HWY 79

Highway 79 and Mississippi River Crossing Study

prepared for

Arkansas State Highway and Transportation Department

in cooperation with:

Federal Highway Administration
Mississippi Department of Transportation
Tennessee Department of Transportation

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This report documents the findings of the *Highway 79 and Mississippi River Crossing Study*, which was conducted for the Arkansas State Highway and Transportation Department (AHTD). This study was authorized as part of the Transportation Equity Act for the 21st Century (TEA21) enacted in 1998.

STUDY PURPOSE AND SCOPE

The purpose of this *Highway 79 and Mississippi River Crossing Study* is to determine the feasibility of constructing an Interstate-type facility in the vicinity of Highway 79 (on either new or existing location) between Pine Bluff, Arkansas and Highway 61 near Memphis, TN. The purpose of this proposed project is to improve traffic operations, address safety concerns, and to promote economic development within the corridor. In addition, this study includes evaluating the impacts and feasibility of a new Mississippi River crossing. Should the initial study phase find that an Interstate-type facility throughout the entire Highway 79 corridor is not feasible, the remainder of the study will evaluate the feasibility (including benefits and impacts) of various Mississippi River crossing alternatives between Highway 79 and Highway 61 in either Mississippi or Tennessee. The findings and results of this study can be utilized for later studies to determine a specific location of a future Mississippi River crossing in the project area.

The study identified an initial range of transportation and river bridge options and performed a "fatal flaw" and generalized screening evaluation to select the candidate alternatives to be studied in more detail. Evaluation criteria and measures of effectiveness (MOE) were developed related to transportation/mobility impacts, engineering/cost issues, environmental/land use impacts, economic development benefits, and public concerns/input. An evaluation matrix was developed for this evaluation to facilitate comparisons of alternatives. This evaluation provides general technical information regarding the potential impacts and feasibility of this project, which can be used by AHTD and other area agencies in subsequent project development phases.

Documentation for this study included four interim technical memoranda and other reports as follows:

- Technical Memorandum No. 1 "*Project Overview*" – documents study area, purpose and need, study coordination and development, and data collection efforts.
- Technical Memorandum No. 2 "*Evaluation of Existing Corridor*" – documents existing conditions within the corridor (environmental, engineering, and socioeconomic), previous studies within the project area, existing and projected travel demand, major traffic generators and intermodal facilities, existing land use conditions, roadway and bridge inventories, crash history and rates, and environmental constraints.
- Technical Memorandum No. 3 "*Travel Demand Forecasts*" – documents future travel demands along the Highway 79 corridor and the new Mississippi River crossing.

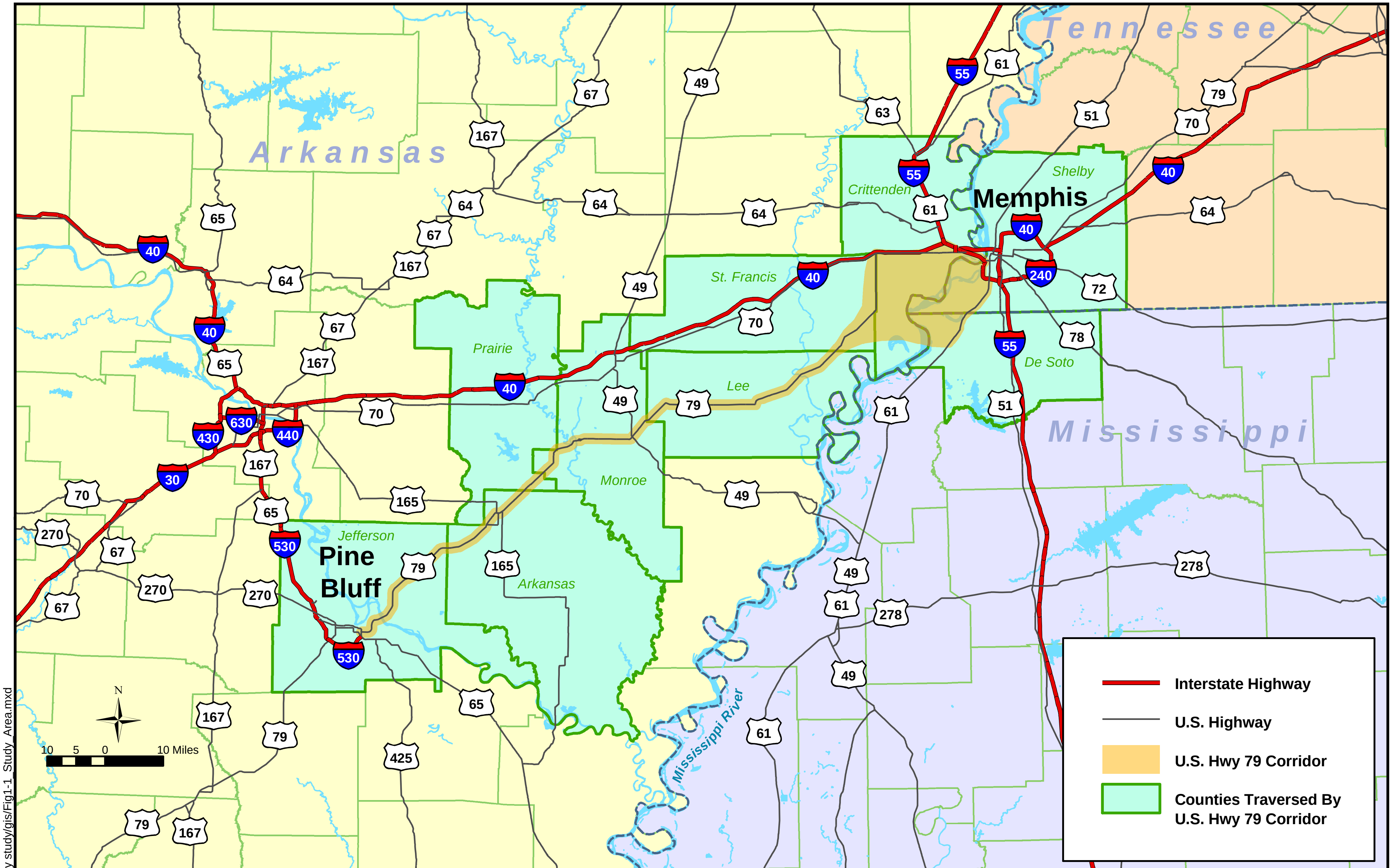
- Technical Memorandum No. 4 "*Feasibility Evaluation*" – documents alternatives considered and the impacts associated with each.
- Public Meeting Summary Reports – summarizes the two series of public meetings conducted for the project.
- "*Feasibility Study Report*" – this overall report documents the study analyses and findings. It incorporates the information contained in the interim technical memoranda.
- Executive Summary – provides a study overview and highlights the important study findings.

STUDY AREA

The existing limits of Highway 79 in the study area are from Pine Bluff, Arkansas to Highway 70 in Crittenden County, approximately 25 miles west of Memphis. A new Mississippi River crossing would connect Highway 79 with Highway 61 in Mississippi or Tennessee. The project corridor spans seven counties in Arkansas: Jefferson, Prairie, Arkansas, Monroe, Lee, St. Francis, and Crittenden. The proposed eastern terminus is located in southern Shelby County, Tennessee and northern De Soto County, Mississippi. Highway 79 is functionally classified as a rural principal arterial and is designated as a component of the National Highway System (NHS) from Pine Bluff to Highway 49. The study corridor, shown in **Figure 1-1**, is approximately 125 miles in length. Interstate highways within or near the corridor include I-30, I-40, I-240, I-630, I-430, I-440, I-530, and I-55.

Arkansas communities along the project corridor include Wabbaseka, Humphrey, Stuttgart, Ulm, Roe, Clarendon, Monroe, Marianna, Soudan, Brickeys, Hughes, Chatfield, and Shearerville. The study corridor is very rural and the majority of the communities are sparsely populated. The exceptions to this are the City of Pine Bluff with a Year 2000 population of 55,085, City of Stuttgart with a population of 9,745, City of Marianna with a population of 5,181, City of West Memphis with a population of 27,666, and the City of Memphis with a population of 650,100.

The study corridor crosses numerous streams or bayous and four rivers – the Arkansas River just northeast of Pine Bluff, the White River near Clarendon, the St. Francis River near Marianna and the Mississippi River at Memphis. The primary land uses throughout the corridor are agricultural including the production of rice, corn, and cotton. In the southern portion of the corridor, logging is a predominant industry. The largest traffic generator and employer in the corridor (excluding the cities of Pine Bluff, West Memphis, and Memphis) is Riceland Foods located in Stuttgart. There are also two paper mills in the vicinity of Pine Bluff - International Paper Company Pine Bluff Mill located northeast of the Pine Bluff and Gaylord Container Corporation east of Pine Bluff. Refer to **Appendix A** for study area photographs.



HWY 79

Figure 1-1
Study Area
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

STUDY COORDINATION AND DEVELOPMENT

Several meetings were conducted with representatives of the following agencies at major project milestones: the Arkansas State Highway and Transportation Department, the Federal Highway Administration, the Mississippi Department of Transportation, the Tennessee Department of Transportation, the West Memphis Metropolitan Planning Organization (MPO), the Memphis MPO, the Pine Bluff MPO, and De Soto County, Mississippi. The purpose of these meetings was to guide the technical development of the study and to provide opportunities for these agencies to discuss issues and transportation improvement needs along the Highway 79 corridor.

PUBLIC INVOLVEMENT

Additional input was received from other stakeholders and citizens through the study's public outreach program. Two series of public meetings were conducted for this study. Both series of public meetings were held in the vicinity of Memphis, Tennessee and were an "open house" format. There were numerous display boards available at the meetings that presented the study purpose and area, issues, schedule, concepts, and findings.

The first series of meetings were held Monday, October 14, 2002 in West Memphis, Arkansas and Tuesday, October 15, 2002 in Hernando, Mississippi. The purpose of these meetings was to introduce the study and present the study issues. A total of 31 citizens attended the first series of public meetings. These included representatives from the media, elected officials, and county, state, and federal representatives.

The second series of public meetings were held on Wednesday, April 23 and Thursday, April 24, 2003, at the same locations that the first series of meetings were conducted. The purpose of these meetings was to present the Mississippi River crossing concepts and their related impacts, benefits, and feasibility. A total of 44 citizens attended the second series of public meetings. These also included representatives from the media, elected officials, and county and state representatives.

More information regarding the public meetings can be found in the Public Meeting Summary Reports dated November 5, 2002 and June 13, 2003. **Appendix B** contains the Memphis Urban Area MPO's comments for this study.

DATA COLLECTION

This study utilized available information and data obtained from the Departments of Transportation and other governmental agencies at the federal, state, and local levels, as well as information from the private sector. Information concerning existing conditions and planned improvements was supplemented with field investigations and meetings/discussions with the various agencies.

Primary sources of highway and transportation related data include the participating Departments of Transportation (Arkansas, Tennessee, and Mississippi), Metropolitan

Planning Organizations, and cities and communities along the study corridor. Other sources of data and information include the U.S. Census Bureau, and environmental agencies such as the U.S. Corp of Engineers, U.S. Fish and Wildlife Services, and the National Register of Historic Places.

SUMMARY OF CONDITIONS AND NEED

This section summarizes conditions and issues associated with the Highway 79 corridor.

System Linkage

Direct access between the Highway 79 study corridor and the Interstate system is provided by Highway 79 connections to I-40 in the vicinity of West Memphis and to I-530 at Pine Bluff. Highway 79 generally parallels I-40 between Stuttgart and West Memphis and additional access between the corridor and the Interstate system is provided by several north-south connectors between Highway 79 and I-40. The most significant of these routes is Highway 49, connecting to I-40 at Brinkley, Arkansas. Highway 49 also provides access to an existing Mississippi River crossing at Helena, Arkansas, southeast of the corridor and will provide access to the proposed I-69 corridor.

A new Mississippi River crossing in the study corridor would provide additional access to the Memphis metropolitan area. The proposed crossing would extend from Highway 79 and connect with Highway 61 in either Mississippi or Tennessee.

Traffic Conditions

Year 2001 traffic volumes range from 820 vehicles per day (vpd) on Highway 79 just east of Highway 49 to 5,400 vpd near Stuttgart. Traffic volumes along Highway 79 have generally grown by approximately one to three percent per year over the past five-year period. Year 2001 daily traffic volumes indicate an acceptable level-of-service (LOS C or better) conditions on Highway 79 within the study corridor. By Year 2023, Highway 79 within the study area is projected to carry 1,400 vpd to 4,500 vpd and operate at LOS C or better throughout the corridor.

Traffic analysis was conducted on the existing I-40 and I-55 Mississippi River crossings at the Arkansas/Tennessee state lines. Year 2001 traffic volumes on I-40 were 37,900 vpd, which is representative of LOS C/D operations. Year 2001 traffic volumes on I-55 were 38,000 vpd and the LOS is in the E/F range. Year 2001 traffic volumes on the common segment of I-40 and I-55 in West Memphis were 64,800 vpd which is representative of LOS E/F. Based upon the percentages of traffic that the individual bridges carried in Year 2001, projected Year 2023 traffic volumes on the I-40 bridge are approximately 46,000 vpd, which results in LOS C/D operations. Projected Year 2023 traffic volumes on the I-55 bridge are approximately 49,000 vpd, resulting in LOS E/F conditions. From these projections, by Year 2023 the Memphis area bridges will be approaching or reaching their capacity.

Cost Effectiveness

The economic benefits derived from a major transportation improvement, such as the improvement of Highway 79 to a four-lane freeway facility, can be separated into direct and indirect benefits. Direct benefits result from the benefits of travel efficiencies, including reduction in expenses to operate vehicles (vehicle operating cost savings), reduction in time spent traveling between destinations (travel time savings), and reduction in the frequency and severity of crashes (crash savings). Indirect benefits result from economic development that potentially increases in industrial employment and production in the region served by the proposed improvement.

Based on the low magnitude of the traffic volumes forecasted for the Highway 79 corridor, economic benefits resulting from the improvement are not projected to be large enough to exceed the costs associated with construction of a freeway facility of this magnitude, which is not considered cost effective.

Consistency with Local Transportation Plans and Programs

A third Mississippi River crossing is currently not reflected in any of the fiscally-constrained portions of the Federally-recognized MPO long-range transportation plans in the study area.

In July 2000, the West Memphis Metropolitan Planning Organization (MPO) completed the 2025 Long Range Transportation Plan for the West Memphis-Marion Area Transportation Study area. Within the fiscally unconstrained section, a new Mississippi River crossing was indicated. The Mississippi River crossing included in this study is consistent with their long range plan as the location of the new bridge crossing is within this study's corridor.

The City of Pine Bluff's 2025 Transportation Plan does not include any projects that would expand capacity along Highway 79 in the study area.

Safety

The Arkansas State Highway and Transportation Department (AHTD) provided a vehicle crash history for the study corridor from Pine Bluff to Memphis. Data were provided for the five-year period from 1997 to 2001 and included information on fatality, incapacitating injury, non-incapacitating injury, possible injury, and property damage only crashes. After an increase in total crashes between 1997 and 1998, total number of crashes has decreased in 1999 and 2000 and remained relatively constant at 107 total vehicle crashes in 2001.

During the last five year period, only a few sections had crash rates greater than the statewide average rate for rural, two-lane, undivided roadways with no control of access, but none of the sections experienced crash rates greater than the statewide average for more than two of the five years. In Year 2000, all of the sections had crash rates lower than the statewide average and in Year 2001 only one section in Monroe County south of Clarendon had a crash rate higher than the statewide average.

Access

Highway 79 which is functionally classified as a rural primary arterial and on the National Highway System (NHS) accommodates traffic along the corridor from Pine Bluff, Arkansas to West Memphis, Arkansas in the study area. Highway 79 provides access for commuters from rural communities along the facility to employment centers in the larger cities. These cities include Pine Bluff, Stuttgart, Brinkley, Forrest City, West Helena, Helena, West Memphis, and Memphis. Highway 79 also provides access to an intermodal facility located in Ebony (just north of West Memphis) via Highway 218, I-40 and Highway 147, and a new "super terminal" intermodal facility that is planned southwest of Memphis, west of I-55 near the Tennessee/Mississippi state line. Upgrading Highway 79 to an Interstate-type facility and a new Mississippi River crossing would provide improved access in the corridor.

Providing a new Mississippi River crossing in the study corridor would provide another direct connection into Memphis. The I-40 and I-55 bridges into Memphis are approximately two miles apart. The next existing Mississippi River bridge south of this location is on Highway 49 (in Helena/West Helena) which connects to Highway 61. This bridge is approximately 70 miles from the Memphis area. The I-155 bridge is approximately 90 miles north of the I-40 and I-55 bridge and is located between Caruthersville, Missouri and Dyersburg, Tennessee. A new bridge would also provide access to the casinos located along Highway 61 in Mississippi.

Intermodal Connectivity

The proposed upgrading of Highway 79 to an Interstate-type facility in the vicinity of Highway 79, and a new Mississippi River crossing would provide improved access to airports, rail lines, bus lines, waterways, and ports. The closest commercial airports are located in Little Rock, Arkansas and Memphis, Tennessee, while public airports are located throughout the project area in Pine Bluff, Stuttgart, and West Memphis. The improved facility and new river crossing would also provide improved access to both rural and urban communities within the study corridor.

The Union Pacific Railroad (UPRR) and the Burlington Northern and Santa Fe Railroad (BNSF) are Class I railroads (national service) that serve the Highway 79 study corridor on the Arkansas side of the Mississippi River. Five Class I railroads (BNSF, UPRR, Canada National/Illinois Central, CSX, and Norfolk Southern) serve the Memphis side of the river. An important consideration for rail facilities in the study area is the connectivity with the national rail system and local freight terminals that allow for intermodal freight goods movements between rail/truck and rail/waterborne operations. Regional constraints to the rail service involve the lack of Mississippi River crossings. There are presently two active river crossings in the vicinity of Memphis. The next closest crossings are at Vicksburg, Mississippi on the south and Cape Girardeau, Missouri on the north.

