

**SECTION 905(B) (WRDA 86) ANALYSIS
MISSISSIPPI RIVER IN ALEXANDER COUNTY, ILLINOIS
AND SCOTT COUNTY, MISSOURI**

1. STUDY AUTHORITY

This study is authorized by resolution of the U.S. House of Representatives Committee on Transportation and Infrastructure adopted March 7, 1996, which reads:

“Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army review the report of the Chief of Engineers on the Mississippi River between Coon Rapids Dam, Minnesota, and the mouth of the Ohio River, published as House Document 669, Seventy-sixth Congress, Third Session, the report on the Mississippi Rivers and Tributaries Project, published as House Document 308, Eighty-eighth Congress, Second Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of flood control, navigation and related purposes along the Mississippi River and its Tributaries with particular reference to that area located along or affected by the Mississippi River in Alexander County, Illinois and Scott County, Missouri.”

In addition to the above authority, the study area was included in Section 517 of the Water Resources Development Act (WRDA) 1996 which reads as follows:

“The jurisdiction of the Mississippi River Commission, established by the 1st section of the Act of June 28, 1879 (33 U.S.C. 641; 21 Stat. 37), is extended to include—

- (1) all of the area between the eastern side of the Bayou Lafourche Ridge from Donaldsonville, Louisiana, to the Gulf of Mexico and the west guide levee of the Mississippi River from Donaldsonville, Louisiana, to the Gulf of Mexico;*
- (2) Alexander County, Illinois; and*
- (3) The area in the State of Illinois from the confluence of the Mississippi and Ohio River mile 39.5, including the Len Small Drainage and Levee District, insofar as such area is affected by the flood waters of the Mississippi River”*

and the Mississippi River and Tributaries (MR&T) Project authorized by the 1928 Flood Control Act (H.R. 8479) which reads as follows:

“Provided, That the unexpended and unallotted balance of said sum, or so much thereof as may be necessary, may be allotted by the Secretary of War on the recommendation of the Chief of Engineers in the reimbursement of levee districts or others for expenditures heretofore incurred or made for the construction, repair, or maintenance of any flood-control work on any tributaries or outlets of the Mississippi River that may be threatened, impaired, or destroyed by the flood of 1927 or subsequent flood or that have been impaired, damaged, or destroyed by flood; and also in the construction, repair, or maintenance, and in the reimbursement of levee districts or others for the construction, repair, or maintenance of any flood-control work on any of the tributaries or outlets of the Mississippi River that have been impaired, damaged, or destroyed by caving banks or that may be threatened or impaired by caving banks of such tributaries, whether or not such caving has taken place during a flood stage: Provided further, That if the Chief of Engineers finds that it has been or will be necessary or advisable to change the location of any such flood-control work in order to provide the protection contemplated by this section, such change may be approved and/or authorized.”

The District received \$61,000 in Fiscal Year 1999 and \$39,000 in Fiscal Year 2000 to conduct the reconnaissance studies.

2. STUDY PURPOSE

The purpose of this study is to determine the need for Federal flood control and navigation improvements along the Mississippi River between approximate river miles 21 and 34 above the Ohio River. The study will also investigate opportunities for ecosystem restoration.

3. LOCATION OF PROJECT/CONGRESSIONAL DISTRICT

The study area is along the Mississippi River from approximately Fayville, Illinois, to past the apex of Dogtooth Island Bend (see Figure 1), a distance of approximately 19 miles. The nearest municipalities are Willard and Miller City, Illinois. Cape Girardeau, Missouri is 18 miles to the northwest, and St. Louis, Missouri is 120 miles to the northwest.

