee sponsor costs associated with infrastructure » Establish an infrastructure task force, consisting of local, regional, state, and federal officials for assessing, coordinating, and funding infrastructure requirements » Identify access points over and back on the new levee to all landowners and interest-holders on riverward lands 	■				■			
<p>U</p> <p>S</p> <p>P</p>	<p>38 NRCS Administrative Action process if NRCS easements are impacted and mitigation is needed (as applicable)</p>	■			■	■		■	
<p>S</p> <p>L</p>	<p>39 Other impacted easements negotiated</p>	■			■				


















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ACTION ITEM

	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
<p>40 Develop unified permitting strategy</p> <ul style="list-style-type: none"> » Identify all water quality permitting needs based on design and potential construction methods » If other partner agencies (including potential granting agencies) need to complete the same coordination, align steps so all agencies' coordination is combined into one process » Determine if the project needs to initiate a new NEPA effort, or if the planned emergency actions can be tiered from an existing or programmatic NEPA document; the lead agency may have NEPA implementation regulations that allow for NEPA documentation to be developed concurrently with or after completing emergency actions; establish Cooperating Agencies as needed to streamline agency coordination » Identify project partner members with solid understanding or strong relationships with other agencies to lead permitting and agency coordination efforts 								
<p>41 Complete all needed permits/environmental law compliance activities</p> <ul style="list-style-type: none"> » Revisit and update permitting strategy as needed » Complete all permitting required for construction, wetland fill, etc. prior to action. 								
<p>Planning/Design Milestone: Project Goes to Bid, Construction Contractor Selected</p>								
<p>42 Construction contracting</p> <ul style="list-style-type: none"> » Establish construction contracts with flexibility <ul style="list-style-type: none"> - Prioritize cost-reimbursable contract model - flexibility in design to execution » Consider contract allowing different courses of action, enabling construction to continue before all real estate issues are sorted out 								

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
U S	43 Construction schedule » Develop and maintain construction schedule; identify construction milestones, connecting them with overall project milestones (permitting, easements, etc.) » Continue regular project team coordination meetings » Consider weather-related construction contingencies (cold weather, heavy rains, etc.)								
	44 Construct setback levee								
Project Milestone: Construction Substantially Complete									
U	45 Finalize permitting								
U S P	46 Conduct final land surveying for real estate								
S P	47 Complete due diligence, which includes but is not limited to final title search, final appraisals, amended options to purchase								
U S P	48 Finalize NRCS Administrative Action (if applicable)								
S P	49 NRCS shares anticipated closing dates on easements 30 days in advance and coordinates closing with Residual Interest Buyers								
S P	50 NRCS closes on easements, Residual Interest Buyer closes on the remaining interest on the land post-easement								

RESPONSIBLE & SUPPORTING PARTNERS	ACTION ITEM	PRE-DISASTER	INITIATE POST-FLOOD RECOVERY EFFORTS	CREATE INTER-AGENCY WORK GROUP	REAL ESTATE	FUNDING	DESIGN	PERMITTING	CONSTRUCTION
									
 	51 Levee sponsor releases easement on old footprint (as applicable)								
 	52 Close mitigation acres with NRCS or other easement holders (if applicable)								
 	53 Update operation and maintenance (O&M) manuals to reflect changes to levee system								

Summary of Project Components







INITIATE POST-FLOOD RECOVERY EFFORTS

Following a disaster involving levee damage or a breach, USACE and levee sponsors initiate post-flood recovery efforts through damage assessments and evaluation of levee rehabilitation alternatives. Under PL 84-99, USACE provides rehabilitation assistance to construct the least cost, technically feasible rehabilitation alternative to restore pre-disaster flood protection. Additional improvements can be made at the levee sponsor's expense.

Recommended Best Practices

There is tremendous value in pre-disaster planning because any activities that can be done pre-disaster save time and coordination efforts when time is of the essence post-disaster.

Timeline Variables

The estimated 0-30 day time frame may be prolonged if high water conditions persist, limiting USACE's ability to access and assess damage.

Levee Sponsor Key Action Items

- 1** Request rehabilitation assistance from USACE (Action Item 2)
- 2** Determine existing land ownership in potential realignments (Action Item 4)
- 3** Determine real estate needs (Action Item 11)

Opportunities for Pre-Disaster Planning

Pre-disaster planning has the potential to significantly impact post-flood recovery efforts. The forethought of potential levee setback locations, documentation of potential benefits and system-wide impacts, and awareness of associated real estate and funding needs will provide a levee sponsor the information needed to advocate for a large-scale levee setback as an alternative, as well as enable USACE to give due consideration to levee setback rehabilitation alternatives.