The three active commercially navigable waterways in the study area are the Arkansas, Mississippi, and White Rivers. The waterways provide an important import/export link to both domestic market areas linked to the inland river system and global trade markets via the deep-water ports at the Gulf of Mexico. Public use ports within the study area that provide access to these waterways include: Little Rock Port and Port of Pine Bluff on the Arkansas River; and Port of Memphis, Osceola Port, Port of West Memphis, and the Helena Slackwater Harbor. Additional Mississippi River port and harbor facilities located south of the study area are at Rosedale, Yellow Bend, and Greenville. There are no public ports on the White River although there are several private ports on both the White River and the Arkansas River.

Truck/rail freight transfer terminals are located at the UPRR facility at Ebony and the BNSF Harvard Yard facility at Marion. The UPRR terminal provides regional container service and the BNSF terminal provides piggyback trailer service.

Other truck/rail freight transfer terminals being planned are at Wilmar in south Arkansas (near Monticello), and there is the potential for an additional facility in the Memphis, Tennessee area. Users within the study area have highway access to the existing terminals by way of Highway 49, I-40 and I-530. The proposed I-69 and the I-69 Connector between Pine Bluff and Wilmar will provide access to the terminal at Wilmar. Truck access between the study area and any terminal that develops in the vicinity of Memphis will be provided by I-40 and I-55, and rail access will be provided by the existing Memphis rail crossings of the Mississippi River. As mentioned previously, Highway 79 also provides access to an intermodal facility located in Ebony (just north of West Memphis) via Highway 218, I-40, and Highway 147, and a new "super terminal" intermodal facility that is planned southwest of Memphis, west of I-55 near the Tennessee/Mississippi state line.

Highway Conditions

Existing Highway 79 through the study corridor is in reasonably good condition. Existing geometric features, with the exception of shoulder widths, are acceptable for future use as a two-lane facility. Some highway sections have been identified by the AHTD's District Engineers as needing either pavement reconstruction, bridge replacement and/or roadway widening. Roadway widening consists of shoulder improvements or adding auxiliary lanes in selected locations. However, use of this facility as a part of a four-lane route would require extensive reconstruction of the highway section. This reconstruction would include modification of the pavement cross slope and extensive shoulder and roadside modifications.

I-40 and I-55 intersect on the west side of West Memphis, and share a common segment of the interstate facility through West Memphis until the approaches to the Mississippi River. If an incident occurs on this common segment, traffic operations will be diminished severely across both of the bridges.

Mississippi River Highway Bridges

An inventory of existing Mississippi River bridges within the Highway 79 corridor was completed to assess existing bridge design features and their condition ratings. The inventory included all of the Mississippi River crossings in the Memphis area, and bridges located downstream of the study area. The two existing highway bridges include the I-55 bridge and the I-40 bridge. The nearest downstream highway bridge is located at Helena, Arkansas and the nearest up stream bridge is located between Caruthersville, Missouri and Dyersburg, Tennessee.

The I-55 bridge was constructed in 1949 and is also known as the Memphis-Arkansas Memorial bridge. The bridge is owned jointly by Arkansas and Tennessee. The bridge is a steel truss bridge and carries four 12-foot lanes of traffic with a median barrier and has inside and outside shoulders of less than one foot. The bridge has 6-foot sidewalks in both directions. The I-55 bridge is not considered to be structurally deficient or functionally obsolete. It has, however, been given a sufficiency rating of only 48.9. The bridge provides a vertical clearance of 69.5 feet over a horizontal navigation channel of 770 feet.

The I-40 bridge was constructed in 1971 and is located approximately two miles upstream from the I-55 bridge. It is also referred to as the Hernando-Desoto Bridge and is jointly owned by the states of Arkansas and Tennessee. The I-40 bridge carries six lanes of traffic on two 41-foot roadways. This bridge has two 900-foot tied arch spans over the channel with a low steel clearance of 60 feet. It also has narrow inside and outside shoulders. The bridge is not classified as structurally deficient, but is considered to be functionally obsolete. It is considered functionally obsolete due to under-clearances. The I-40 bridge has an acceptable sufficiency rating of 71.0. Also, the risk of earthquakes in this area is very high, and at this time none of the highway or railroad bridges meet seismic requirements. The I-40 bridge is currently being retrofitted to meet these requirements.

The closest existing bridge south of the Highway 79 corridor is at Helena, Arkansas. Located approximately 70 miles south of Memphis on Highway 49, it is currently the only bridge on the Mississippi River between Memphis, Tennessee and Greenville, Mississippi. It has a low steel clearance of 60 feet and a navigation channel clearance of 800 feet. It has a sufficiency rating of 58 and is not functionally obsolete or structurally deficient.

The nearest bridge north of Memphis is the I-155 bridge between Caruthersville, Missouri and Dyersburg, Tennessee. The navigation span is 900 feet in width with a vertical clearance of 52.4 feet over the historic high water elevation. It has a sufficiency rating of 91 and is not functionally obsolete or structurally deficient.

Security

The tragic event of September 11, 2001 has led to a heightened awareness of the country's security and its vulnerability. The Memphis metropolitan area is a major transportation hub within the United States and an additional Mississippi River crossing would provide another route for emergency evacuation if needed.

Air Quality

The Memphis region is currently considered a maintenance area for the purposes of attainment of the National Ambient Air Quality Standards (NAAQS). The existing Transportation Improvement Program (TIP) and Long Range Transportation Plan (LRTP) have been found to conform to requirements of the 1990 Clean Air Act Amendments and the U.S. EPA 1997 Transportation Conformity Rule. (The West Memphis region conducts separate conformity analyses and is neither a maintenance or non-attainment area.) However, both regions are expected to violate the new NAAQS 8 hour ozone requirements and may also violate maximum levels of small particulates (p.m.2.5). The new NAAQS place more restrictive requirements on these regions and conformity determinations may be more difficult to achieve in the future. Mobile source emissions contribute to the regions' air pollution problems and are exacerbated by traffic congestion. Efforts to reduce congestion in the vicinity of the I-55 and I-40 bridges may have a positive impact on air quality in the region.

Navigation

The U.S. Coast Guard is responsible for the governance of the navigable waters of the United States. In this role, the U.S. Coast Guard identifies bridges as potential obstructions to navigation and has the jurisdictional authority to issue permits for crossing the nation's waterways.

At this time, the U.S. Coast Guard has indicated that no significant navigational impacts are anticipated along the Mississippi River within the study area. In addition, neither the I-55 nor the I-40 Mississippi River bridges are listed as bridges obstructive to navigation under the Truman-Hobbs Act.

Population and Employment

According the U.S. Census Bureau, the population of the seven counties (Arkansas, Crittenden, Jefferson, Lee, Monroe, Prairie and St. Francis) traversed by Highway 79 in Arkansas has decreased slightly between Years 1990 and 2000. The exceptions were Crittenden, Prairie, and St. Francis counties, which experienced a marginal increase in residents. The combined total population of these counties decreased from 219,480 in Year 1990 to 217,595 in Year 2000. In addition, projected population growth for these counties in the Year 2025 is expected to maintain the current trends.

Historic and projected employment growth in the corridor is similar to the population trends and projections according to Woods and Poole data. Between the Years 1990 and 2000, most counties experienced very slight growth in employment. During this period, Monroe and Prairie counties had a slight decrease in the number of jobs. Employment projections for the year 2025 indicate a slight increase in employment for these counties, ranging from less than one percent to nearly two percent.

While much of the Highway 79 corridor has experienced poor growth, the Memphis Metropolitan Statistical Area (MSA) has experienced somewhat better growth in that region. Year 2000 Population was 1,135,614 and is expected to increase to 1,470,785 by Year 2025. This represents an annual growth rate of 1.0 percent. Employment within the Memphis MSA is expected to grow from 732,838 jobs in Year 2000 to approximately 1,021,799 jobs by Year 2025, representing an annual growth rate of 1.3 percent. De Soto County, Mississippi, adjacent to the Memphis area is now one of the fastest growing counties in that state. Year 2000 population was 107,199 and is expected to increase to 207,219 by Year 2025 (representing an annual growth rate of 2.7 percent), and employment is expected to grow from 46,177 jobs in Year 2000 to 86,943 jobs in Year 2025. This represents an annual growth rate of 2.6 percent. Access to this expanding economy is an important issue in the eastern portion of the Highway 79 corridor.

Economic Opportunity

The construction of an Interstate-type facility can potentially attract large businesses to a corridor and generally stimulate economic activity. Much of the Highway 79 corridor is depressed economically and in genuine need of an economic boost. However, with limited historic and projected traffic and minor population growth along the Highway 79 corridor, roadway improvements alone, in all likelihood, will not be sufficient to improve economic opportunity without extensive planning and concerted economic development activity occurring simultaneously.

The exception to this is potential commercial and residential growth near Memphis that may benefit from an added river crossing. An additional crossing from Highway 61 to Highway 79 would offer a viable alternative to travelers and commuters that commonly utilize I-40. It also would offer a more direct route to the casino industry along the eastern side of the Mississippi River in Mississippi. The combination of commuter traffic and recreational traffic created by the new bridge could enhance the economic conditions south of West Memphis and, if designed appropriately, could also provide an increase in property value and investment potential. Another area of potential growth is along the facilities that connect to I-40 and to Highway 79. These include Highways 50, 38, 75, 149, and 357.

Currently there is a program to assist the lower Mississippi Delta (which is one of the poorest areas in the United States) which contains all of the non-metro counties within the Highway 79 study corridor. As a measure to try to help alleviate these poverty conditions, in 1996 the U.S. Department of Agriculture and the Housing Assistance Council developed an initiative to develop a comprehensive community development strategy for the Delta region. As a result of this initiative, in August 1998, over 30 organizations and institutions signed a "Delta Compact" pledging $40 million in resources and technical assistance for housing and community development within this area.

CONCLUSION

Upgrading Highway 79 in the study area to an Interstate-type facility would provide improved access to communities and cities, employers, intermodal facilities, and other various attraction generators. This improvement would also eliminate the existing engineering deficiencies along the roadway that are briefly mentioned in this report. However, after examining existing and projected travel demand and demographics in the study area, there does not appear to be a need to upgrade Highway 79 to an Interstate-type facility. The greatest needs appear to be related to constraints in the Memphis area, where inadequate bridge and Interstate capacity has created a serious congestion problem. This lack of capacity also negatively impacts accessibility, the economy and potentially air quality. The existing I-40 bridge is experiencing a LOS C/D and I-55 is experiencing an unsatisfactory LOS E/F, and traffic is projected to worsen on these facilities. I-55 currently has a very low sufficiency rating and I-40 is considered functionally obsolete. Freight traffic has experienced phenomenal growth in this region and this trend is expected to continue in the foreseeable future. Infrastructure improvements to support this growth are needed, particularly in terms of river crossings. Finally, the issue of transportation security and emergency evacuation must be considered when regional access is so dependent on two aging structures in an area of potential seismic activity with no viable alternate routes in the vicinity. Based on these existing and future conditions, it has been determined that there is a need for an additional crossing over the Mississippi River in the Memphis area.

This chapter discusses existing transportation and highway conditions along the Highway 79 study corridor. Elements discussed include the physical characteristics along Highway 79 and Mississippi River bridges in the area, existing and projected travel demand, crash history, programmed improvements, transit facilities, major traffic generators, intermodal facilities, navigation impacts, and major utilities and railroads.

HIGHWAY 79 CONDITIONS

The following section describes the condition of Highway 79 and the bridge structures along this facility.

Roadway

The Highway 79 study corridor is shown in **Figure 2-1**, which indicates the existing route with section numbers used by the Arkansas State Highway and Transportation Department (AHTD). This allows for access to information including records of highway conditions through the AHTD District Offices. **Table 2-1** lists existing highway conditions along Highway 79 study corridor.

As indicated in Table 2-1, Highway 79 through the study corridor is in reasonably good condition. Existing geometric features, with the exception of shoulder widths, are acceptable for future use as a two-lane facility (existing lanes are 12 feet wide). Sections 10, 11, 13 and 14 (which are located in Jefferson, Arkansas, and Monroe Counties - refer to Table 2-1 for locations) have been identified by the District as needing either pavement reconstruction, bridge replacement or shoulder widening. Use of this facility as a part of a four-lane route would require extensive reconstruction of the highway section. This reconstruction would include modification of the pavement cross slope and extensive shoulder and roadside modifications.

Bridge Structures

A bridge is considered deficient if it is either structurally deficient or functionally obsolete. A bridge is structurally deficient if it is in relatively poor condition, or has insufficient load-carrying capacity. If a bridge is structurally deficient it can be restricted to light vehicles, require immediate rehabilitation to remain open, or be closed. Bridges are functionally obsolete if they have deck geometry, load-carrying capacity, clearance or an approach roadway alignment that no longer meet the criteria for the system to which the bridge is a part, potentially due to a change in desired standards. Any bridge classified as structurally deficient is excluded from the functionally obsolete category.

In addition to identifying whether each bridge was deficient in the category of structural deficiency or functional obsolescence, a sufficiency rating was also assessed for each bridge in the study area. The sufficiency rating formula is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of a bridge sufficiency to remain in service. It is based on structural adequacy

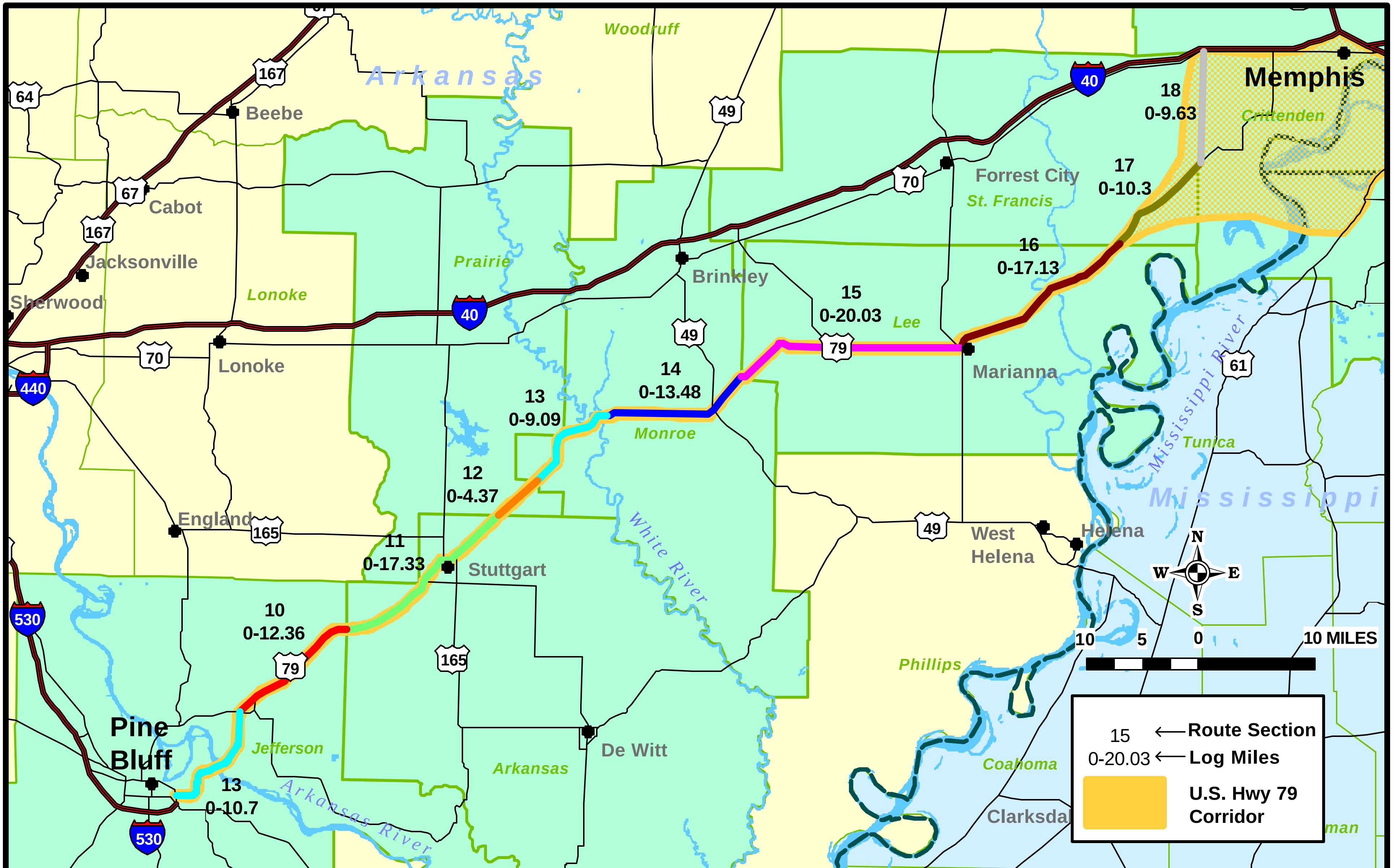


Figure 2-1
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Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Table 2-1
Existing Highway 79 Conditions
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Description	County	Route Section Number	Begin Station	End Station	Length (miles)	Speed Limit (mph)	Stop Control	Number of Lanes	Existing Shoulder Condition	Recom'd Shoulder Width	Pavement Condition	Number of Bridges
Highway 63 – Hwy 65B to Arkansas River	Jefferson	13	10.70	8.44	2.26	55	Signalized at Highway 65B	2	8' Paved	8'	Good	6
Highway 63 Arkansas River-Hwy 79	Jefferson	13	8.44	0.00	8.44	55	2-way stop at Hwy 79	2	8' Paved	8'	Good	3
Highway 79 Highway 63-Wabbaseka	Jefferson	10	0.00	5.20	5.20	30 Wabbaseka 55 elsewhere	4-Way Stop at Altheimer	2	6' Paved	8'	Good	2
Highway 79 - Wabbaseka to Jefferson/Arkansas C.L. (1)	Jefferson	10	5.20	12.36	7.16	30 Wabbaseka 55 elsewhere		2	N/A	8'	Fair	5
Highway 79 - Jefferson/ Arkansas C.L.- Hwy 63 (2)	Arkansas	11	0.00	11.28	11.28	45 Humphries		2	Paved	8'	Fair	4
Highway 79 - Hwy63- Arkansas/Prairie C.L (3)	Arkansas	11	11.28	17.33	6.05	35 Stuttgart, 55 elsewhere	Signalized Intersection	4 in Stuttgart, 2 elsewhere	3'	8'	Good	1
Highway 79 - Arkansas/ Prairie C.L.-Prairie/Monroe CL.	Prairie	12	0.00	4.37	4.37	35 Ulm, 55 elsewhere		2	N/A	8'	Good	1
Highway 79 Prairie/Monroe C.L.-Hwy 302 (4)	Monroe	13	0.00	9.09	9.09	40 Roe, 45 Clarendon 55 elsewhere		2	N/A	8'	Good	5
Highway 79 - Hwy 302-Hwy 86	Monroe	14	0.00	1.75	1.75	55		2	N/A	8'	Good	1
Highway 79 - Hwy 86 - Hwy 17	Monroe	14	1.75	6.76	5.01	55		2	N/A	8'	Poor	1
Highway 79 - Highway 17 to Monroe/Lee County Line (5)	Monroe	14	6.76	13.48	6.72	40 at Hwy 49 55 elsewhere		2	N/A	6'	Good	3
Highway 79 - Monroe/Lee C.L. to Hwy 121	Lee	15	0.00	20.03	20.03	55		2	6'	6'	Good	5

