

MORGANZA FLOODWAY HISTORY

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Authorized by the 1936 Flood Control Act, the Morganza floodway is designed to relieve pressure on the levee system along the critical Baton Rouge to New Orleans corridor by providing a major diversion of floodwaters from the Mississippi River to the Atchafalaya basin. The floodway is operated when Mississippi River flows below the floodway are projected to exceed 1.5 million cfs or when stages are forecasted to encroach upon freeboard requirements on the levee along the Baton Rouge to New Orleans corridor. Floodwaters are introduced into the floodway via a 3,906-foot long controlled spillway located on the right descending bank of the Mississippi River just north of the city of Morganza, Louisiana. The 125-gate spillway is designed to divert up to 600,000 cfs from Mississippi River during project design flood conditions. Floodwaters entering the floodway are contained between an upper guide levee extending from the Mississippi River levee to the Atchafalaya River levee and a lower guide levee extending from just above the city of Morganza to just past the town of Lottie. Since its completion in 1954, the Morganza floodway has only seen activation during the 1973 and 2011 floods.

Prior to the Mississippi River and Tributaries (MR&T) project, federal flood control policy was one of confinement by levees. The 1927 flood, however, completely overwhelmed the levee system and devastated the lower Mississippi River valley, showing the

inadequacy of the “levees-only” policy. The flood was the catalyst for the comprehensive MR&T project authorized by the 1928 Flood Control Act. The project was developed specifically to provide protection from the project design flood by raising and strengthening levees and constructing floodways to relieve pressure on the mainstem levee system by providing room for the river to expand. The original plan called for five floodways, two of which – the East and West Atchafalaya floodways – were in the Atchafalaya River basin.



While feasible from an engineering standpoint, the floodways proved difficult to implement and provoked intense opposition, particularly from landowners within the floodways. This opposition led to delays in construction. Many landowners in Louisiana were ill-prepared for the reality that their lands, once protected by levees, would now be subject to periodic inundation to benefit private

landowners elsewhere in the valley without federal compensation for their land rights. Section 4 of the 1928 Flood Control Act obligated the federal government to compensate landowners within the floodways who would be subjected “to additional destructive floodwaters that will pass by reason of diversion” from the Mississippi River.

However, President Calvin Coolidge did not approve the federal acquisition of flowage rights for the Louisiana floodways on the grounds that the Boeuf and Atchafalaya basin floodways were natural floodways and would not be subjected to additional floodwaters because they would be receiving the same level of protection as before. Landowners also opposed the use of fuseplug levees as a means to floodway activation. Fuseplugs – sections of levee that are designed to overtop and crevasse – represented an untried theory that opponents considered dangerous. The most common criticisms involved the uncertainty of where the levee would crevasse and the possible damage caused by the uncontrolled kinetic energy of floodwaters coursing through the floodway.

In June 1932, the Mississippi River Commission began work on an experimental program designed to increase the carrying capacity of the channel and lower the flood line on the Mississippi River between the mouth of the Arkansas River and Old River. The program was based largely on cutting off numerous river bends and using corrective dredging

techniques to realign the channel, thereby increasing the river’s velocity and scouring the riverbed deeper to increase the cross section of the channel. By 1935, the commission had facilitated eight cutoffs which, when combined with corrective dredging measures, allowed the Mississippi to carry more water at lower stages. The initial success of the program allowed the Mississippi River Commission to propose



modifications to the MR&T project, including replacement of the East Atchafalaya floodway with the smaller Morganza floodway, which would be regulated by a controlled spillway situated directly on the Mississippi River. The commission also proposed federal compensation for land rights within the floodways.