- Document repetitive damages in a local HMP. (Pre-Disaster Action Item C)
- Identify and include conceptual levee setback alignments in a local HMP. (Pre-Disaster Action Items C, E)
- Verify land ownership along existing levee and potential setback alignments. (Pre-Disaster Action Item F)
- Understand real estate and funding needs associated with levee setback alignments. (Action Items 4, 5)
- Develop relationships with potential project partners. (Pre-Disaster Action Item A, Action Item 8)
- Develop relationships with potentially impacted landowners. (Pre-Disaster Action Item G)
- Develop a “Participation Option” program/tool to support landowner outreach post-flood. (Pre-Disaster Action Item H)

Determining if a Large-Scale Levee Setback is a Viable Alternative

- Significant foundational and levee section damage preclude in-line repairs of the levee (least-cost alternative)
- Real estate is available for construction of a setback levee
- Adequate funding can be secured to acquire needed real estate
- Potentially supported by a history of repetitive damages
- Ancillary benefits, not limited to hydraulic, environment, and resilience



CREATE AN INTER-AGENCY WORK GROUP

After deciding to pursue a levee setback alternative, establishing an inter-agency work group is critical to the project's success. The inter-agency work group provides all project partners a voice and a shared understanding of the roles and procedures of each agency involved in the project.

The composition of this group may include, but is not limited to:

- Levee Sponsors
- USACE Division/District
- Local governments, municipalities, and counties
- State Emergency Management Agency
- State Conservation Department
- State Department of Natural Resources
- Federally-Directed Recovery Programs, such as the MRRP
- Non-governmental organizations (NGOs) with shared interests
- State or Tribal Historic Preservation Offices
- Regional Council of Governments or Planning Commissions
- US Department of Agriculture NRCS
- US Department of Commerce Economic Development Administration
- US Fish and Wildlife Service
- Federal Emergency Management Agency
- Consultants (as applicable)

Levee Sponsor Key Action Items

- 1 Pursue inter-agency partnerships to support identified real estate and funding needs. (Action Item 8)

Timeline Variables

Pre-disaster coordination with potential project partners will expedite the development of the inter-agency work group; however, as project needs evolve, the composition of this group may change through the course of the project.

Opportunities for Pre-Disaster Planning

- Conduct levee damage/failure tabletop exercises that simulate disaster response and recovery as a part of levee emergency preparedness planning and hazard mitigation planning. These efforts increase pre-disaster partner collaboration and could identify opportunities for a levee setback project. (Pre-Disaster Action Item B)

“The biggest thing I would tell a levee sponsor post-flood if I had the opportunity is, to get as many other agencies at the table as you can and get an understanding where those agencies can and can’t help you. Start filling up your toolbox with different authorities, different people, different capabilities.”

– **Tony Krause, Chief of the US-ACE-Omaha Flood Risk and Floodplain Management Office**



PROJECT MANAGEMENT

Regular coordination and collaboration among project partners has significant positive impacts on the project, including the development of a master project management plan that outlines project goals and milestones and identifies what project elements are contingent on other elements. For example, design informs real estate requirements, which in turn informs sponsor funding needs and influences the construction schedule. Project management, through routine coordination meetings, builds trusted working relationships between project partners and accountability for project action items.

Recommended Best Practices

Building from the action item list provided on pages 4-05 - 4-12, develop a Project Management Plan (PMP) that compiles the requirements, schedules, and milestones of all project partners, specifically those associated with USACE and NRCS.

Timeline Variables

Project management is an ongoing activity that can proactively identify project milestones and action items that are contingent on the progression or completion of other tasks.

Levee Sponsor Key Action Items

Decide whether to continue pursuing levee setback after:

- 1** Verifying willingness of impacted landowners to participate (Action Items 12, 20)
- 2** Confirming ability to acquire necessary LERRDs (Action Item 12)
- 3** Evaluating viability of funding strategy (Action Item 14)

Opportunities for Pre-Disaster Planning

- Identify real estate consultant to support real estate process. (Action Item 11)
- Identify grant expert to support funding pursuits and grant applications. (Action Item 14)
- Identify quantity of private acres needed for project. (Action Item 11)
- Identify potential real estate conflicts. (Action Item 12)
- Outline potential funding needs. (Action Item 13)
- Identify potential funding sources. (Action Item 14)

“The benefit of collaborative work, especially between government and non-governmental teams, is reducing the risk of boxing ideas in and not offering a variety of solutions that may be outside of the box. I think that this project was especially exciting or different because people were willing to voice opinions and not be afraid if they didn’t work out or if they sounded ridiculous, because of the strong gubernatorial and legislative support, that we knew the end product was possible, likely, and valued.”