Table 2-1 (continued)
Existing Highway 79 Conditions
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Description	County	Route Section Number	Begin Station	End Station	Length (miles)	Speed Limit (mph)	Stop Control	Number of Lanes	Existing Shoulder Condition	Recom'd Shoulder Width	Pavement Condition	No. of Bridges
Highway 79 - Highway 121-Marianna	Lee	16	0.00	0.96	0.96	45 Marianna		2	3' in Marianna	8'	Fair	12
Highway 79 - Marianna-Soudan	Lee	16	0.96	9.39	8.43	55		2 Lanes	(6)	8'	Fair	12
Highway 79 - Soudan-Lee/St. Francis C.L.	Lee	16	9.39	17.13	7.74	55		2	None	8'	Fair	12
Highway 79 - Lee/St. Francis C.L.-Hughes	St. Francis	17	0.00	4.11	4.11	45 Hughes 55 elsewhere		2	N/A	6'	Fair	2
Highway 79 - Hughes-St. Francis/Crittenden County Line	St. Francis	17	4.11	10.30	6.19	55		2	N/A	8'	Fair	2
Highway 79 - St. Francis/ Crittenden C.L.-Highway 70	Crittenden	18	0.00	9.63	5.55	55		2	8'	6'	Good	1

and safety, serviceability and geometry, essentiality for public use and other special reductions. Sufficiency values range from 0 to 100 where 0 is entirely deficient.

Highway 79 in the study corridor crosses three significant rivers; the Arkansas, the White, and the St. Francis Rivers. The Arkansas and the White Rivers are both navigable. In addition to the river crossings there are several stream and floodplain relief structures along the route. The existing conditions of these bridge crossings are shown in **Table 2-2**. The bridges on Highway 63, east of Pine Bluff, have not been in service as long as those on Highway 79 and were constructed to meet more current geometric design criteria. The Highway 63 bridges provide for adequate roadway shoulders and would meet current criteria without significant reconstruction. However, with a few exceptions, the Highway 79 bridges do not provide for shoulders and have approaches that do not meet current design standards.

A tentative plan has been developed for crossing the White River. The purpose of this project is to replace three structurally deficient and functionally obsolete bridges as well as to replace the unstable fill approaches to the bridges on Highway 79. The Cache River National Wildlife Refuge extends north from the existing Highway 79 crossing at the White River, and the White River National Wildlife Refuge extends to the south. The planned project crosses the White River south of the existing location, within the White River National Wildlife Refuge. The AHTD and U.S. Fish and Wildlife Service (the agency responsible for the administration of both the Cache River and White River National Wildlife Refuges) are near reaching an agreement concerning the planned location and details for the project. The tentative agreement provides for a two-lane roadway (two 11-foot lanes with seven-foot shoulders) and three bridges with a total combined length of approximately 1.8 miles.

MISSISSIPPI RIVER BRIDGES

The Mississippi River is a predominant feature within the study corridor. Currently, Highway 79 has a route connection via Highway 218 to both the I-40 and I-55 Mississippi River bridges in West Memphis, Arkansas. Highway and railroad bridge connections across the river play an important role in maintaining the social and economic vitality of the Arkansas, Tennessee, and Mississippi regions.

An inventory of existing Mississippi River bridges within the Highway 79 corridor was completed to assess existing bridge design features. The inventory included all of the Mississippi River crossings in the Memphis area and the Helena Bridge located downstream of the study area. The four existing bridges located upstream of the proposed Mississippi River crossing include the I-55 bridge, the Frisco Bridge, the Harahan Bridge and the I-40 bridge. The nearest downstream bridge is located at Helena, Arkansas on Highway 49. **Figure 2-2** shows the locations of the bridges in the Memphis area.

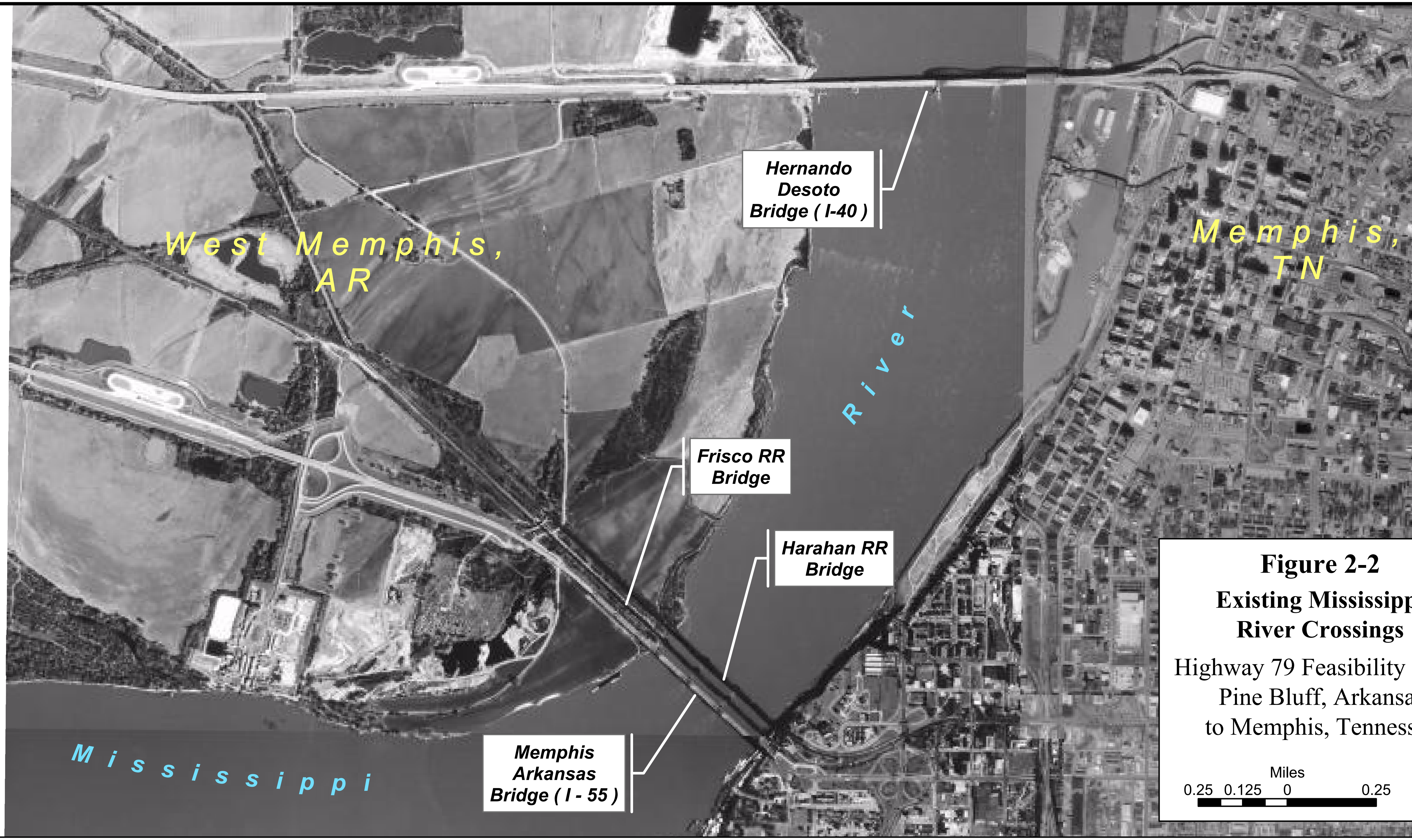

Figure 2-2
Existing Mississippi River Crossings
Highway 79 Feasibility Study
Pine Bluff, Arkansas
to Memphis, Tennessee

HWY 79

Table 2-2
Highway 79 Crossing Conditions
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Route	Section	Log Mile	Feature Intersected	Structure Length	Width C/C(1)	Quality Code(2)	Sufficiency Rating
Jefferson	63	13	0.64	St. Louis SW RR	242	40.0	NQ	98.9
Jefferson	63	13	1.99	Sally Bayou	27	0.0	NQ	63.9
Jefferson	63	13	3.44	Plum Bayou	414	40.0	NQ	94.4
Jefferson	63	13	4.18	Arkansas River	9578	40.0	Owned by COE	91.5
Jefferson	63	13	8.29	St. Louis SW RR	788	40.0	NQ	92.3
Jefferson	63	13	9.18	Ditch	47	0.0	NQ	63.9
Jefferson	63	13	9.70	(data not available)		0.0		
Jefferson	63	13	10.10	Ditch	36	0.0	NQ	63.9
Jefferson	63	13	10.58	Jim's Ditch	21	0.0	NQ	63.9
Jefferson	79	10	4.28	Bradley Slough	75	28.0	NQ	79.9
Jefferson	79	10	5.20	Bayou Wabbaseka	175	25.8	FO	54.7
Jefferson	79	10	8.73	Holmes Ditch	105	40.0	NQ	80.9
Jefferson	79	10	10.53	Salt Bayou Relief Ditch	140	40.0	NQ	86.1
Jefferson	79	10	11.09	Bear Bayou	175	40.0	NQ	86.1
Arkansas	79	11	2.21	Crooked Creek	481	24.0	FO	44.5
Arkansas	79	11	4.71	Divena Branch	81	24.0	FO	44.5
Arkansas	79	11	5.73	Bayou Metro	441	24.0	FO	48.6
Arkansas	79	11	13.36	Little Lagru Bayou	92	26.0	FO	67.9
Prairie	79	12	1.18	Ditch	33	44.0	NQ	72.0
Monroe	79	13	0.23	Bayou Lagru	242	26.0	FO	54.6
Monroe	79	13	4.19	Leadmine Creek	22	0.0	NQ	56.7
Monroe	79	13	5.36	Bayou Roc Roe	1430	24.5	FO	44.5
Monroe	79	13	7.20	West Old White River	3742	24.5	FO	44.5
Monroe	79	13	8.28	4 City Sts, White River	4283	24.0	FO	15.3
Monroe	79	14	0.27	MoPac RR	291	39.0	NQ	98.8
Monroe	79	14	5.05	Ditch	49	37.8	NQ	76.5
Monroe	79	14	7.80	Ditch	25	0.0	NQ	57.2
Monroe	79	14	9.40	Cypress Creek	212	26.0	SD	49.6
Monroe	79	14	11.66	Creek	33	0.0	NQ	60.4
Lee	79	15	1.87	Big Piney Creek	152	26.0	SD	51.2
Lee	79	15	2.89	Little Piney Creek	93	26.0	NQ	67.4
Lee	79	15	4.29	Walnut Lake/Big Creek	302	26.0	SD	14.4
Lee	79	15	6.77	Little Hog Tusk Creek	92	26.0	NQ	76.3
Lee	79	15	7.21	Big Hog Tusk Creek	92	26.0	NQ	57.6
Lee	79	15	13.34	Cat Creek	62	26.0	FO	75.9
Lee	79	15	16.64	Big Cypress Creek	92	26.0	SD	45.0
Lee	79	16	1.75	CR 115, Languille River	571	28.0	NQ	65.2
Lee	79	16	3.36	St. Francis Div. Channel	964	26.0	FO	63.5
Lee	79	16	8.96	Cow Bayou Relief	154	26.0	FO	52.3

Table 2-2 (continued)
Highway 79 Crossing Conditions
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Route	Section	Log Mile	Feature Intersected	Structure Length	Width C/C(1)	Quality Code(2)	Sufficiency Rating
Lee	79	16	9.32	Cow Bayou	422	40.0	NQ	92.4
Lee	79	16	9.43	St. Francis River	912	40.0	NQ	86.7
Lee	79	16	10.11	Ditch	24	0.0	NQ	56.8
Lee	79	16	10.26	Ditch	24	83.0	NQ	72.7
Lee	79	16	11.52	Alligator Bayou	482	40.0	NQ	97.4
Lee	79	16	17.00	Frenchman's Bayou	280	40.0	NQ	97.4
St. Francis	79	17	5.53	Caruthers Bayou	32	0.0	NQ	71.6
St. Francis	79	17	7.50	Fifteen Mile Creek	218	26.0	FO	62.4
Crittenden	79	18	2.80	Cutoff Bayou	182	39.2	NQ	99.0

Source: Arkansas State Highway and Transportation Department – Bridge Division
(1) = C/C is curb to curb; 0.0 indicates a box culvert
(2) = Quality Code; FO=functionally obsolete, SD=structurally deficient, NQ=not qualified for either category (bridge is satisfactory)

Mississippi River Highway Bridges

The I-55 bridge was constructed in 1949. The bridge is also known as the Memphis-Arkansas Memorial Bridge and was added to the National Register of Historic Places in 2001. It is significant in the category of engineering and is jointly owned by the states of Arkansas and Tennessee. The bridge is a steel truss bridge and carries four 12-foot lanes of traffic with a median barrier and has inside and outside shoulders of less than one foot. The bridge has six-foot sidewalks in both directions. The I-55 bridge is not considered to be structurally deficient or functionally obsolete. It has, however, been given a sufficiency rating of only 48.9. The bridge provides a vertical clearance of 69.5 feet over a horizontal navigation channel of 770 feet.

The I-40 bridge is located approximately two miles upstream from the I-55 bridge. It is also referred to as the Hernando De Soto Bridge and is jointly owned by the states of Arkansas and Tennessee. It was built in 1965. The I-40 bridge carries six lanes of traffic on two 41-foot roadways. This bridge has two 900-foot tied arch spans over the channel with a low steel clearance of 60 feet above the high water elevation. It also has narrow inside and outside shoulders. The bridge is not classified as structurally deficient, but is considered to be functionally obsolete. It is considered functionally obsolete due to under-clearances for roadway traffic. The I-40 bridge has an acceptable sufficiency rating of 71.0. Also, the risk of earthquakes in this area is very probable, and at this time none of the highway or railroad bridges meet seismic requirements. The I-40 bridge is currently being retrofitted to meet these requirements.

The closest existing bridge south of the Highway 79 corridor is at Helena, Arkansas. Located approximately 70 miles south of Memphis on Highway 49, it is currently the only bridge on the Mississippi River between Memphis, Tennessee and Greenville, Mississippi. It has a low steel clearance of 60 feet and a navigation channel clearance of 800 feet. It has a sufficiency rating of 58 and is neither functionally obsolete nor structurally deficient. Another bridge is now under design just north of Greenville at Arkansas City, Arkansas. This bridge is known as the Great River Bridge.

The nearest bridge north of Memphis is the I-155 bridge between Caruthersville, Missouri and Dyersburg, Tennessee. This bridge was designed in 1968 as a steel cantilevered through truss. The navigation span is 900 feet in width with a vertical clearance of 52.4 feet over the historic high water elevation. Although this is the newest of the Memphis area bridges, it was not designed to withstand earthquakes and is located in the center of the New Madrid Seismic Zone. Currently, the Missouri and Tennessee Departments of Transportation are studying the seismic vulnerability and potential retrofit of this bridge.

Mississippi River Railroad Bridges

The Frisco Railroad Bridge is immediately upstream of the I-55 bridge and downstream of the Harahan Railroad Bridge. It is owned by Burlington Northern Santa Fe (BNSF). The Frisco Bridge is considered to be historically significant. It is a single-track, pinned through truss railroad bridge completed in 1893. The Frisco Bridge has the highest low steel clearance of the bridges in the Memphis area. The low steel clearance was specified at 75 feet in order to clear the tallest smoke stacks of the river boats working the Lower Mississippi. The U.S. Coast Guard currently requires a minimum clearance of 55 feet over the navigation channel for this stretch of the river. The longest span of Frisco Bridge provides 770 feet of horizontal clearance in the navigation channel.

Immediately upstream from the Frisco Bridge is the Harahan Bridge. The Harahan Bridge is a double-track, through truss railroad bridge currently owned by the Union Pacific Railroad Co. It was built in 1916 by the Arkansas and Memphis Railway Bridge & Terminal Co. When originally constructed, the bridge also carried two lanes of automobile traffic. However, the automobile lanes, which were located on either side of the two rails, have been removed from the bridge. The Harahan Bridge has a low steel clearance of 65 feet and a 790-foot span over the navigation channel.