The study area is located in the jurisdiction of the following legislators:

US Representative Jerry F. Costello, 12th District, Illinois (D)
US Senator Peter G. Fitzgerald, Illinois (R)
US Senator Richard J. Durbin, Illinois (D)
US Representative Jo Ann Emerson, 8th District, Missouri (R)
US Senator Christopher S. Bond, Missouri (R)
US Senator John Ashcroft, Missouri (R)

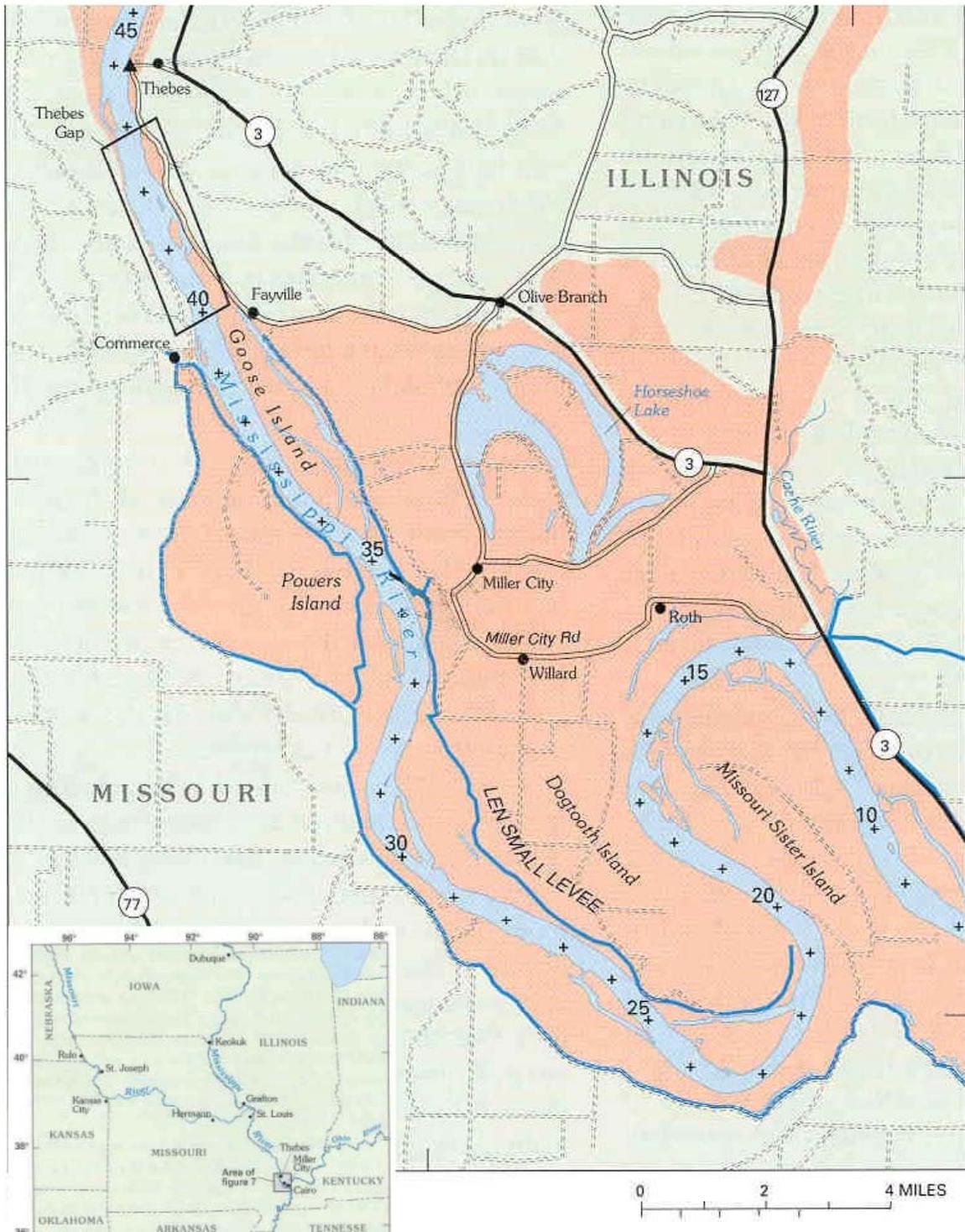


Figure 1. Project Area Map

4. DISCUSSION OF PRIOR STUDIES, REPORTS AND EXISTING WATER PROJECTS

There have been several PL 84-99 eligibility inspections and subsequent reports on an existing levee operated and maintained by the Len Small Levee and Drainage District that lies within the study area on the left descending bank of the Mississippi River. The latest PL 84-99 eligibility inspection report on the Len Small Levee was completed in 1994. In the Memorandum for Record, dated 3 Jan 1994, it was recommended that noted deficiencies be addressed before considering the levee eligible for inclusion into the PL 84-99 program.