– Jessica Catron, SEMA



REAL ESTATE REQUIREMENTS

Real estate can be one of the most critical and time-consuming efforts related to a large-scale levee setback. For PL 84-99 levee rehabilitation efforts, the levee sponsor is responsible for acquiring lands for the new levee footprint, securing borrow material (the material used to construct the new levee), and utility relocations (as applicable). Though not a USACE requirement, levee sponsors may also decide to compensate landowners for the new riverward lands. Voluntary participation by affected landowners may determine the feasibility of a levee setback alternative.

Recommended Best Practices

Determine impacted landowner needs early on, asking:

What is motivating the landowners; money or time?

- » Do landowners want pre-flood, levee-protected farmland values? If yes, NRCS and FHWA (and possibly FEMA if buyouts for home or business are needed) are likely the only viable funding sources.
- » Do landowners want to close sooner than 12-18 months on real estate interest sold? If so, values would be “as is” and would likely not include NRCS or FHWA.

Do landowners want to continue owning lands?

- » Regardless of whether an easement is purchased on their landward land, do landowners want to keep or sell their landward land?
- » Regardless of whether an easement is purchased on their riverward land, do landowners want to keep or sell their riverward land?

Timeline Variables

Real estate is a sequence of events. While most steps fit within a fixed timeline, certain actions can and should be taken early. Acres to be purchased will be dependent on final survey but once the initial metes and bounds survey is done, start title searches. Many title issues can be resolved simultaneously with other more-sequentially based real estate activities.

Levee Sponsor Key Action Items

- 1** Determine potential real estate conflicts and if they affect setback viability or timeline (Action Item 12)
- 2** Establish and maintain communication with impacted landowners (Action Items 4, 8, 12, 20, 33, 35, 50)
- 3** Work with USACE to conduct initial metes and bound surveys of impacted lands, share results with project partners (Action Item 19)
- 4** Confirm real estate to be acquired (Action Item 22)
- 5** Initiate title work that can be shared with project partners (Action Item 36)
- 6** Identify and coordinate borrow material (Action Item 35)

NRCS conservation easement purchases typically take between 12-18 months to complete. If an entity is going to purchase the residual interest, they typically have to wait until the NRCS finishes their easement acquisition.

Opportunities for Pre-Disaster Planning

- Confirm ownership along existing alignment and potential setback alignments. (Action Item 4)
- Identify real estate consultant to support landowner outreach and real estate process. (Action Item 11) Ideally, the purchaser of any residual interest conducts the real estate process in concert with partners.
- Identify quantity of private acres needed for project. (Action Item 11)
- Identify potential real estate conflicts. (Action Item 12)

Other Considerations

- The land that was beneath the old footprint has limited use because it is narrow in shape. Although it is not a requirement to purchase this land, having a ribbon of land with multiple ownerships creates access and management issues.
- Access to new riverward land needs to be determined. Working from pre-existing public rights-of-way is best, and requires communication with the local road commissioners.
- If NRCS is used to purchase an easement, access to each easement (regardless of riverward or landward) must also be identified prior to final surveys.



FUNDING APPROACH

Closely tied to the real estate components of a large-scale levee setback, the funding approach can make or break a project. USACE covers the cost of planning, design, and construction, while levee sponsors are responsible for the real estate requirements (described in the real estate section), borrow material sourcing, and utility relocations. These costs are often beyond the means of levee sponsors, making the need to identify and secure adequate funding, in a short time frame, a major hurdle to overcome.

Recommended Best Practices

- Cast every hook you can for potential funding sources and be prepared to hear “no.” Keep trying.
- Consider enlisting the help of a grant writer who can provide insight on potential funding sources, how they can be complementary or in conflict with one another, and could support grant application development.
- Have a funding strategy for contingencies, like unforeseen utility expenses.

Timeline Variables

Grant programs have their own timelines. Be cognizant of grant application due dates and anticipated award dates.