EXISTING TRANSPORTATION DEMAND

As shown in **Figure 2-3**, Year 2001 traffic volumes range from 820 vehicles per day (vpd) on Highway 79 just east of Highway 49 to 5,400 vpd near Stuttgart. Traffic volumes average between 3,500 vpd to 3,600 vpd in the southern section (between Pine Bluff and Stuttgart), between 820 vpd to 5,400 vpd in the central section (between Stuttgart and Marianna) and between 1,200 vpd to 2,800 vpd in the northern section (between Marianna and Highway 70). The figure also shows the historical traffic volume growth during the five-year period between Year 1996 and Year 2001. The average annual traffic growth

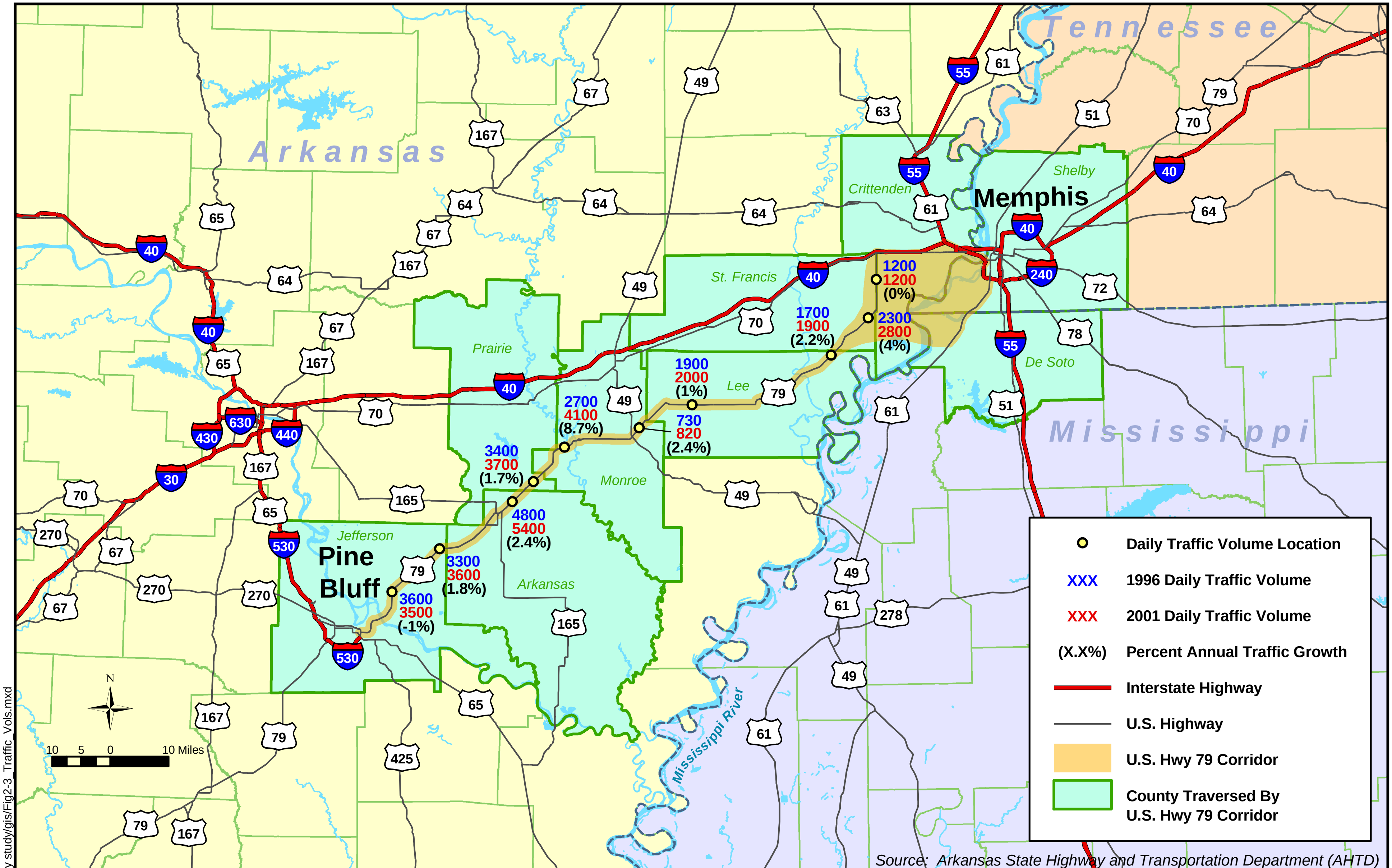

Figure 2-3
1996 and 2001 Daily Traffic Volumes on Highway 79
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

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rate ranged from no growth to two percent in the southern section, two percent in the central section (with an exception of a nine percent growth rate near the community of Roe), and between zero to four percent in the northern section.

Level-of-Service (LOS) is a qualitative measure of traffic operations, ranging from LOS A to LOS F. LOS A/B represents good traffic operations with virtually no congestion. LOS C/D, which is considered the limit of acceptable traffic operations, represents some but reasonable traffic delays. LOS E/F represents conditions where traffic volumes are approaching or exceeding the highway capacities, which result in congestion and unacceptable traffic delays and speeds. A quantitative measure to represent LOS is the ratio of traffic volume to the capacity of the roadway (v/c ratio). **Table 2-3** describes the different levels of service.

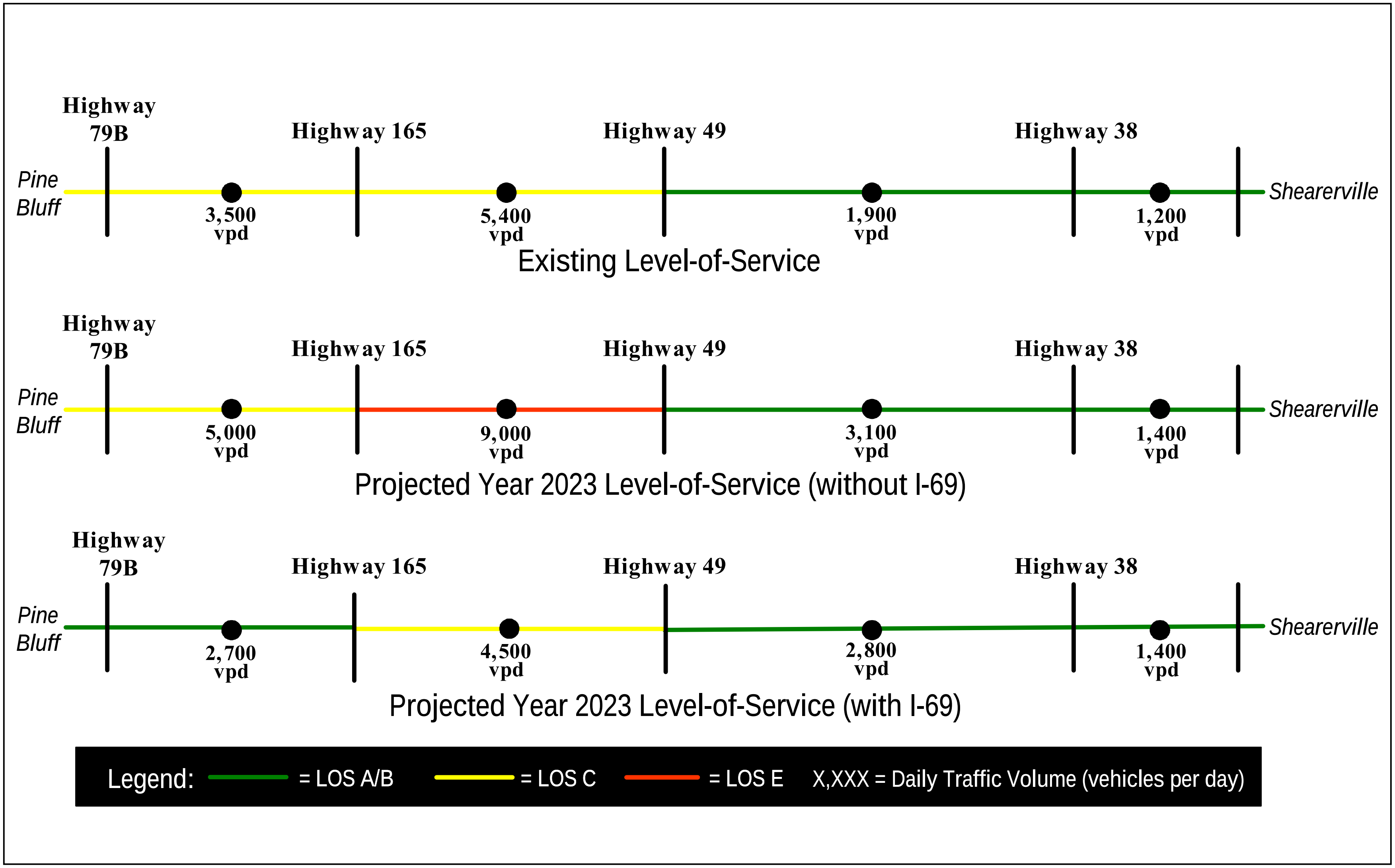
Table 2-3
Level-of-Service Definitions
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

LOS	Description
A	Highest quality of traffic service; free-flow conditions; motorists drive at desired speed; minor traffic flow disruptions.
B	Good quality of traffic service; reasonable flow conditions; noticeable presence of other vehicles; ability to maneuver is slightly restricted.
C	Stable traffic flow; noticeable increase in platoon formation; ability to maneuver noticeably restricted; minor disruptions could cause traffic service deterioration.
D	Approaching unstable traffic flow; speed and ability to maneuver severely restricted; limit of acceptable operations.
E	Unstable traffic flow; travel demand approaching or at roadway capacity.
F	Heavily congested flow; traffic demand exceeds roadway capacity; forced or breakdown traffic flow.

Source: Highway Capacity Manual, Special Report 209, TRB, 2000.

LOS C is considered to be the limit of acceptable operation in most rural areas and LOS D being the limit in urban areas. Year 2001 daily traffic volumes indicate a current LOS C or better on Highway 79 within the study corridor. **Figure 2-4** illustrates the existing and projected LOS along Highway 79.

Traffic analysis was conducted on the existing I-40 and I-55 Mississippi River crossings at the Arkansas/Tennessee state lines. Year 2001 traffic volumes on I-40 were 37,930 vpd, which is representative of LOS C/D operations. Year 2001 traffic volumes on I-55 were



HWY 79

Figure 2-4
Existing and Projected Traffic Volumes/Level-of-Service Along Highway 79
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

38,000 vpd and the LOS is in the E/F range. Year 2001 traffic volumes on the common segment of I-40 and I-55 in West Memphis were 64,760 vpd which is representative of LOS E/F.

PROJECTED TRAVEL DEMAND

Future traffic volume forecasts were developed for Highway 79 using the national travel demand model developed by Wilbur Smith Associates as part of the Interstate 69 (I-69) Feasibility Study (1,650 mile corridor from Mexico to Canada) and consideration of historical traffic growth. The modeling for this study assumed that the I-69 corridor (NAFTA) would be implemented. Future traffic demand along Highway 79 within the study area was calculated for Year 2023. More detailed information regarding the travel demand modeling for this project is summarized in Technical Memorandum No. 3 "*Travel Demand Model/Forecasts*".

Projected LOS on Highway 79 within the study corridor in Year 2023 is shown in Figure 2-4. Year 2023 traffic volumes range from 1,400 vpd near Chatfield to 4,500 vpd near Stuttgart. The highest annual growth is approximately two percent, although some locations showed nominal growth. There was a reduction in volumes in the southern portion of the corridor between Pine Bluff and Highway 165. This is due to the assumption of I-69 being in place south of Highway 79. Highway 79 is anticipated to operate generally at an acceptable LOS C or better in Year 2023. However, without the implementation of I-69, traffic is projected to grow at an annual growth rate of approximately two percent, and will operate at an unacceptable LOS E in the section between Highway 165 and Highway 49 (as shown in Figure 2-4). I-69 reduces the volumes mainly from the southern portion of the study area.

Projected Year 2023 traffic volumes on the common segment of I-40 and I-55 are approximately 86,000 vpd, resulting in a LOS of E/F. As mentioned previously, based upon the percentages of traffic that the individual bridges carried in Year 2001, projected Year 2023 traffic volumes on the I-40 bridge are approximately 46,000 vpd, which results in LOS C/D operations. Projected Year 2023 traffic volumes on the I-55 bridge are approximately 49,000 vpd, resulting in LOS E/F conditions. From these projections, by Year 2023 the Memphis area bridges will be approaching or reaching their capacity.

CRASH HISTORY

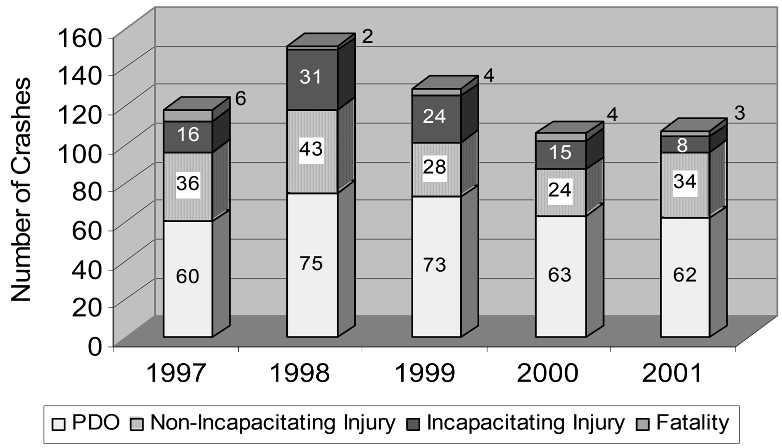
Crash history and rates for the Highway 79 study corridor, I-40 and I-55 bridges, and the common segment of I-40 and I-55 are described in the following sections.

Highway 79 Corridor

Crash history for the study corridor was reviewed for the five-year period from Years 1997 to 2001 and included information on fatality, incapacitating injury, non-incapacitating injury, possible injury, and property damage only crashes. A summary of the data for the entire study corridor is shown in **Figure 2-5**. After an increase in total crashes between

Years 1997 and 1998, the total number of crashes has decreased in Years 1999 and 2000 and remained relatively constant at 107 total crashes in Year 2001.

Figure 2-5
Five Year Crash History for Highway 79 Corridor
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee



Crash Locations - Roadway intersections, median openings, crossovers, and driveways represent the basic vehicle conflict areas for rural highway facilities where many crashes occur. Crash locations during the last five-year period were typically concentrated in the higher traffic volume areas with more vehicle conflicts. Crash locations were further summarized by roadway segment, with the roadway segments used in the analysis corresponding to the AHTD section numbering system for Highway 79 and Highway 63. The summary of the total number of crashes by segment is shown in **Table 2-4**, with total numbers of fatal crashes shown in **Table 2-5**. The segments of Highway 79 in Arkansas County and Lee County had the highest total number of crashes since they are the longest sections.

Crash Rate - The crash rate per roadway section was calculated based upon the number of crashes per million vehicle miles traveled (MVMT), as shown in **Table 2-6**. During the last five-year period, four sections (Highway 63, Sec 13 – Jefferson County I-530 to Highway 79, Highway 79, Sec 11 – Arkansas County, Highway 79, Sec 13 – Monroe County South of Clarendon, and Highway 79, Sec 15 – Lee County west of Marianna) had crash rates greater than the statewide average crash rate for rural, two-lane, undivided roadways with no control of access, but none of the section's crash rates were greater than the statewide average for more than two of the five years. In Year 2000, all of the sections had crash rates lower than the statewide average and in Year 2001 only section 13 (Highway 79 Monroe County south of Clarendon) had a crash rate higher than the statewide average.

Table 2-4
Total Crashes by Section for Highway 79, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Number of Crashes				
				1997	1998	1999	2000	2001
63	13	Jefferson County I-530 to Hwy 79	10.58	15	25	21	13	5
79	10	Jefferson County North of Hwy 63	12.36	12	18	7	13	17
79	11	Arkansas County	17.33	40	47	35	27	22
79	12	Prairie County	4.37	1	2	1	3	1
79	13	Monroe County South of Clarendon	9.09	6	5	5	5	19
79	14	Monroe County East of Clarendon	13.48	9	10	7	8	3
79	15	Lee County West of Marianna	20.03	15	19	26	18	20
79	16	Lee County North of Marianna	17.13	12	18	18	9	16
79	17	St. Francis County	10.3	5	4	6	7	1
79	18	Crittenden County	9.63	3	3	3	3	3
TOTAL			124.3	118	151	129	106	107

Table 2-5
Total Fatal Crashes by Section for Highway 79, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Number of Fatal Crashes				
				1997	1998	1999	2000	2001
63	13	Jefferson County I-530 to Hwy 79	10.58	0	0	2	0	0
79	10	Jefferson County North of Hwy 63	12.36	0	0	0	1	0
79	11	Arkansas County	17.33	1	0	0	0	2
79	12	Prairie County	4.37	0	0	0	0	0
79	13	Monroe County South of Clarendon	9.09	1	0	0	0	0
79	14	Monroe County East of Clarendon	13.48	1	0	0	1	0
79	15	Lee County West of Marianna	20.03	2	1	2	1	1
79	16	Lee County North of Marianna	17.13	1	0	0	0	0
79	17	St. Francis County	10.3	0	1	0	1	0
79	18	Crittenden County	9.63	0	0	0	0	0
TOTAL			124.3	6	2	4	4	3

Table 2-6
Crash Rate by Section for Highway 79, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Crash Rate (crashes/MVM)				
				1997	1998	1999	2000	2001
63	13	Jefferson County I-530 to Hwy 79	10.58	1.29	***2.16***	***1.70***	0.91	0.38
79	10	Jefferson County North of Hwy 63	12.36	0.70	0.97	0.41	0.82	1.02
79	11	Arkansas County	17.33	1.32	***1.52***	1.06	0.85	0.64
79	12	Prairie County	4.37	0.18	0.36	0.18	0.45	0.17
79	13	Monroe County South of Clarendon	9.09	0.58	0.47	0.41	0.44	***1.43***
79	14	Monroe County East of Clarendon	13.48	1.08	1.13	0.65	0.77	0.27
79	15	Lee County West of Marianna	20.03	1.08	***1.37***	***1.78***	1.17	1.14
79	16	Lee County North of Marianna	17.13	0.96	1.31	1.31	0.69	1.16
79	17	St. Francis County	10.3	0.58	0.44	0.69	0.74	0.11
79	18	Crittenden County	9.63	0.71	0.71	0.71	0.66	0.66
Statewide Average Crash Rate				1.38	1.36	1.33	1.34	1.24

Note: Bold and italicized numbers represent locations where the crash rate is greater than the statewide average.