The proposed Morganza floodway offered several advantages over the East Atchafalaya floodway. First, the floodway would use a controlled spillway in place of the unproven and

unpredictable fuseplug levee. Under the previous plan, which included fuseplug levees for the East and West Atchafalaya floodways, the commission speculated that both fuseplug levees would be operated during project design flood conditions. However, during smaller floods it was possible that only one of the two floodways would face operation. Which one would be activated depended on chance. To remove this uncertainty, the commission recommended a controlled intake directly on the Mississippi River near Morganza, a location where levees had historically crevassed. In

addition to providing greater predictability, the controlled intake directly on the Mississippi could better assure the integrity of the flood control system from Old River to the Gulf of Mexico. Moving the intake offered the further advantage of saving approximately 100 square miles of rich farmland formerly located within the east

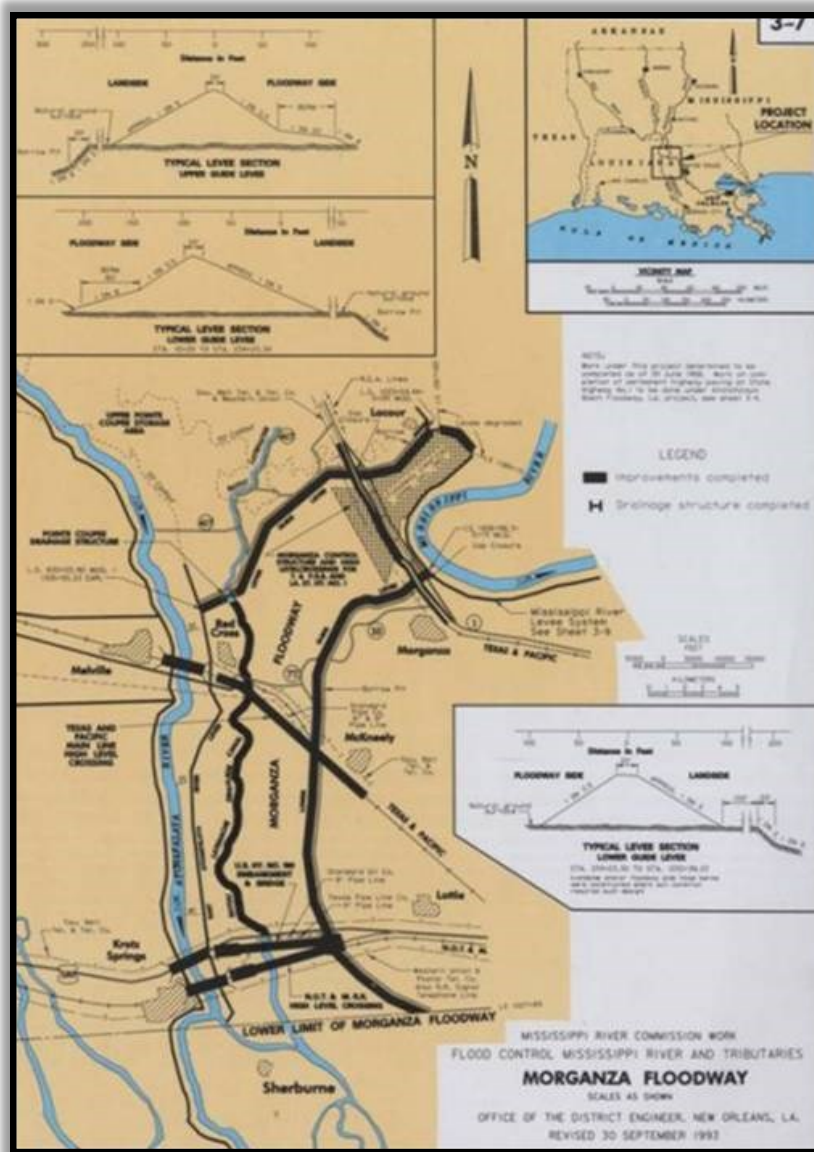
Atchafalaya floodway in northern Point Coupee Parish from inundation in the event of opening the Morganza spillway. The Mississippi River Commission also believed that the diversion of excess flows through the Morganza floodway, combined with the increased carrying capacity of the Atchafalaya, would improve conditions in the Red River backwater area and lessen the likelihood of triggering the activation of the West Atchafalaya floodway.