Levee Sponsor Key Action Items

- 1** Identify funding needs and develop a funding strategy
(Action Items 5, 13, 14)
- 2** Secure necessary funding (Action Items 25-30)

Opportunities for Pre-Disaster Planning

- Outline potential funding needs. (Action Item 13)
- Identify potential funding sources. (Action Item 14)

LEGEND		WHAT THE FUNDS CAN BE USED FOR					
		NEW LEVEL FOOTPRINT	LANDOWNER COMPENSATION	MISCELLANEOUS NEEDS*	POTENTIAL MATCH DOLLARS		
F	Federal	S	State	L	Local	N	NGO
FUNDING TYPE	POTENTIAL FUNDING SOURCE						
F	USACE MRRP (or similar program)		■				
F	USACE General Investigations program			■			
F	FEMA Hazard Mitigation Grant Program (HMGP)		■				
F	FEMA Public Assistance		■				
F	US EDA Emergency Disaster Recovery Funds	■	■				
F	US HUD Community Development Block Grant - Disaster Recovery				■		
F	USDA Risk Management Agency		■				
F	USFWS		■		■		
F	Federal Highway Administration	■	■		■		
F	NRCS EWPP-FPE (if landowner wants pre-flood land valuation)		■				
F	NRCS ACEP		■				
S	State Emergency Management Agency	■	■	■	■		
S	Department of Transportation	■	■		■		
S	Department of Natural Resources or Conservation		■	■	■		
L	Regional Council of Governments			■			
L N	Conservation organizations and local land trusts (examples: The Nature Conservancy, Ducks Unlimited, Izaak Walton League, Theodore Roosevelt Conservation Partnership)		■	■	■		

* Flood risk mitigation studies, real estate due diligence (title work, appraisals, surveys, environmental assessments), utility removal/relocation, construction, grant writing.



PERMITTING

Permitting and environmental law compliance should be initiated and coordinated early on in a large-scale levee setback project. Inter-agency coordination is critical to efficient permitting and environmental law compliance activities, as there are opportunities to eliminate redundant efforts among project partners. Under its PL 84-99 authority, USACE serves as the lead agency for permitting and environmental law compliance related to the setback levee. Due to the emergency nature of PL 84-99, the permitting process may not be completed until after the setback levee is constructed.

Environmental Law Compliance and Coordination for Levee Setback

National Environmental Policy Act (NEPA)

- Establish partners as Cooperating Agencies, as applicable
- Tier from programmatic NEPA documents, if possible

Clean Water Act

- Prepare 404 permit application and begin USACE Regulatory coordination (not necessary if USACE is doing the construction) and prepare 404(b)(1) report
- Obtain 401 water quality certification from applicable state agency ASAP
- A project with self-mitigating features (e.g., borrow pit wetlands) results in easier paperwork and analysis

Endangered Species Act (ESA)

- Engage USFWS immediately for consultation at the beginning of the effort
- Endangered Species Act emergency consultation may be initiated immediately after an emergency
- Prepare Biological Assessment, follow USFWS conservation measures during construction

Migratory Bird Treaty Act

- Coordinate with USFWS before any tree removal
- May need to conduct nesting surveys, establish tree removal avoidance time frames and/or nesting tree distance buffers prior to/during construction

Fish and Wildlife Coordination Act (FWCA)

- Ensure close coordination with applicable state natural resource agencies
- Ensure close coordination between USFWS and state natural resource agencies

National Historic Preservation Act Section 106 (NHPA):

- Immediately initiate coordination with SHPO and tribes
- Immediately initiate coordination for NHPA Section 106
- Initiate 106 emergency coordination within 30 days following flood event, if necessary

NRCS Easement Coordination

- Immediately initiate coordination with NRCS if there are any easements in the project area or if any surrounding landowners are considering submitting an NRCS easement application
- Different coordination will be required for easement impacts vs easement

enhancement through actions like wetland creation from borrow pits

- If USACE is doing the work, verify if Regional MOU applies

Federal/state conservation land

- Immediately initiate coordination with any federal or state conservation entities that own land within/adjacent to the project area
- Different coordination will be required for conservation land impacts vs conservation land enhancement through actions like wetland creation from borrow pits

Contractor obtains needed construction permits prior to work

- National Pollutant Discharge Elimination System (NPDES) Permit
- Depending on design or construction methods, check with state water quality regulatory agency for any additional permits that may be required

Other environmental laws

- Specific environmental laws not listed here may apply to other projects across the country
- The lead federal agency involved in the project should have the list of laws to ensure compliance



PERMITTING (CONTINUED)

Recommended Best Practices

- Initiate permitting collaboration early to prevent redundant efforts of multiple agencies. (Action Item 15)
- Identify project partner members with solid understanding or strong relationships with other agencies to lead permitting and agency coordination effort. (Action Item 40)

Timeline Variables

Regulatory agencies have their own processes and procedures. For example, USFWS and SHPO offices may need at least 30 days for review while state permit applications can take 60 days to review. Coordinate with these agencies early on to establish timeline expectations.