“Flood Control, Mississippi River and Tributaries, Hydraulic Engineering Analysis of the Upper St. Francis Levee, Commerce to Birds-Point Reach, June 1996, U.S. Army Corps of Engineers, Memphis District” (96 Report) was completed as a result of higher than expected flood stages on the Mississippi River during the flood of 1995. During investigations, it was determined that the river stages in this area are influenced by the presence of non-Federal levees along both sides of the river, the I-57 roadway embankment, and backwater effects from river stages at Cairo, Illinois. A reanalysis of the project flowline indicated that current conditions within the floodplain increased the project design flood (PDF) flowline such that additional increases to the Commerce to Birds-Point Levee were required. The reanalysis included several scenarios to assess the sensitivity of assumptions used for performance of the private levees in the area in development of the revised PDF flowline. The condition that had the greatest affect on the results was the assumption that the Miller City Levee, also known as the Len Small Levee, would either be overtopped with no crevasses or the PDF would be reached with increases to the height of this levee system. In conclusion, the report recommended that a new PDF flowline for this reach of the river be adopted and serve as the basis for the design of levee improvements for the Commerce to Birds-Point Levee system. A new PDF flowline was subsequently approved and work to improve the MR&T Levee system in this reach is in progress at the time of this writing.

5. PLAN FORMULATION

a. Identified Problems:

1) Existing Conditions:

- a) **Flood Damage Prevention:** The study area has been subjected to numerous floods over the last several years with 1993 flood flows in excess of 300,000 cfs traversing the Dogtooth Bend peninsula. Although protected somewhat by the presence of the Len Small levee, headwater flooding has caused crevasses in the levee at least twice within the last seven years. After the flood of 1993, the State of Illinois, with the assistance of FEMA, repaired a crevasse in the levee at an estimated cost of more than \$9 Million. The total cost of repairs as a result of this flooding event within Alexander County alone was in excess of \$12 Million. Headwater flooding cutting across the peninsula has caused significant losses to the quality of prime agricultural land, increased sedimentation to Horseshoe

Lake, degradation of marketable timber, and has resulted in significant losses of valuable environmental habitat throughout the area. In addition to headwater flooding, backwater flooding commonly occurs during periods of high water elevations on the Ohio River. These backwater flooding events do not cause excessive damage.

- b) Navigation: There have been numerous navigation improvements constructed throughout this reach of the river by the St. Louis District. There has been a continuous channel improvement program in this reach of the river since 1879. This reach includes a very dynamic, ever-changing channel that requires constant attention and engineering response. At present, there are approximately \$40 million worth of channel improvement features in this reach of the river. Should the river change course, traversing Dogtooth Bend, much of this infrastructure and investment would be lost. During the 1993 flood, at a time when the Len Small levee breached, the river attempted to change course which would have resulted in a twenty-mile cutoff. The problems associated with such a cutoff will prove extremely costly to repair and/or replace. Additionally, if this were to occur, navigation through this reach of the river would be extremely difficult to ensure and very costly to maintain in the longterm.

b. Evaluation of Alternatives

The array of alternatives examined in the reconnaissance study included structural and non-structural alternatives along this portion of the Mississippi River floodplain. Alternative combinations of actions, including no action, was examined for economic feasibility of proposed solutions. There was no solution found that offered quantifiable economic benefits to the area immediately behind the Len Small levee sufficient to justify the overall project. However, one alternative appears to offer significant benefits in that it protects the integrity of an existing MR&T levee project, Commerce to Birds-Point, while at the same time, offering incidental benefits to those land owners on the Dog Tooth Bend peninsula in the form of flood damage prevention.