The fatal crash rate per roadway section was calculated based upon the number of fatal crashes per 100 million vehicle miles traveled (100MVMT) and then compared to the statewide average fatal crash rate for rural two-lane undivided roadways with no control of access, as shown in the **Table 2-7**. All sections except for Section 12 in Prairie County and Section 18 in Crittenden County have had at least one fatal crash in the last five years. Section 15, which is the section of Highway 79 in Lee County west of Marianna, experienced seven fatal crashes during the last five year period, including at least one fatal crash every year, and had a fatal crash rate greater than the statewide average during each year.

Table 2-7
Fatal Crash Rate by Section for Highway 79, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Fatal Crash Rate (crashes/100MVM)				
				1997	1998	1999	2000	2001
63	13	Jefferson County I-530 to Hwy 79	10.58	0.00	0.00	***16.18***	0.00	0.00
79	10	Jefferson County North of Hwy 63	12.36	0.00	0.00	0.00	***6.33***	0.00
79	11	Arkansas County	17.33	3.29	0.00	0.00	0.00	***5.86***
79	12	Prairie County	4.37	0.00	0.00	0.00	0.00	0.00
79	13	Monroe County South of Clarendon	9.09	***9.72***	0.00	0.00	0.00	0.00
79	14	Monroe County East of Clarendon	13.48	***11.96***	0.00	0.00	***9.68***	0.00
79	15	Lee County West of Marianna	20.03	***14.40***	***7.20***	***13.68***	***6.51***	***5.70***

Table 2-7 (continued)
Fatal Crash Rate by Section for Highway 79, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

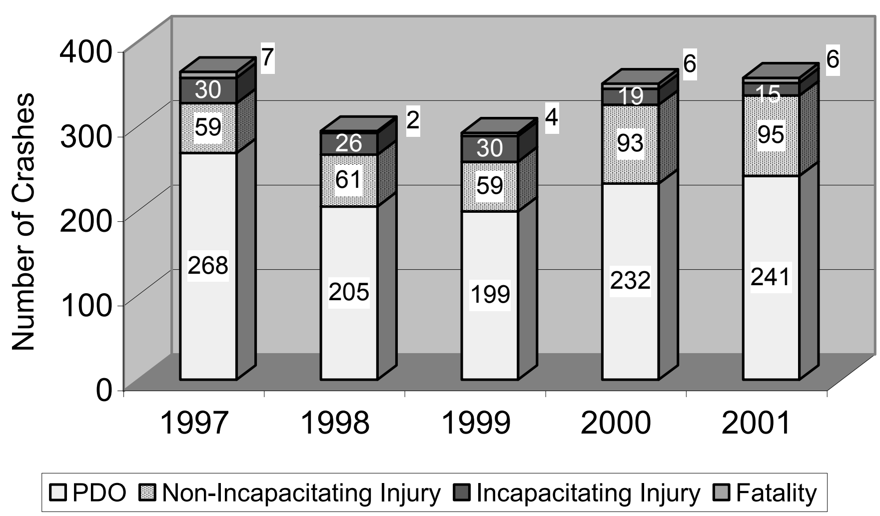
Highway	AHTD Sect #	Location	Total Length (miles)	Fatal Crash Rate (crashes/100MVM)				
				1997	1998	1999	2000	2001
79	16	Lee County North of Marianna	17.13	***8.00***	0.00	0.00	0.00	0.00
79	17	St. Francis County	10.3	0.00	***11.08***	0.00	***10.64***	0.00
79	18	Crittenden County	9.63	0.00	0.00	0.00	0.00	0.00
Statewide Average Crash Rate				3.35	2.86	2.83	3.09	2.82

Note: Bolded and italicized numbers represent locations where the fatal crash rate is greater than the statewide average.

I-40/I-55 Bridges

Crash history was reviewed for I-40 and I-55 from the Crittenden County line to the I-55/Highway 70 interchange. Similarly, data were provided for the five-year period from Years 1997 to 2001 and included information on fatality, incapacitating injury, non-incapacitating injury, possible injury, and property damage only crashes. A summary of the data for the entire study corridor is illustrated in **Figure 2-6**. After a decrease in total crashes between Years 1997 and 1998-1999, the total number of crashes increased in Year 2000 and remained relatively constant at 357 total crashes in Year 2001.

Figure 2-6
Five Year Crash History for I-40/I-55
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee



Crash Locations - Freeway entrance and exit ramps and freeway weaving areas represent the basic vehicle conflict areas for freeway facilities where many crashes occur. Crash locations during the last five year period were typically concentrated in the higher traffic volume areas with more vehicle conflict areas. Crash locations were further summarized by roadway segment, with the roadway segments used in the analysis corresponding to the AHTD section numbering system for I-40 and I-55. The total number of crashes by segment is shown in **Table 2-8** and total numbers of fatal crashes is shown in **Table 2-9**. All segments have had at least one fatal crash in the last five years. The I-40 and I-40/55 segments had the highest fatal crash count with 11 fatalities in the last five years.

Table 2-8
Total Crashes by Section for I-40/I-55, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Number of Crashes				
				1997	1998	1999	2000	2001
I-40	52	Crittenden County, County Line to I-55	4.73	130	77	62	83	92
I-55	11	Crittenden County, County Line to I-40	4.42	93	57	84	98	79
I-40/I-55	52/11	Crittenden County, I-40/I-55 Interchange to Overpass after US 70 Split	3.69	141	160	146	169	186
TOTAL			12.84	364	294	292	350	357

Table 2-9
Total Fatal Crashes by Section for I-40/I-55, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Number of Fatal Crashes				
				1997	1998	1999	2000	2001
I-40	52	Crittenden County, County Line to I-55	4.73	4	2	0	2	3
I-55	11	Crittenden County, County Line to I-40	4.42	1	0	0	0	2
I-40/I-55	52/11	Crittenden County, I-40/I-55 Interchange to Overpass after US 70 Split	3.69	2	0	4	4	1
TOTAL			12.84	7	2	4	6	6

Crash Rate - The crash rate per roadway segment was calculated based upon the number of crashes per million vehicle miles traveled (MVMT), as shown in **Table 2-10**. During the last five-year period, all sections had at least one year that exhibited crash rates greater than the statewide average crash rate for Interstate roadways. All sections exhibited crash rates higher than the statewide crash rate during Year 1997. The I-40/I-55 segment had crash rates greater than the statewide average during the last five years and the I-55 segment had crash rates greater than statewide average crash rate during the last three years. The I-40 segment had crash rates lower than the statewide average crash rates during the last three years.

Table 2-10
Crash Rate by Section for I-40/I-55, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Crash Rate (crashes/MVM)				
				1997	1998	1999	2000	2001
I-40	52	Crittenden County, County Line to I-55	4.73	***2.71***	***1.52***	0.97	1.47	1.59
I-55	11	Crittenden County, County Line to I-40	4.42	***1.64***	1.00	***1.56***	***1.80***	***1.38***
I-40/I-55	52/11	Crittenden County, I-40/I-55 Interchange to Overpass after US 70 Split	3.69	***1.64***	***1.87***	***1.77***	***1.90***	***2.23***
Statewide Average Crash Rate		Four-Lane Divided (Full access control)		1.04	1.06	1.23	1.33	1.28
		Six or more Lanes Divided (Full access control)		1.39	1.32	1.63	1.66	1.74

Note: Bolded and italicized numbers represent locations where the crash rate is greater than the statewide average. Year 1997 crash rates are based on estimated 1997 AADT obtained using 1998 AADT and the average annual growth rate for Years 1998 to 2001 period.

The fatal crash rate per roadway section was calculated based upon the number of fatal crashes per 100 million vehicle miles traveled (100MVMT) and then compared to the statewide average fatal crash rate for Interstate roadways, as shown in the **Table 2-11**. All segments had crash rates lower than the statewide average fatal crash rates during all analysis years.

Table 2-11
Fatal Crash Rate by Section for I-40/I-55, Years 1997 to 2001
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Highway	AHTD Sect #	Location	Total Length (miles)	Fatal Crash Rate (crashes/100MVM)				
				1997	1998	1999	2000	2001
I-40	52	Crittenden County, County Line to I-55	4.73	0.08	0.04	0.00	0.04	0.05
I-55	11	Crittenden County, County Line to I-40	4.42	0.02	0.00	0.00	0.00	0.03
I-40/I-55	52/11	Crittenden County, I-40/I-55 Interchange to Overpass after US 70 Split	3.69	0.02	0.00	0.05	0.04	0.01
Statewide Average Crash Rate		Four-Lane Divided (Full access control)		0.67	0.71	0.93	1.45	1.15
		Six or More Lanes Divided (Full access control)		0.69	0.40	0.60	0.83	0.38

Note: Bolded and italicized numbers represent locations where the fatal crash rate is greater than the statewide average. Year 1997 crash rates are based on estimated 1997 AADT obtained using 1998 AADT and the average annual growth rate for Years 1998 to 2001 period.

PROGRAMMED IMPROVEMENTS ON HIGHWAY 79

Improvement projects that are currently planned along Highway 79 in the study area are listed in **Table 2-12.** These are programmed projects that are in Arkansas' Statewide Transportation Improvement Program (STIP) for Fiscal Years 2003-2005. The majority of these projects are for bridge structures and their approaches. There are no capacity improvement projects programmed along Highway 79.

Table 2-12
Programmed Improvements
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Job Name	County	Type Work	Cost	Start Date
Walnut Lake & Big Cypress Creek Structures & Approaches	Lee	Bridge & Approaches	$2,000,000	2003
White River & Relief Structures & Approaches (Clarendon) (Ph. I)	Monroe	Bridge & Approaches	$12,750,000	2003
White River & Relief Structures & Approaches (Clarendon) (Ph. II)	Monroe	Bridge & Approaches	$15,000,000	2005
Highway 31 - Stuttgart (Selected Sections)	Arkansas, Jefferson	Widening	$2,000,000	2004

Source: Arkansas' Statewide Transportation Improvement Program for Fiscal Years 2003-2005

Proposed I-69

A project approximately 60 miles south of the Highway 79 corridor is the proposed I-69 (NAFTA) corridor which extends through southeast Arkansas. The corridor in its entirety extends from the Mexican border to the Canadian border, a distance of approximately 1,650 miles. Also known as High Priority Corridors 18 and 20, I-69 traverses nine states including Arkansas, Kentucky, Illinois, Indiana, Louisiana, Michigan, Mississippi, Tennessee, and Texas. The primary purpose of this project is to provide a facility to transport approximately four billion tons of freight that move within this corridor. The corridor in Arkansas extends from the Louisiana state line south of El Dorado to McGehee, Arkansas and then crosses the Mississippi River to Benoit, Mississippi and continues northward toward Memphis, Tennessee.

TRANSIT FACILITIES

There are no transit services available to residents along the study corridor outside of the Pine Bluff and West Memphis urban areas.

Within Pine Bluff and the surrounding area, transit services that are available include Greyhound Bus Line (national service), Pine Bluff Transit, and Southeast Arkansas Transit System. Pine Bluff Transit is a city owned and operated facility offering services within the City of Pine Bluff. Southeast Arkansas transit system is a service provided for the elderly that operates within Jefferson County and is in the process of extending services into Arkansas County.

The Memphis Area Transit Association (MATA) provides services in the Memphis urban area that currently include bus and shuttle services within the suburban area and trolley service in the downtown area. MATA has completed a Regional Transit Plan (1997) that provides for completion of light rail projects in three corridors by the Year 2020. Transit services in West Memphis include Greyhound Bus Line and a shuttle service provided by the MATA.

MAJOR TRAFFIC GENERATORS

Major traffic generators that are associated with the study corridor are primarily at the terminal ends of the corridor. There are traffic generators within the urban area boundaries of Pine Bluff and West Memphis that don't significantly influence traffic volumes on Highways 63 or 79 outside those areas. The International Paper Company Pine Bluff Mill and the Riceland Foods plant in Stuttgart are the most significant major traffic generators that are located on Highway 79 in the study corridor. Traffic volumes within the immediate areas around these facilities result in some short-term traffic delays.

INTERMODAL FACILITIES

The proposed upgrading of Highway 79 to an Interstate-type facility and a new Mississippi River crossing would provide improved access to airports, rail lines, bus lines, waterways, and ports. The closest commercial service airports are located in Little Rock, Arkansas and Memphis, Tennessee, while general aviation airports are located throughout the project area in Pine Bluff, Stuttgart, and West Memphis. The improved facility and new river crossing would also provide improved access to both rural and urban communities within the study corridor.

The Union Pacific Railroad (UPRR) and the Burlington Northern and Santa Fe Railroad (BNSF) are Class I railroads (national service) that serve the Highway 79 study corridor on the Arkansas side of the Mississippi River. Five Class I railroads (BNSF, UPRR, Canada National/Illinois Central, CSX, and Norfolk Southern) serve the Memphis side of the river. An important consideration for rail facilities in the study area is the connectivity with the national rail system and local freight terminals that allow for intermodal freight goods movements between rail/truck and rail/waterborne operations. Shippers within the study corridor have rail access at terminals in Pine Bluff and Little Rock. Container service is available at the UPRR terminal at Ebony and piggyback trailer service at the BNSF Harvard Yard facilities at Marion. Regional constraints to the rail service involve the lack of Mississippi River crossings. There are presently two active river crossings in the vicinity of Memphis. The next closest crossings are at Vicksburg, Mississippi to the south and Cape Girardeau, Missouri to the north. Amtrak provides national rail services to travelers within the study corridor. Connections to Amtrak are made through terminals located in Little Rock, Arkansas and Memphis, Tennessee.

Nationwide bus service is made available to travelers within the study corridor by Greyhound Bus Line with terminals locate in Pine Bluff, Brinkley, West Memphis and Memphis. Travelers can use Greyhound Bus Line to access national rail service with connections in Little Rock, Arkansas and Memphis, Tennessee. Charter service is available in West Memphis by Sanford Transportation Bussing Coach and Limousine.

The three active commercially navigable waterways in the study area are the Arkansas, Mississippi, and White Rivers. A small portion of the St. Francis River is navigable, but only in proximity to its connection to the Mississippi River. Within the study corridor, the major commodity types that are moved over these waterways include earth materials such as sand and gravel, metal products such as scrap iron and agricultural products such as grain and fertilizer. The waterways provide an important import/export link to both domestic market areas linked to the inland river system and global trade markets via the deep-water ports at the Gulf of Mexico. Public use ports within the study area that provide access to these waterways include: Little Rock Port and Port of Pine Bluff on the Arkansas River; and Port of Memphis, Osceola Port, Port of West Memphis, Helena Slackwater Harbor; and Yellow Bend Harbor on the Mississippi River. There are no public ports on the White River although there are several private ports on both the White River and the Arkansas River.

Other truck/rail freight transfer terminals being planned are at Wilmar in south Arkansas (near Monticello), and there is the potential for an additional facility in the Memphis, Tennessee area. Users within the study area have highway access to the existing terminals by way of Highway 49, I-40 and I-530. The proposed I-69 and the I-69 connector between Pine Bluff and Wilmar will provide access to the terminal at Wilmar. Truck access between the study area and any terminal that develops in the vicinity of Memphis will be provided by I-40 and I-55, and rail access will be provided by the existing Memphis rail crossings of the Mississippi River. As mentioned previously, Highway 79 also provides access to an intermodal facility located in Ebony (just north of West Memphis) via Highway 218, I-40 and Highway 147, and a new “super terminal” intermodal facility that is planned southwest of Memphis, west of I-55 near the Tennessee/Mississippi state line. Users will be able to access this facility via I-55 and Highway 61.

NAVIGATION IMPACTS

The U.S. Coast Guard is responsible for the governance of the navigable waters of the United States. This includes not only enforcement of U.S. Maritime Law, but also providing for the safety and security on the nation's inland rivers. In this role, the U.S. Coast Guard sees bridges as potential obstructions to navigation and has the jurisdictional authority to issue permits for crossing the nation's waterways. Although there are no written guidelines for the required horizontal clearance, it is expected that the minimum would be on the order of 1,000 feet, depending on the geometry, depth and current in the vicinity of the bridge. A minimum of 55 feet of vertical clearance is required over the maximum river level as defined by the U.S. Army Corps of Engineers (USACE).

Bridge construction could result in temporary impacts to navigation on the Mississippi River, if a new bridge were constructed. Erection of the bridge superstructure could limit river traffic for brief periods as cranes operate over the navigation channel.

For this study, coordination with the U.S. Coast Guard was conducted. It was determined that the horizontal and vertical clearances and the span lengths for the proposed river crossing concepts were adequate.

Several navigational studies are being conducted in the study area. The McClellan-Kerr Arkansas River Navigation Study is currently underway for the Arkansas River. The study is a joint project between Little Rock and Tulsa USACE districts to look at how the Arkansas River Navigation System is operated. The navigation study is investigating possible operational and structural changes to the system that might improve its ability to quickly evacuate high water out of the upstream reservoirs and this may also prevent some local flooding. The study will result in an Environmental Impact Statement.

The White River Minimum Flow Study is also being conducted by the USACE to look at both positive and negative impacts that could result from reallocating storage in Beaver, Table Rock, Bull Shoals, Norfork and Greers Ferry lakes to maintain minimum flows to improve trout fishing on the White, North Fork, and Little Red rivers.