The proposed engineering features of the plan drew wide support, with the Louisiana Board of State Engineers calling it “as near being a perfect plan, consistent with justifiable outlay and funds, as it is possible to conceive.” Congress authorized the recommendations of

the plan in the 1936 Flood Control Act. While engineers were conducting design studies on the Morganza spillway structure, the Corps of Engineers began purchasing easements for the floodway, constructing levees and relocating highways and railroads. By the end of 1940, construction was complete on the upper and

lower guide levees. By mid-1940, the Corps of Engineers had received offers to sell comprehensive easements on 80 percent of the total land value for the floodway and had completed payment on 50 percent of these.

The general plan for the spillway was based on the 1935 Mississippi River Commission report and a more comprehensive 1948 report detailing the design criteria of the project. Actual construction of the spillway began in 1949 and was completed by 1954.



The completed spillway was 3,906 feet long, with 125 gated openings, each of which was 28 feet 3 inches wide and separated by 36-inch wide piers with a weir crest of 37.5 feet. The top of the gates stood at an elevation of 60 feet. The operational plan called for activation of the

floodway when the discharge at Tarbert Landing was forecasted to reach or exceed 1.5 million cfs, which in 1950 corresponded to a stage of 56 feet at the spillway. This was supposed to allow four feet of leeway, or freeboard, before the spillway's gates would overtop. The spillway's vertical lift gates are opened by two gantry cranes that move along the structure and raise the gates by lowering lift beams equipped with pins into the two lifting eyes. The pins attach to the lifting eyes and raise the gates. Aligning the pins into the lifting eyes requires visual assistance and confirmation. Because of the method of operation, having the necessary freeboard to operate the structure before it overtopped is essential. With the structure completed, it would take nearly two decades before it would face its first significant test.



In 1973, a major flood struck the lower Mississippi River valley. During the flood, significant scouring occurred in the inflow channel of the Old River control structure, causing the south guide wall of the structure to collapse and compromising the integrity of the entire structure. To lower flood stages and relieve pressure on the Old River control structure, the Corps of Engineers initially opened 42 of the Morganza spillway's 125 gates. Because of adverse affects on wildlife and a malfunction at the Point Coupee Drainage Structure which prevented one of the gates from closing, the spillway bays had to be closed for two days. When the New Orleans District began re-opening the bays, they opened just ten

initially and then opened two a day until a total of 20 bays were opened. The purpose of this slow opening was to reduce adverse affects on wildlife and to reduce scouring below the spillway. The flood crested at 1,498,000 cfs at the Tarbert Landing gage before beginning to subside in mid-May. The primary problems the Morganza spillway experienced during its operation was the development of scour holes below the stilling basin and damage to the stilling basin caused by displaced derrick

stones. Engineers addressed these problems by placing concrete pads in the outflow channel to reduce future scouring.

Another major flood struck the lower Mississippi in 1983. Although the Morganza floodway was not activated, the north end of the spillway experienced major seepage problems. A scour hole developed under the north abutment pier

on the inflow side of the structure. Engineers repaired the structure by placing a six-foot deep clay blanket on the forebay side of the structure extending from the north abutment to the wing wall and from the curtain wall extending out about 130 feet. Engineers also constructed a permanent seepage cutoff with sheet pile in front of the approach piers and the abutment pier on both ends of the structure. Engineers also constructed a concrete apron behind the seepage cutoff extending to the curtain wall.

The 1973 exposed a potential problem involving the operation of the Morganza

spillway. Rating curves developed after the flood indicated a progressive deterioration of the discharge capacity of the Mississippi between Old River and the floodway, possibly due to the changes in the dynamics of the river created by the Old River Control Complex. In other words, higher stages than expected for a given flow had materialized. An analysis of the MR&T project just after the 1973 flood indicated a 15 percent decrease in the capacity of the channel, causing stages near Tarbert Landing to be up to an estimated 1.7 feet higher at a given flow than they were in 1950.