Levee Sponsor Key Action Items

1

USACE staff and/or the contractor will conduct the necessary permitting for levee setback construction; however, levee sponsors are responsible for any permitting requirements associated with utilities and infrastructure (Action Item 36)

Opportunities for Pre-Disaster Planning

- Inventory programmatic NEPA documents that could streamline new NEPA requirements.
- Inventory existing Clean Water Act General Permits, Regional General Permits, and/ or Nationwide Permits that may be applicable to future work.
- Understand various environmental law emergency provisions, be ready to invoke and take advantage if possible.
- Establish regulatory agency points of contact for future communication needs.
- Leverage USACE knowledge, documents, and points of contact for these and any other pre-disaster planning efforts.





DESIGN

Under its PL 84-99 authority, USACE will conduct the planning and design for the least cost, technically feasible rehabilitation alternative.

Recommended Best Practices

- Use existing topographic data (LiDAR) to review land topography and identify optimal alignments for setback.
- Develop flexible contract options to ensure flood protection is restored, regardless of whether real estate is secured for the setback footprint.
- Conduct geotechnical investigation prior to construction to proactively identify borrow material sites.

Timeline Variables

Determining potential and optimal alignments for a levee setback requires time to complete geotechnical assessments and determine borrow material needs. The ability to complete geotechnical assessments post-disaster may be impacted by weather, ground conditions to accommodate mobilization of equipment (i.e., extended high water conditions), ground conditions for drilling (i.e., frozen ground creates challenges), presence of actively growing crops at locations of proposed borings, and private landowner coordination for access. Pre-disaster planning could expedite the initial design stages. Lack of early utility coordination can also lead to schedule delays in later stages of the design process and through construction.

Levee Sponsor Key Action Items

- 1** Work with USACE to determine potential levee setback alignment(s) (Action Items 4, 5)
- 2** Initiate utility coordination as soon as preliminary alignments are identified (Action Item 15)
- 3** Work with USACE to develop interim emergency preparedness plans for the period of time the area will be without flood protection (Action Item 17)



Opportunities for Pre-Disaster Planning

- Identify levee segments where pre-disaster mitigation actions might provide long-term benefits. (Pre-Disaster Action Item D)
- Identify potential levee setback locations before disasters occur and include conceptual levee alignments in local HMPs. (Pre-Disaster Action Items D, E)
- Develop draft engineering design templates for locations identified for potential setback. (Pre-Disaster Action Item I)



CONSTRUCTION

Under its PL 84-99 authority, USACE will construct the least cost, technically feasible rehabilitation alternative. Construction is usually the culmination of many preceding moving parts; however, in a disaster-recovery project, the path to construction is accelerated and can begin before the design, permitting, and land acquisition are complete to restore the system and reduce risk to lives and assets. The levee setback construction process and schedule are most significantly impacted by real estate acquisition, the availability and proximity of suitable borrow materials, and weather conditions.

Recommended Best Practices

- Have contingency borrow areas identified in case current borrow sites do not contain enough suitable material.
- Be prepared to shift equipment to contingency borrow areas as needed.
- Consider weather-related construction contingencies (cold weather, heavy rains, etc.).

Timeline Variables

Weather and availability of construction materials, including borrow, significantly influence construction timelines. Adaptability and problem-solving will be instrumental in keeping the project on schedule.

Levee Sponsor Key Action Items

- 1 Following substantial completion of construction, complete real estate acquisition process (Action Item 50)
- 2 Update operation and maintenance (O&M) manuals to reflect changes to levee system (Action Item 51)

Opportunities for Pre-Disaster Planning

- Develop potential setback alignments (Pre-Disaster Action F) and begin coordinating with any utility that could be impacted by future setback. There may be an opportunity to resolve potential utility conflicts prior to disaster.
- Identify borrow material quantity and quality. (Action Item 35)





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