- 1) No Action. This alternative, as discussed somewhat above, provides no benefit while still imposing significant risk to the existing Commerce to Birds-Point levee on the opposing bank, to the existing navigation channel through this reach of the river, and adds nothing in the way of flood damage reduction to the Dogtooth Bend area.
- 2) Strengthen/Raise Existing Len Small Levee. This alternative was reviewed at the request of the Len Small Levee and Drainage District. Although this would provide some benefit to the area behind the Len Small levee, it was determined that such a raise would have an adverse impact on the existing Commerce to Birds-Point levee on the opposing bank. The benefits attributable to such an improvement were insufficient to justify an overall project, thus further study of this alternative was not done.

3) Removal of Existing Len Small Levee and Construction of New Set-Back Levee. This alternative was investigated as a means to provide benefits to the Dogtooth Bend area while posing little to no adverse impact to the existing Commerce to Birds-Point levee. It was determined during the development of this alternative that the new levee would have to be set-back to such an extent that very few benefits would be realized. The benefits that would be expected are insufficient to justify this alternative, thus further study was not done.

4) Construction of Controlled Overflow Traversing Dogtooth Bend (see Figure 2). This alternative was investigated to provide benefits to the Dogtooth Bend area while at the same time enhancing the integrity of the Commerce to Birds-Point levee. This alternative, while not providing benefits sufficient to justify the project solely for the Dogtooth Bend peninsula, appears to provide the greatest benefit in regards to protecting the integrity of the Commerce to Birds-Point levee. Further development of this alternative resulted in what appears to be a feasible project, as follows:

Project Description: The existing Len Small Levee will be utilized to provide protection and reduce repeated damages from river flow crossing over the Dog Tooth Bend peninsula from approximately mile 35 to Mile 15. The reach from Mile 31 to 35 will be designed to allow "skimming" of flow over and above the 20 year flowline. The amount of controlled flow put into storage on the landside of the levee will be increased at the 100 year and SPF flowlines to preserve those respective flow lines.

Preserving the 100 year and SPF flowlines with appropriate crossover flow is required in order to maintain the integrity of the existing Commerce to Birds-Point levee and to minimize any increase in flow across the peninsula to prevent River cutoff/rerouting. Design will be done in such a way as to maximize areas with flood protection up to the maximum extent possible on the Dogtooth Bend peninsula. Non structural means to reduce the scouring potential of flows crossing the peninsula above the 20 year flow line could also be used and perhaps, even considered for environmental enhancement or mitigation purposes. A gravity outlet structure to allow for draining of the area landside of the existing protection along Miles 31-35 when River stages are low will also be required.

Project Features: The existing earthen levee alignment will be utilized and improved to prevent the formation of crevasses or breaches and to ensure that flood flows are directed over a reinforced earthen section. This reinforced earthen section will serve as an overflow weir allowing flood flows to enter the floodway in a controlled environment. Ponding water landside of the levee will allow overtopping with minimal damage. A flap gated gravity drain will be located in the overflow weir at the lowest elevation to promote landside drainage during low river stages. An existing road that is perpendicular to the cross peninsula flow will be reinforced to further control flows and prevent scouring during cross peninsula flows. Energy dissipation features (i.e. trees, ground cover) will be utilized to minimize local ground cover scouring across the peninsula. The area along River Mile 15 when cross peninsula flow reenters the River will be maintained at its current elevation.



Figure 2. Controlled Overflow Across Dog Tooth Bend Peninsula

- *Blue line denotes overflow weir, varying from approximately 20 year to 100 year elevation.*
- *Floodway lies between two yellow lines.*
- *Red and green lines denote existing Len Small Levee. Red portion may need to be strengthened.*