UTILITIES AND RAILROADS

The following sections discuss the utilities and railroads within the study area.

Utilities

The combination of different types of utilities and/or railroads in association with the Highway 79 Corridor represents joint development opportunities. For example, if a new bridge was constructed across the Mississippi River, it could be developed as an intermodal bridge, serving both highway and rail traffic. The Highway 79 Corridor currently has several utility corridors that could have crossing conflicts if a new parallel corridor was developed within the Highway 79 study area. The locations of major utility corridors have been identified and are shown on Figure 3-1 in Chapter 3, the

Environmental and Physical Constraints map. The map shows the location of major power lines, power plants, substations and stations, water reservoirs or water supply tanks, and pipelines for gas and oil.

The major power lines intersect Highway 79 at eight locations. Generally, crossing points are in close proximity to towns along the corridor including Pine Bluff, Stuttgart, Clarendon, Marianna, Hughes and West Memphis. Between Pine Bluff and Clarendon, power lines parallel the existing Highway 79 alignment. Power plants, stations and substations are located throughout the study area and the majority of these are located in close proximity to the power line corridors, forming major utility corridors within the study area.

Oil and gas pipelines are also shown on Figure 3-1. Pipelines cross the Highway 79 corridor near Highway 88 running north-south. Another pipeline runs east-west to the south of the Highway 79 corridor, across the White River National Wildlife Refuge and the La Grue Bayou. In Shelby County, Tennessee a pipeline is located east of the Mississippi River near the De Soto/Shelby county line.

Water reservoirs and water supply tanks are mainly located near towns along the corridors in order to provide the town's water needs.

Railroads

The Union Pacific Railroad (UPRR) railroad parallels the Highway 79 Corridor from Pine Bluff to Clarendon. In Pine Bluff, the UPRR crosses the Arkansas River to the north of Highway 79 and then crosses over Highway 79 to parallel south near Altheimer to Clarendon. In Clarendon, it then heads north and at Brinkley splits into a northern route paralleling Highway 49 to Missouri, and an eastern route, paralleling I-40. Near the eastern terminus of Highway 79, at the St. Francis/Crittenden county line, the UPRR crosses Highway 79 running east-west and then crosses the Mississippi River to Memphis, Tennessee on the Harahan Bridge.

Within Stuttgart, a second UPRR line ties in from the southeast beginning near Highway 152 to the south. Near Marianna a UPRR line crosses the Highway 79 alignment running north-south, and terminates to the south near Helena.

From the north, a Burlington Northern Santa Fe (BNSF) railroad line, paralleling I-55 into the study area, crosses the Mississippi River to Memphis on the Frisco Bridge. The rail lines are identified on Figure 3-1.

This chapter discusses the following elements for the Highway 79 study corridor: demographics, land use, water resources, farmlands, geology, soils, parklands, wildlife, threatened and endangered species, cultural resources, air quality, hazardous materials, seismic considerations, visual quality, aesthetics, and permits.

DEMOGRAPHICS AND ECONOMIC CONDITIONS

The following discussions regarding demographics are separated into two major geographic areas which encompass the project – the counties in Arkansas and the Memphis Metropolitan Statistical Area (MSA)/De Soto County, Mississippi region.

Arkansas

According to the U.S. Census Bureau, the population of the seven counties that Highway 79 traverses in Arkansas in Year 2000 was 217,595 down from a total of 219,480 in Year 1990. **Table 3-1** shows the population for each county and the annual growth rate from Years 1990-2000. As indicated, population growth has basically been negligible (and in some cases has decreased) during the last decade.

Table 3-1
Historic Population Growth
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	1990 Population	2000 Population	Annual Growth (%)
Arkansas	21,653	20,749	-0.43
Crittenden	49,939	50,866	0.18
Jefferson	85,487	84,278	-0.14
Lee	13,053	12,580	-0.37
Monroe	11,333	10,254	-1.01
Prairie	9,518	9,539	0.02
St. Francis	28,497	29,329	0.29

Source: U.S. Census Bureau

Table 3-2 presents Year 2025 projected populations of these counties compared to their Year 2000 population and their respective annual growth percentages. As with historic conditions, projected population growth is expected to be negligible (and in some cases decrease) during the next 25 years. The source of the projected population is from Woods and Poole.

Table 3-3 illustrates the historic employment growth from Year 1990 to Year 2000. There was minor growth in the counties, and even decreased employment between Year 1990 and Year 2000 in Monroe and Prairie Counties.

Table 3-4 shows the projected employment from Year 2000 to Year 2025 within the seven Arkansas counties and the annual growth rate. The annual growth rate in employment ranges from zero to two percent.

Table 3-2
Projected Population Growth
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	2000 Population	2025 Population	Annual Growth (%)
Arkansas	20,749	20,486	-0.05
Crittenden	50,866	53,184	0.18
Jefferson	84,278	86,000	0.08
Lee	12,580	11,829	-0.25
Monroe	10,254	9,185	-0.44
Prairie	9,539	9,398	-0.06
St. Francis	29,329	30,878	0.21

Source: U.S. Census Bureau, Woods and Poole

Table 3-3
Historic Employment Growth
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	1990 Employment	2000 Employment	Annual Growth (%)
Arkansas	9,228	9,825	0.63
Crittenden	20,049	21,625	0.76
Jefferson	33,236	33,550	0.09
Lee	3,853	4,350	1.22
Monroe	3,871	3,675	-0.52
Prairie	3,906	3,850	-0.15
St. Francis	9,665	11,050	1.35

Source: U.S. Census Bureau

Table 3-4
Projected Employment Growth
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	2000 Employment	2025 Employment	Annual Growth (%)
Arkansas	9,825	15,718	1.90
Crittenden	21,625	27,049	0.90
Jefferson	33,550	52,261	1.79
Lee	4,350	4,762	0.36
Monroe	3,675	5,176	1.40
Prairie	3,850	3,976	0.13
St. Francis	11,050	15,531	1.37

Source: U.S. Census Bureau, Woods and Poole

Table 3-5 presents the racial composition within the different counties in the corridor. Three of the seven counties have nearly equal percentages of White and African American residents, Arkansas and Prairie Counties have predominantly White residents, Lee County has slightly more African American residents than White Residents, and vice versa for Monroe County. The classification of "Other" ranged from one to three percent.

Table 3-5
Year 2000 Racial Composition in Arkansas Counties
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	White	African American	Other
Arkansas	15,602 (76%)	4,848 (23%)	299 (1%)
Crittenden	25,896 (51%)	23,934 (47%)	1,036 (2%)
Jefferson	40,840 (48%)	41,788 (50%)	1,650 (2%)
Lee	5,209 (42%)	7,201 (57%)	170 (1%)
Monroe	6,088 (59%)	3,978 (39%)	188 (2%)
Prairie	8,092 (85%)	1,308 (14%)	139 (1%)
St. Francis	14,184 (48%)	14,375 (49%)	770 (3%)

Source: U.S. Census Bureau

Memphis MSA/De Soto County, Mississippi

While much of the Highway 79 corridor has experienced low growth, the Memphis Metropolitan Statistical Area (MSA) has experienced somewhat higher growth in the region. Year 2000 Population was 1,135,614 and is projected to increase to 1,470,785 by Year 2025. This represents an annual growth rate of 1.0 percent. Employment within the Memphis MSA is estimated to grow from 732,838 jobs in Year 2000 to approximately 1,021,799 jobs by Year 2025, representing an annual growth rate of 1.3 percent. De Soto County, Mississippi, adjacent to the Memphis area, is now one of the fastest growing counties in that state. Year 2000 population was 107,199 and is projected to increase to 207,219 by Year 2025 (representing an annual growth rate of 2.7 percent). Employment is expected to grow from 46,177 jobs in Year 2000 to 86,943 jobs in Year 2025. This represents an annual growth rate of 2.6 percent. Access to this expanding economy is an important issue in the eastern portion of the Highway 79 corridor.

Table 3-6 shows the racial composition within the Memphis MSA and De Soto County, Mississippi. In summary, approximately 53 percent in the Memphis MSA were identified as White residents, 43 percent were identified as African American residents, and four percent were classified as "Other". De Soto County, according to the U.S. Census Bureau, had 86 percent residents that were classified as White, 11 percent who were identified as African American, and three percent were classified as "Other".

Table 3-6
Year 2000 Racial Composition in Memphis MSA and De Soto County, MS
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Memphis MSA	White	African American	Other
Tennessee Portion	482,751 (49%)	456,381 (47%)	38,417 (4%)
Arkansas Portion	25,896 (51%)	23,934 (47%)	1,036 (2%)
Mississippi Portion	91,950 (86%)	12,216 (11%)	3,033 (3%)
Total Memphis MSA	600,597 (53%)	492,531 (43%)	42,486 (4%)

Source: U.S. Census Bureau

EXISTING LAND USE

Land use throughout the Highway 79 corridor is mainly agricultural. The corridor is contained within the largest rice producing area in the United States. Other crops grown within this corridor are corn and cotton. The City of Stuttgart (located in Arkansas County) is known as the "Rice and Duck" capitol of the world.

Logging is a predominant industry in the southern portion of the corridor near Pine Bluff. There are two paper mills near Pine Bluff which create a large amount of truck traffic within the area. The northern portion of the corridor closer to the Mississippi River consists of swamps and marshes. There are two wildlife refuges located in the corridor

As mentioned previously, much of the corridor is very sparsely populated. The exceptions to this are the City of Pine Bluff with a Year 2000 population of 55,085, City of Stuttgart with a population of 9,745, City of Marianna with a population of 5,181 persons, City of West Memphis with a population of 27,666, and the City of Memphis with a population of 650,100.

DELTA REGION ISSUES

The Highway 79 corridor is located in the Lower Mississippi Delta Region. The Lower Mississippi Delta is one of the poorest areas in the United States, with nearly one-third of the population of Arkansas, Mississippi, and Louisiana living in poverty. High unemployment rates and a slow economy are predominant issues in the Delta. Arkansas counties included in the Lower Mississippi Delta include all of the counties in the study area – Jefferson, Arkansas, Prairie, Monroe, Lee, St. Francis, and Crittenden.

In 1988, Congress authorized the formation of the Lower Mississippi Delta Development Commission. The Commission's objective was to create economic development policies and strategies to fight poverty and associated social and economic issues in the lower delta region. In 1990, the Commission submitted a report, *The Delta Initiatives*, which outlined the importance of economic development to the future of the region. The report identified the Lower Mississippi Delta area, comprising 219 counties in Arkansas, Mississippi, Louisiana, Missouri, Illinois, Tennessee, and Kentucky, as one of the poorest regions of the United States.

In 1995, the Federal Highway Administration initiated an update of the Lower Mississippi Delta Development Commission's report as it specifically related to transportation issues. The resulting document, *Linking the Delta Region with the Nation and the World*, supported the correlation between transportation improvements and economic development in the Delta Region. The report sited specific case studies of economic trends in locations where transportation improvements had been made. The report noted that between 1990 and 1995, many of the highway-related recommendations of the Lower Mississippi Delta Development Commission had been substantially or partially implemented and that during the same period of time the counties and parishes of the Delta region cumulatively outperformed the United States, as a whole, in relative job growth.

In the 1996 Farm Bill, the U.S. Department of Agriculture (USDA) committed to supporting initiatives to address the constant poverty found in the Mississippi Delta. The USDA established a cooperative agreement with the Housing Assistance Council (HAC). Together they created the “Building Communities in the Lower Mississippi Delta” initiative that was directed at building upon the existing plans and community development efforts to identify and promote successful Delta projects. Participants in the Delta initiative are currently in the process of developing a collaborative agreement called the “Delta Compact” to encourage stakeholders in the Delta to adopt development strategies for the area, further collaborate on the various initiatives for the Delta, and create new financial and technical assistance products for the Delta.

The Highway 79 project could improve general transportation accessibility of the region, on both a local level between communities and points in the adjacent states and on a broader regional or national level to more distant sources. This would be especially true if a new Mississippi River crossing was constructed within the study area. While travel conducted for many reasons would be affected, the emphasis for local economic development concerns is to attract new industry and expand existing industry in the region. By bringing in new jobs, expanding regional income and adding to the tax base, local leaders hope to improve the economic and social status of the region's residents and businesses. In doing so, benefits such as reduced unemployment and reliance on public assistance, stemming from the out-migration of labor force and households, expanded public and private investment, and enhanced self-sufficiency are also seen as likely.

WATER RESOURCES

Water quality of the lakes, rivers, and streams, groundwater quality, floodplains and wetlands are discussed within this section, as well as a description of those resources. The water resources for the Highway 79 study area are shown on **Figure 3-1**, Environmental and Physical Constraints, and **Figure 3-2**, Water Resources.

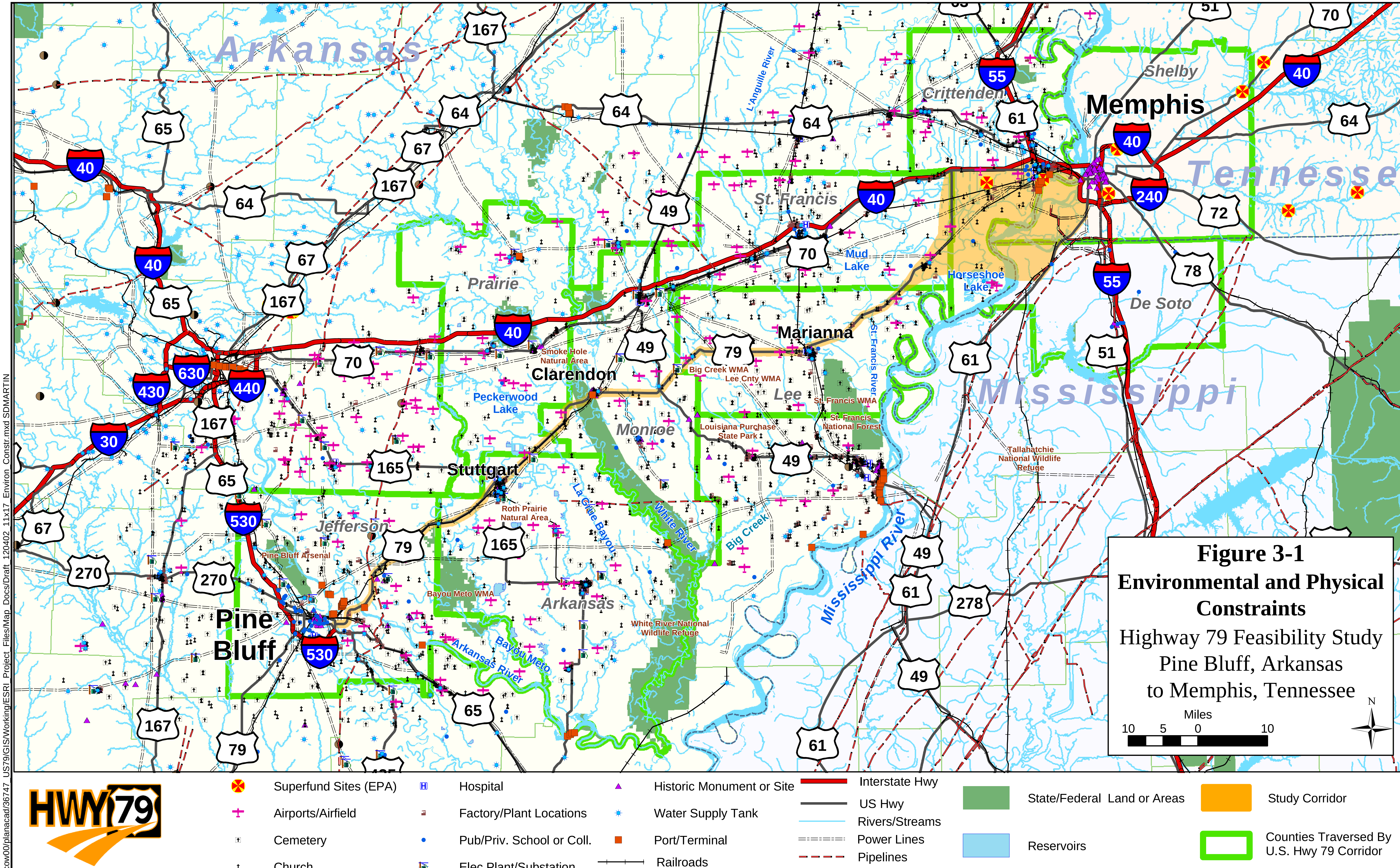


Figure 3-1
Environmental and Physical Constraints
Highway 79 Feasibility Study
Pine Bluff, Arkansas
to Memphis, Tennessee

kcow00/planacad/36747 US79/GIS/Working/ESRI Project Files/Map Docs/Draft 120402 11x17 Environ Constr.mxd SDMARTIN