The phenomenon occurred again during subsequent floods. During 1973 flood, a discharge of 1,335,000 cfs at Tarbert Landing produced a stage of 52 feet at the Morganza spillway, but during the 2008 flood, the same rate of flow produced a stage of 54 feet at the spillway. During the 2011 flood, the same rate of flow produced a stage of 55 feet. Because the discharge was not correlating to the expected stage, engineers

recognized the strong possibility that the river could overtop the gates at the Morganza spillway before reaching the 1.5 million cfs discharge trigger.

The obvious deterioration of the channel between the Old River Control Complex and the Morganza floodway presented numerous challenges for the operation of the floodway during the 2011 flood. With the top of the spillway's gates standing at 60 feet, there was

supposed to be approximately four feet of freeboard once the river reached the 1.5 million cfs discharge trigger for operating the floodway. . However, even though stages at the spillway continued to rise above 56 feet, discharge at Tarbert Landing had not yet reached 1.5 million cfs, which led to the possibility that the gates would be overtopped prior to the discharge reaching 1.5 million cfs. If this occurred, it would be difficult for the gantry crane operators to align the pins with the lifting eyes to lift the gates. Another problem was that since the Morganza spillway was



designed under the assumption that the gates would rise prior to river stages reaching 56 feet, all tables, graphs, and data in the water control manual ended at that stage. Thus, rating curves and various equations used by the New Orleans District's hydraulic engineers to extrapolate stages were not as precise as needed, posing an incredible challenge for the district.

With the trigger stage of 1.5 million cfs at Tarbert Landing forecasted for May 14, 2011, Col. Edward Fleming, the New Orleans District Commander, requested that Maj. Gen. Michael Walsh, President of the Mississippi River Commission, approve slowly opening the structure starting on May 11. Fleming based his request on the experience the district had gained during the 1973 flood as well as on the operational guidelines of the Water Control Manual. However, having made the agonizing decision to activate the Birds Point-New Madrid

floodway just over a week earlier, Walsh wanted to avoid activating the Morganza floodway if possible and was poised to follow the operational trigger point of 1.5 million cfs at Tarbert Landing as spelled out in the approved water control manual. The deterioration of the channel also made Walsh's decision even more difficult, as higher than expected stages were occurring at a given discharge. For example, when the discharge at Tarbert Landing reached 1.5 million cfs, the stage at that gage was 62.3 feet, 4.2 feet higher than the same stage during the 1973 flood.

With the stage rapidly rising and the discharge forecasted to reach 1.5 million cfs by May 15, the New Orleans District informed Walsh that if the structure was not opened soon, the district would be forced to further deviate through the Old River Control Complex to prevent the spillway from overtopping. On May 14, with the stage less than a foot away from

overtopping the structure and the discharge still below 1.5 million cfs, Walsh gave the order to open the spillway. Two gate bays were opened on May 15, with 17 gate bays being opened by May 18, with peak flows reaching 180,000 cfs.

Operation of the floodway damaged several areas of the spillway. In part due to the high head differential under which the spillway was initially operated, the structure suffered significant scouring in its tailbay beyond the limits of the scour protection, along the stilling

basin end sill wall, and in the concrete plunge pond. If allowed to continue unimpeded, this scouring could have affected the structure's integrity. Additionally, some of the stone from the scour protection area adjacent to the stilling basin was washed out and displaced. The floodway's lower guide levee had scour damage in low sections and other scour areas developed along the forebay levee slopes.

The 2011 flood revealed several deficiencies in the operation of the Morganza floodway, the most pressing of which was that the operational

trigger was tied to a defined river discharge rather than a river stage. Due to this operational deficiency and the deterioration of the channel, floodwaters nearly overtopped the spillway before river discharge reached the 1.5 million cfs level that dictates floodway operation. Due to the continuing deterioration of the channel, the discharge



threshold for operation of the floodway is increasingly associated with stages that are very close to the top of the spillway. Further deterioration of the channel could lead to the operational discharge trigger occurring at a stage exceeding the spillways elevation. Moving forward, engineers are addressing the deterioration of the Mississippi channel between the Morganza floodway and the Old River Control Complex and reevaluating the operational plans for activation of the floodway.