6. FEDERAL INTEREST

It was determined during the reconnaissance studies that the Dogtooth Bend area should be considered as an inseparable element to the existing Commerce to Birds-Point levee system, as detailed in the Memphis District report, "Flood Control, Mississippi River and Tributaries, Hydraulic Engineering Analysis of the Upper St. Francis Levee, Commerce to Birds-Point Reach, June 1996, U.S. Army Corps of Engineers, Memphis District" (96 Report). The PDF flowline, used to develop plans and specifications for the existing MR&T Commerce to Birds-Point levee, is directly effected by the presence of the Len Small levee. Should the Len Small levee not crevasse, as assumed in the report, the integrity of the Commerce to Birds-Point levee will be threatened by a rise in the flowline.

a. Economic Indicators

The reanalysis in the 96 Report included several scenarios to assess the sensitivity of assumptions used for performance of the Len Small Levee in the development of the PDF flowline. The condition that affected the results the greatest was the assumption that the Len Small Levee would be overtopped with no crevasses. As locally financed improvements are made to the Len Small Levee system to the point that it will no longer crevasse, the PDF flowline through this reach of the river will increase significantly, thus having an adverse impact on the Commerce to Birds-Point levee. As these improvements are made, it will become necessary to revisit the height of the Commerce to Birds-Point Levee.

Economic benefits would be derived from the avoidance of future expenditures on the Commerce to Birds Point Levee and the Mississippi River and Tributaries project (MR&T) system. These expenditures are estimated to be in excess of \$10 million to raise the Commerce to Birds-Point Levee to a height adequate to provide the intended flood protection. Additionally, there is nothing to ensure that a similar situation would not occur again since Commerce to Birds-Point is directly dependent upon the Len Small Levee. Both the Len Small and Commerce to Birds-Point Levees are within the jurisdictional area of the MR&T project. The Mississippi River Levees project, part of the MR&T, is one of the Main Stem components that comprise the plan of improvement for the control of floods on the Mississippi River. The contribution of both the existing MR&T levee system, Commerce to Birds-Point levee, and the Len Small Levee to the overall plan is inseparably related. Therefore, their benefits are inseparable and the use of a composite benefit-cost ratio for the Main Stem components is appropriate.

b. Environmental Impacts. No significant adverse impacts are expected as a result of implementing any of the suggested alternatives. However, significant environmental benefits may be achieved through the implementation of the suggested alternative as it would provide the greatest opportunities for environmental enhancement. Additionally, this alternative appears to offer the greatest benefit in the way of preventing further degradation of the existing environmental ecosystem in that erosion and sedimentation will greatly reduced. The greatest of these environmental benefits are expected in and around the vicinity of Horseshoe Lake.

7. PRELIMINARY FINANCIAL ANALYSIS

For typical navigation and flood control studies, the feasibility phase is cost-shared equally between a non-Federal sponsor and the Federal Government. Based on the findings of this reconnaissance study, Federal interest in feasibility studies does not appear to be warranted based on providing benefits to the Dogtooth Bend area. However, there is significant Federal interest in ensuring the integrity of the existing Commerce to Birds-Point levee system, of which the Dogtooth Bend peninsula was found to be an inseparable element. This being the case, no letter of intent from a local sponsor to cost share is required. Further evaluation, design, and construction activities which may result from this study would be conducted under the Mississippi River and Tributaries Project under the authority of the 1928 Flood Control Act.

8. RECOMMENDATION

On the basis of the findings above, I recommend that the Reconnaissance Study be terminated in accordance with current policy and that regular feasibility studies not be initiated at the present time. In the event that significant changes take place within the study area, which increase the benefits to be achieved through the construction of improvements for flood control and/or navigation, additional studies will be required at that time. In lieu of feasibility studies, it is recommended that the District be directed by the President, Mississippi River Commission, to initiate a decision document to further investigate improvements necessary to ensure the integrity of the exiting Commerce to Birds-Point levee system. The subsequent report will be considered as a Decision Document for justifying improvements necessary for that purpose. The estimated time and cost of such a document is estimated to be two years and \$800,000. Similar to a feasibility study, various alternatives will be investigated during the development of a decision document to determine the most economically and environmentally justified alternative. A Project Management Plan (PMP) for further studies is currently being developed and will be provided under separate cover.

9. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE

None, since feasibility studies are not being recommended.

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Commanding