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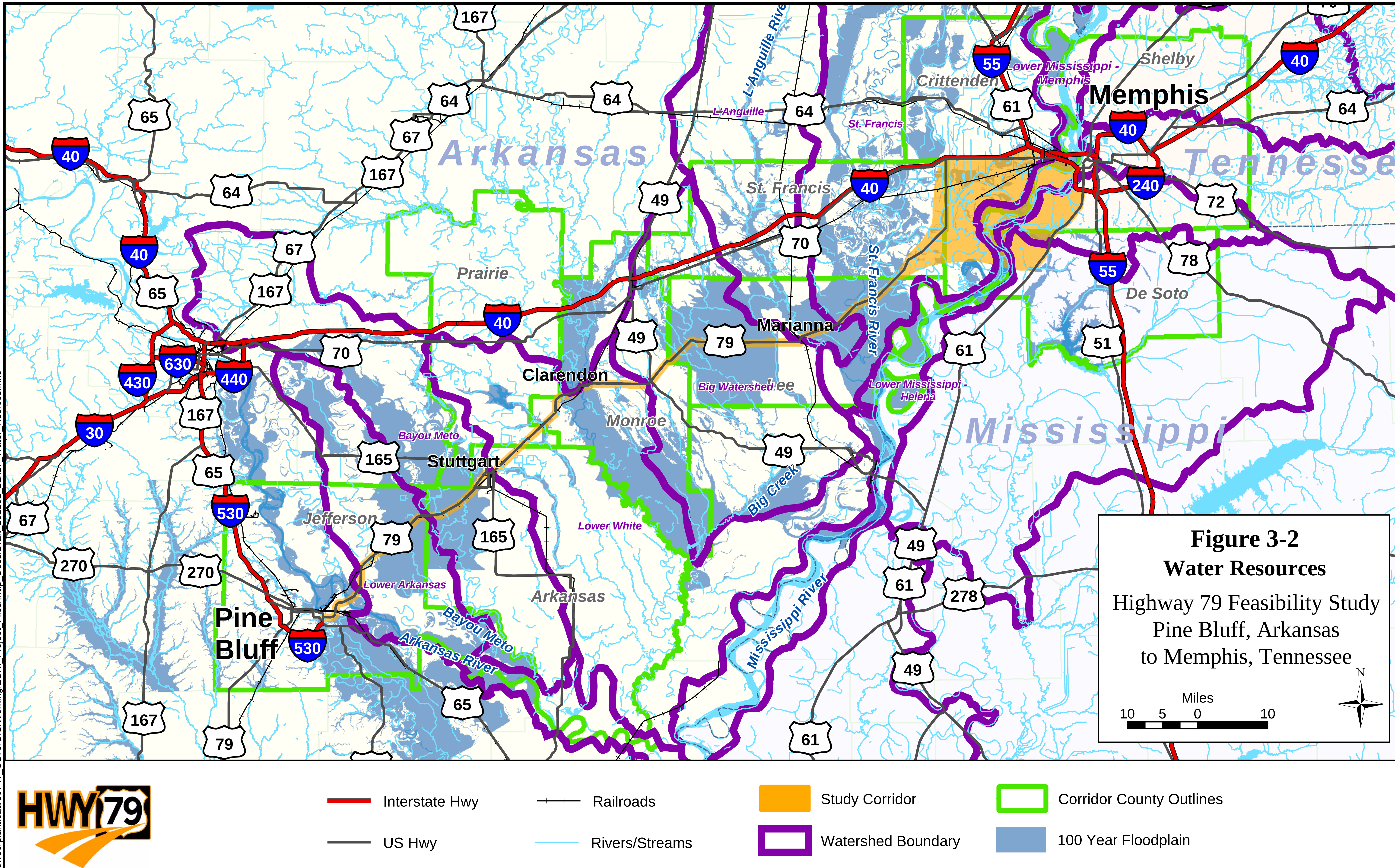

Figure 3-2
Water Resources
Highway 79 Feasibility Study
Pine Bluff, Arkansas
to Memphis, Tennessee

kcow00/planacad/36747_US79/GIS/Working/ESRI_Project_Files/Map_Docs/Draft_102102_11x17_Water_Resrces.mxd

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Watersheds

There are a number of major watersheds that flow throughout the study area. A watershed is an area of land that catches rain and snow and drains or seeps into a particular marsh, stream, river, lake, or groundwater. The United States has been subdivided by the U.S. Geological Survey into hydrologic units for analysis purposes. These are called regions, sub-regions, accounting units and cataloging units. Each has a unique unit code or number associated with it. The watersheds within the study area are listed below, and the hydrologic unit code for the watershed is included in parentheses.

- *Lower Arkansas watershed* (USGS HUC 08020401) is included in seven counties both north and south of Highway 79. Of those seven counties, Jefferson and Arkansas are included in the study area. The watershed drains into the Arkansas River.

- *Bayou Meto watershed* (USGS HUC 08020402) is included in portions of seven counties both north and south of Highway 79, of which Jefferson, Prairie and Arkansas counties are included in the study area. The City of Stuttgart is included within the watershed. The watershed drains into the Bayou Meto and Wabbaseka Bayou waterways.

- *Lower White watershed* (USGS HUC 08020303) is located in seven counties both north and south of Highway 79, although the majority of the watershed lies to the south of the highway. Of those seven counties, Prairie, Arkansas, and Monroe are part of the study area. Clarendon, Arkansas is within the northern portion of the watershed. The watershed drains into the White River.

- *Big watershed* (USGS HUC 08020304) is included in portions of six counties both north and south of Highway 79, of which Arkansas, Monroe, Lee, and St. Francis are part of the study area. Marianna is included along the eastern edge of the watershed. The watershed drains into the White River and the Big Creek.

- *L'Anguille watershed* (USGS HUC 08020205) falls within six counties both north and south of Highway 79, including Lee and St. Francis. The majority of the watershed is north of Highway 79. The watershed drains into the L'Anguille River.

- *Lower St. Francis watershed* (USGS HUC 08020203) contains portions of portions of 19 counties both north and south of Highway 79. This watershed is in parts of Lee, St. Francis, and Crittenden counties. The watershed drains into St. Francis River and the Mississippi River.

- *Lower Mississippi-Helena watershed* (USGS HUC 08020100) is located in portions of both Arkansas and Mississippi and eight counties. The watershed includes Lee and Crittenden counties in Arkansas and De Soto County in Mississippi. This watershed drains into the Mississippi River.

- *Lower Mississippi-Memphis watershed* (USGS HUC 08010100) is included in portions of Arkansas, Mississippi, and Tennessee. The counties include Crittenden County in Arkansas, Shelby County in Tennessee and De Soto County in Mississippi. Within the study area, the watershed drains into the Mississippi River.

Table 3-7 lists the watersheds by county and the percentage of watershed that falls in each county. The Lower White and Lower St. Francis watersheds make up the largest percentage of watersheds in the study area. The category of other means that large portions of the county is outside of the Highway 79 study area and as a result falls into watersheds outside of the area.

Table 3-7
Watersheds by County
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Lower Arkansas	Bayou Meto	Lower White	Big	L'Anguille	Lower St. Francis	Lower Mississippi-Helena	Lower Mississippi-Memphis	Other
Jefferson	34%	4%							62%
Arkansas	11%	34%	55%						
Monroe			40%	36%					24%
Prairie		7%	29%						64%
Lee				47%	18%	26%	9%		
St. Francis				13%	35%	52%			
Crittenden						87%	3%	10%	
De Soto							1%	1%	98%
Shelby								13%	87%

Rivers, Lakes and Streams

Several major water bodies are located within the study area and a general description of those water bodies is provided below. The locations of the major lakes, rivers and streams in the study area are shown on Figure 3-1. Section 303(d) of the Clean Water Act requires a state to list those waters not expected to meet state water quality standards even after application of conventional technology-based controls for which the total maximum daily load status has not yet been completed.

<u>Rivers</u>

- *Arkansas River* headwaters are located in the Rocky Mountains in Colorado; from there the river flows 1,450 miles to the Mississippi River in Arkansas. The Arkansas crosses Highway 79 about five miles east of Pine Bluff in Jefferson County. The Arkansas River is a commercially navigable waterway to the Port of

Catosco at Tulsa, Oklahoma. This river is not listed as an impaired 303(d) waterway for water quality.

- *White River* travels nearly 720 miles from its three points of origin in Arkansas to its entry into the Mississippi. The White River crosses Highway 79 at Clarendon and within the study area runs through portions of Prairie, Monroe, and Arkansas counties. The entire White River Basin comprises an area of 27, 765 square miles. The White River is one of the commercially navigable waterways in the study area. This river is not listed as an impaired 303(d) waterway for water quality.

  The U.S. Army Corps of Engineers (USACE) is conducting the *White River Minimum Flow Study* to look at the impacts that could result from reallocating storage in Beaver, Table Rock, Bull Shoals, Norfork, and Greers Ferry lakes to maintain minimum flows to improve trout fishing on the White and other rivers.

- *L'Anguille River* begins at the Poinsett-Cross county line and flows southeast to its confluence with the St. Francis River Floodway (west channel). The river crosses Highway 79 just east of Marianna and joins the St. Francis River Floodway about two miles from that point. The L'Anguille runs through Lee and St. Francis counties within the study area. The L'Anguille drains 938 square miles of the St. Francis River basin. The river is not a commercially navigable waterway for water quality. The L'Anguille River is listed as a 303(d) impaired water. The impairment is listed as siltation and turbidity, with the major source of contamination being agricultural activities. The impairment is of low priority.

- *St. Francis River* runs from near Farmington, Missouri to the confluence of the St. Francis and Mississippi Rivers about 10 miles above Helena, Arkansas. The St. Francis River Floodway (west channel) crosses Highway 79 about four miles east of Marianna and the St. Francis River (east channel) crosses the highway about eight miles east of Marianna. Between the two channels are numerous bayous and lakes. In the study area the river runs through St. Francis and Lee counties. The St. Francis River is not considered a commercially navigable waterway within the study area. The Huxtable Dam is located on the east channel about two miles northeast of the confluence with the west channel. The USACE is managing a flood control project in the St. Francis Basin by means of levees, channel improvements, new channels, auxiliary channels, and floodways. This river is not listed as an impaired 303(d) waterway for water quality.

- *Mississippi River* headwaters are located in northern Minnesota and the river travels 2,552 miles to the Gulf of Mexico in Louisiana. The total drainage area of the Mississippi River is approximately 1.25 million square miles. Within the study area the river forms the eastern border of Lee and Crittenden counties in Arkansas and the western border of Shelby County in Tennessee and De Soto County in

Mississippi. The Mississippi River is considered a commercially navigable waterway. It is not listed as an impaired 303(d) waterway for water quality.

Lakes and Bayous

- *Bayou Meto* headwaters are near Jacksonville, Arkansas and it travels through Arkansas County until it meets the Arkansas River. The bayou crosses Highway 79 about five miles south of Stuttgart. Bayou Meto is part of the Bayou Meto Wildlife Management Area (WMA) and the Bayou Meto Wetland Planning Areas (WPA). The water quality is generally considered to be moderate for supporting recreational contact, a warm water fishery or for human consumption.

- *LaGrue Bayou* begins in Prairie County and travels southeast through Arkansas County until its confluence with the White River. The bayou crosses Highway 79 about nine miles east of Stuttgart.

- *Peckerwood Lake* is a 4,000 acre irrigation reservoir located in Prairie County. The lake is about four miles north of Highway 79 between Stuttgart and Clarendon.

- *Big Creek* is located in the western portion of Lee County and is part of the Big Creek Wildlife Management Area. The creek runs from just north of I-40 in St. Francis County, through Lee County and into the northern part of Phillips County. Big Creek crosses Highway 79 about four miles east of Monroe and is part of the Big Creek WPA.

- *Bear Creek Lake* is located inside of the St. Francis National Forest in Lee County. It is a 625-acre watershed lake situated atop of Crowley's Ridge. The lake is about five miles southeast of Marianna and Highway 79. The average depth of the lake is 10 feet and its primary purpose is recreational.

- *Mud Lake* is located in St. Francis County just north of Highway 79 about three miles west of Hughes.

- *Horseshoe Lake* is located in Crittenden County about six miles southeast of Highway 79 near Hughes. The lake is a 2,500-acre oxbow which is now separated from the Mississippi River by a levee. The average depth of the lake is 10 feet and its primary purpose is recreational.

The location of the lakes and bayous are shown in Figure 3-1.

Groundwater

The study area is in the Mississippi Embayment physiographic province and groundwater in the area is drawn from the Mississippi Valley Alluvial aquifer and the Sparta aquifer.

The Alluvial aquifer produces a calcium-bicarbonate water type, whereas the Sparta aquifer produces a sodium-bicarbonate water type.

The primary uses of groundwater in the area are for drinking water and crop irrigation. The groundwater quality is generally good. The major threats to groundwater quality in these areas are drawdowns in the water-table surface, and pesticides and other agricultural runoff.

Floodplains

As part of the National Flood Insurance Program, many communities and counties have performed flood insurance studies to identify flood hazards for floodplain management and flood insurance purposes. The administration of the National Flood Insurance Program, performed by the Federal Emergency Management Agency (FEMA), entails detailed studies of flood-prone streams and rivers for the determination of flood boundaries and flood hazards. FEMA Flood Insurance Rate Maps were used to assess the floodplain locations within the study area. Floodplain areas in Prairie, Arkansas and Lee counties were not available electronically from the Federal Emergency Management Agency (FEMA) at this time and were therefore digitized from hardcopies of FEMA Flood Insurance Rate Maps for the areas. The digitized areas were generalized to show overall location and content; they are not meant to serve as a substitute for electronically available mapping. The floodplain within the study area can be seen on Figure 3-2, Water Resources map.

A significant portion of the area surrounding Highway 79 is part of the 100-year floodplain for several watersheds. Due to the existence of four major rivers, the Arkansas, White, St. Francis and Mississippi, the floodplain areas are quite large. Those areas along Highway 79 where floodplains are less extensive are: an area west of Wabbaseka; an area to the east of Stuttgart until reaching the White River floodplain; the area between Clarendon and Monroe; and an area surrounding Marianna between the Big Creek and St. Francis floodplains.

Wetlands

The Clean Water Act of 1973 is the regulatory authority over all activities in "Waters of the U.S.". Section 404 of the Act regulates discharges of dredged or fill materials, into "Waters of the U.S.," which includes jurisdictional wetlands and other special aquatic sites. After a review of the national wetlands inventory (NWI) data, it was determined that the palustrine, riverine, and lacustrine Cowardin wetland systems and deepwater aquatic habitats are represented in the study area. For manageable inventory purposes in this study, these systems were categorized into three groups of Cowardin wetland classifications as follows:

- *Palustrine Wetlands* – This palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. The types of Cowardin classifications in this category include aquatic bed, emergent, scrub-shrub, and forested. These are predominantly located in low-lying level areas adjacent to streams.

- *Riverine Wetlands* – The riverine system includes all wetlands and deepwater habitats contained within a channel. The types of Cowardin classifications in this category include unconsolidated bottom and unconsolidated shore. These are mainly upland ponds with open water. These are the major streams and rivers throughout the study area.

- *Lacustrine Wetlands* – The lacustrine system includes wetlands and deepwater habitats situated in a topographic depression or a dammed stream channel, with minimal vegetative growth. The types of Cowardin classifications in this category include limnetic and littoral. These are large areas of open water.

The Arkansas Game and Fish Commission (AGFC) has a long-standing commitment to wetland protection in the Mississippi Delta Region. *The Arkansas Wetland Strategy* was developed by the Arkansas Multi-Agency Wetland Planning Team (MAWPT) to describe the basic outline for the statewide goals and objectives for wetlands. The strategy also looks at specific Wetland Planning Regions. Highway 79 is included entirely in what is designated the Delta Region. According to the report, the Delta Region represents the state's greatest potential for wetland restoration.

The region is characterized by low gradient streams with extensive floodplains and wetlands. Significant palustrine and lacustrine wetlands such as backswamps and oxbow lakes exist in this region. The riverine wetlands are located immediately adjacent to the rivers in the area. The less frequently flooded wetlands have been cleared for row-crop agriculture. The region is extensively ditched to facilitate drainage for agriculture. Water quality in this region has been degraded by this.

Wetland Planning Areas (WPA) are subdivisions of the Wetland Planning Region based on similar wetland characteristics and physiographic features in addition to a watershed/wetland context. Within the Delta Region there are seven WPAs which touch on Highway 79. Those planning areas are as follows:

- *Bayou Bartholomew WPA* – This WPA includes the Arkansas River watersheds south of Little Rock and above Pine Bluff. These areas have similar wetland attributes. Bayou Bartholomew is an abandoned channel of the Arkansas River.

- *Bayou Meto WPA* – This includes the entire watershed of Bayou Meto. The southern boundary of the area is the levees of the Arkansas River down to the mouth of Bayou Meto. The WPA lies almost completely within the Mississippi Alluvial Plain.

Most of the terrain in the WPA is flat and contains an extensive network of natural stream channels, channelized natural streams, artificial drainage ditches and canals, oxbow lakes, and artificial impoundments. Most of the wetlands along Bayou Meto have been cleared. The Bayou Meto WMA protects a large area of forested wetlands.

- *Lower White River WPA* – The planning area extends to include the tributaries to the White River. The area includes the bottomland inside the levees on the east side of the river. The White River National Wildlife Refuge (NWR) contains one of the largest contiguous tracts of bottomland forest left in the Mississippi alluvial valley.

- *Big Creek WPA* – This area includes the watershed of Big Creek and other bayous that flow south into the White and Mississippi rivers. The area is to the east of the White River levees. There is very little natural wetland left in the area but there is great potential for restoration.

- *L'Anguille River WPA* – The area includes the complete watershed of the L'Anguille River, until it crosses east of Crowley's Ridge into the St. Francis WPA. The wetlands west of Crowley's Ridge are similar because they are incised into terraces. The main stem of the L'Anguille River remains unchannelized, with a substantial wetland corridor.

- *St. Francis River WPA* – The west boundary is the watershed line between the L'Anguille and St. Francis rivers. The area is characterized by extensive clearing and ditching that bypasses the natural channels of rivers and streams. The remaining high value wetlands lie along the bypassed channels of the St. Francis.

- *Mississippi River WPA* – This planning area includes all lands inside the levees along the Mississippi River. The area has extensive wetlands with large areas that have been cleared or altered because of agriculture and channel improvements. The hydrology has been significantly altered due to constriction of the floodplain by the levees.

Wetland mapping for the study area is shown on **Figure 3-3**, Land Cover Map. Detailed electronic wetland data was not available from the National Wetland Inventory (NWI) for Lee, St. Francis, and Crittenden counties so a national land cover data set from the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (USEPA) was used to identify wetlands within the study area, based on 30-meter Landsat thematic mapper data.

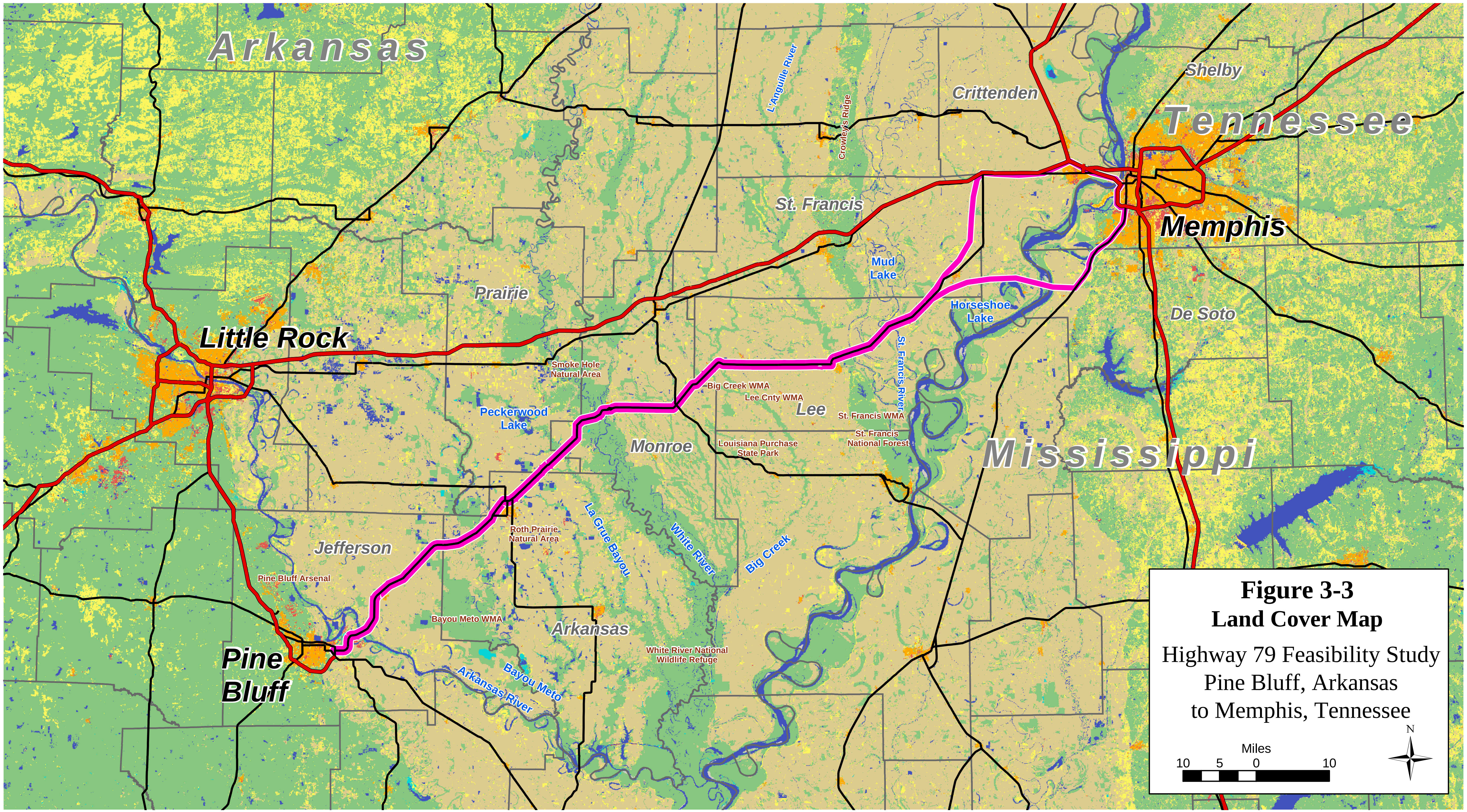

Figure 3-3
Land Cover Map
Highway 79 Feasibility Study
Pine Bluff, Arkansas
to Memphis, Tennessee

Land Cover Classifications

- Open Water
- Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Forest and Woody Wetlands
- Agricultural Uses
- Grasslands/Pasture
- Wetlands
- Study Corridor Outline

kcow00/planacad/36747_US79/GIS/Working/ESRI_Project_Files/Map_Docs/Draft_120502_11x17_Landcover.mxd SDMARTIN

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FARMLANDS, GEOLOGY, AND SOILS

The following sections discuss the geology, topology, soils, and prime farmlands within the study area.

Geology and Topography

Arkansas is divided into two primary natural regions: the Interior Highlands and the Gulf Coastal Plains. Each of these regions can then be divided into various divisions. Most of the Highway 79 study corridor is located within the Mississippi Alluvial Plain division, usually referred to in Arkansas as the "Mississippi Delta". In the Delta, the work of large rivers has been dominant in forming the character of the land. The soil is deep, but often almost impermeable, therefore drainage is poor. The Delta area is flat, its elevations varying only by about 150 feet in the entire 250-mile length of its natural division. The Delta forests are comprised of several bottomland hardwoods adapted to wet, poorly drained soils. The area is designated as lowlands. Within the Mississippi Alluvial Plain there is a small section of the Grand Prairie. The Grand Prairie was a large natural grassland that was located in Lonoke, Monroe, and Arkansas counties, however, most of its native vegetation has been altered or conversion to agricultural uses.

A small portion of the Crowley's Ridge division is also located within the study corridor. The ridge is considered uplands and it rises steeply 250 feet above the nearly flat Delta.

Recent alluvium and terrace deposits cover much of the lowlands in the Delta region of the state. They provide the surface materials in the Mississippi Alluvial Valley and along the rivers in the Gulf Coastal Plain. The recent alluvium has been deposited by flood waters of streams and consists of water washed material, mainly silt. The terrace deposits are frequently older, often Pleistocene, indicating former levels of bottomland below which stream have now cut. The surface geology is mainly from the Cenozoic Era (from the Quaternary period).

Soils

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) conducts soil surveys. The soil associations in the study area are comprised of mostly bottomland and terraced soils within Jefferson, Monroe, Crittenden, and parts of Arkansas, St. Francis, and Lee counties. Bottomland and terraced soils are found along major streams, but especially in areas near the Arkansas, Lower White, and Mississippi river valleys. The chief agricultural uses are for cotton, soybeans, rice, and pasture. The majority of Arkansas County is comprised of eastern prairie soils and significant portions of Lee and St. Francis counties contain loessial plains and hills soils, consistent with their location within the Crowley's Ridge division. Eastern prairie soils are generally silt loam soils used for rice, pasture, soybeans, and cotton. For loessial plains and hills, the chief use is pasture as the area has a moderate slope and there are areas of soil erosion.

The Arkansas state soil is Stuttgart. These soils are named for the city of Stuttgart in Arkansas County. The soils are primarily used for cropland for rice, small grains, corn and soybeans. Stuttgart soils have been mapped on about 20,000 acres in Arkansas. The Stuttgart soils series consists of very deep moderately drained soils formed in silty or clayey alluvium.

Prime Farmland

Agriculture is the predominant land use in the study area. However, as the area develops, land currently dedicated to agricultural use is converted to other uses. The farm base is identified by the soil series present. Agricultural productivity is related to the soil available, as well as the techniques used to farm the land.

The Prime Farmland soils series units within the study area are divided into two categories: 1) those that are designated as prime farmland with no restrictions or qualifications, and 2) those that are considered prime farmland only if drainage or flooding protection measures have been implemented. A significant portion of the soils in Lee, Monroe, and St. Francis counties in Arkansas are classified as Prime Farmland. Farmland soils do not include urban or built-up land. Soil Survey Geographic (SSURGO) Database information was used to determine areas of Prime Farmland. SSURGO is the most detailed level of soil mapping done by the Natural Resources Conservation Service (NRCS). Roughly half of the land in Jefferson County would also be classified as Prime Farmland. Major agricultural areas within the study area are located on Figure 3-3.

PARKLANDS AND WILDLIFE

Parklands within the study area include a state park, a Mississippi River trail, national forest land, a national wildlife refuge, and several wildlife management areas. These parklands are shown on Figure 3-1.

Parks and Trails

There is one state park and no national parks within the study area. The Louisiana Purchase State Park is located at the junction of Lee, Monroe, and Phillips counties about seven miles south of Highway 79. The National Historic Landmark preserves the point from which all surveys of property acquired through the Louisiana Purchase initiated. A granite monument marks this initial point of survey of what became 13 states.

The Mississippi River Trail (MRT) is a seven-state, 1,000 mile-long bike route beginning in St. Louis and ending in New Orleans paralleling the Mississippi River. The MRT will ultimately extend to the Mississippi headwaters at Lake Itasca in Minnesota. The trail currently goes through Illinois, Missouri, Kentucky, Tennessee, Arkansas, Mississippi, and Louisiana. The MRT goes through the metropolitan areas of St. Louis, Memphis, Baton Rouge, and New Orleans.

National Wildlife Refuges

The White River National Wildlife Refuge is located in Arkansas, Desha, Monroe, and Phillips Counties. The refuge lies in the floodplain of the White River and is long and narrow, at three to ten miles wide and almost ninety miles long. The refuge is managed by the U.S. Fish and Wildlife Service.

Within the refuge's 160,000 acres, there are a total of 356 natural and man-made lakes which encompass 4,000 of those acres. There is 154,000 acres of forestland, 900 acres of cropland and 1,000 acres of grassland. These areas are interlaced with streams, sloughs and bayous.

Wildlife Management Areas

Several Wildlife Management Areas (WMAs) are located within the study area. The AGFC is the agency responsible for constructing, acquiring and purchasing land and lakes to provide Arkansas and its communities with places to hunt, fish, and appreciate the great outdoors. The major WMAs are described below.

- *Bayou Meto WMA* is one of the largest state-owned wildlife management areas in the nation, encompassing 33,700 acres in Arkansas and Jefferson counties. The WMA is owned by the AGFC with four private in-holdings consisting of 380 acres.

  The typography of Bayou Meto is generally flat with little more than an 11-foot change in elevation over the entire area. There are nine permanent streams including Five Forks, Wabbaseka Bayou, Government Cypress Slough, Bear Bayou, Dry Bayou, West Bayou, Cross Bayou, Little Bayou Meto, and Big Bayou Meto. There are numerous intermediate streams and an extensive drainage network throughout the WMA. Six lakes, totaling 1,080 acres, are on the area. Halowell Reservoir is the largest, totaling 600 acres, followed by Grand Cypress Lake, with 280 acres, Cox Cypress with 150 acres, and Wrape Lake with 80 acres.

  Recreational uses within the WMA include hunting, fishing, and camping. Bayou Meto WMA can be reached through access off of Highway 79.

- *Big Creek WMA* is located in Lee County, four miles east of Monroe. This WMA is 240-acreas named from the stream which flows through the center portion of the area. The WMA was acquired in 1992 as a small game area with hopes for future expansion. The area is made up of old agricultural fields, which have been reforested. There is an access point for the WMA at a boating access point on Big Creek at Highway 79.

- *Lee County WMA* is located in Lee County south of Haynes, Arkansas, near Crowley's Ridge. The area was established as a WMA in 1970 and is comprised of old agricultural fields, which have been reforested to provide habitat for wildlife including small game and a variety of birds.

- *St. Francis WMA* is located within the same portion of the study area as the St. Francis National Forest in Lee and Phillips counties. A description is provided below in the Forests section.

Forests

The St. Francis National Forest is located within the study area. The forest, consisting of 20,946 acres, is in east central Arkansas in Lee and Phillips counties, between the towns of Marianna and Helena-West Helena. It is bounded on the east and south by the L'Anguille, St. Francis, and Mississippi Rivers. The area is owned by the U.S. Forest Service with a cooperative agreement with the AGFC.

The St. Francis National Forest consists of upland hardwood forests located on the Crowley's Ridge section, with approximately 2,500 acres of bottomland timber adjacent to the St. Francis and Mississippi Rivers. The Forest has two man-made lakes, Bear Creek and Storm Creek. The area is accessible by Highway 44 from Marianna and Highway 1 and Highway 242 from Helena-West Helena.

Within the forest there are hunting, fishing, and camping opportunities for visitors. Along with an abundance of other wildlife, alligators have been stocked in the Beaver Pond on the east side of the area, and eagles have been sighted around Bear Creek and along the Mississippi River. There are two cemeteries located within the forest and Indian burial grounds have been located along the St. Francis and Mississippi Rivers.

Natural Areas

Several natural areas designated by the Arkansas Natural Heritage Commission are located proximate to the study area. The natural areas are considered a part of the Arkansas System of Natural Areas.

- The *Smoke Hole Natural Area* is located in the southern part of Lonoke and Prairie counties and is made up of water tupelo swamp, mixed bottomland hardwood forest, and a small area of upland hardwood forest. The natural area contains approximately two miles of Bayou Two Prairie.

- *Roth Prairie Natural Area* is located in Arkansas County, southwest of Stuttgart, and is comprised of a series of tallgrass prairies that appear in the lower Mississippi River Valley. The natural area is one of the larger remnants of this plant community found in the Grand Prairie of eastern Arkansas.

THREATENED AND ENDANGERED SPECIES

A "threatened" species is one that is likely to become endangered in the foreseeable future. An "endangered" species is one that is in danger of extinction throughout all or a significant portion of its range. There are several species of endangered, threatened or rare plants and wildlife for which suitable habitat is available within the Highway 79 study area. The U.S. Fish and Wildlife Service's (USFWS) Threatened and Endangered Species System (TESS) was consulted to find listings of federally-listed threatened and endangered species by state. The AFGC's website was also reviewed for primary baseline information on state-listed or candidate species that have a historical record of occurrence within Arkansas and potentially within the Highway 79 study area. Section 6 of the Endangered Species Act provides for coordination with states through funding conservation actions involving listed species. In Arkansas, the AGFC has a Cooperative Agreement with the USFWS for Section 6 activities for animal species and the Arkansas Natural Heritage Commission for plants.

The USFWS listed 29 species (23 animals and six plants) within their TESS system for Arkansas. **Table 3-8** lists the endangered, threatened and rare species with potential to be located within the Highway 79 study area.

Table 3-8
Endangered, Threatened and Rare Species
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Species	State Status	Federal Status	Descriptions
Animals			
American Alligator	T	T	*Alligator mississippiensis,* found in southern AR, in Grassy Lake, waterways of Hempstead County
American Burying Beetle	E	E	*Nicrophorus americanus,* found in nine AR counties
Bald Eagle	T	T	*Haliaeetus leucocephalus,* successful nesting and winter habitat in AR, past sightings in study counties
American Peregrine Falcon	E	E	*Falco peregrinus anatum,* found near White River
Pink Mucket Pearlymussel	E	E	*Lampsilis abrupta,* found in the Mississippi, Spring and White Rivers, with smaller numbers in the Ouachita and Little River systems.
Fat Pocketbook	E	E	*Potamilus capax,* found in St. Francis River drainage areas.
Pallid Sturgeon	E	E	*Scaphirhynchus albus,* found in the Mississippi and St. Francis Rivers

Table 3-8 (continued)
Endangered, Threatened and Rare Species
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Species	State Status	Federal Status	Descriptions
Least Tern	E	E	*Steerna antillarum,* found in Arkansas, Mississippi and White Rivers
Scaleshell Mussel	E	E	*Leptodea leptodon,* found in St. Francis, Spring, South Fork Spring, South Fourche LaFave, and White rivers, and Frog Bayou
Arkansas River Shiner	T	T	*Notropis girardi,* found in the Arkansas River basin
Plants			
Eastern Prairie Fringed Orchid	T	T	*Platanthera leucophaea,* found in prairie areas
Running Buffalo Clover	E	E	*Trifolium stoloniferum,* found in prairie areas

CULTURAL RESOURCES

National Register Properties listed on the National Register of Historic Places (NRHP) were evaluated for the entire study area. Cultural resources on the NRHP were reviewed to identify historic sites that may be located in the Highway 79 study area. On the state level, the Arkansas, Mississippi, or Tennessee Historic Preservation Program identifies, evaluates, registers, and preserves the state's historic and cultural resources. Each resource placed on the list is reviewed to determine the potential of each property to affect the quality and significance in American history, architecture, archeology, engineering, and culture by the State Historic Preservation Office (SHPO).

Architectural Resources

Table 3-9 below shows those historic resources listed on the NRHP. National Historic Landmarks in the study area are also included on the NRHP. The Louisiana Purchase Initial Survey Point Site located at the junction of Monroe, Lee, and Phillips counties in eastern Arkansas is located in approximately 10 miles to the south of the Highway 79 corridor. It is the site from which all surveys of land acquired in the Louisiana Purchase were determined in 1815.

Table 3-9
Architectural Resources[1]
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	No. Resources in Study Area	Total No. Resources in County
Jefferson, AR[2]	3	51
Arkansas, AR	5	12
Monroe, AR	33	35
Prairie, AR	0	10
Lee, AR	10	10
St. Francis, AR	0	6
Crittenden, AR	3	8
Shelby, TN[3]	0	146
Desoto, MS	0	6

1: Resources include only Architectural Resources; Bridge Resources and Archeological Resources are shown in Table 3-10 and 3-11. 2: Resources in Pine Bluff are not considered within the impact area for the study area. 3: Resources in Memphis are not considered within the impact area for the study area. Source: National Register of Historic Places

Bridge Resources

Several historic bridge resources are located within the study area counties and included in **Table 3-10**. The bridge resources that could be impacted by the location of an upgraded Highway 79 Corridor or new Mississippi River crossing include the following resources. The existing I-55 bridge (Memphis-Arkansas Memorial Bridge) was added to the National Register of Historic Places in 2001. It is significant in the category of engineering. The Frisco Railroad Bridge is immediately upstream of the I-55 bridge and downstream of the Harahan Railroad Bridge. The Frisco Bridge may be considered historically significant because it was designed by George S. Morison. However, it is not listed on the NRHP at this time. In Clarendon, the Highway 79 bridge crossing the White River is on the NRHP. NRHP architectural and bridge resources are identified on Figure 3-1.

Table 3-10
Bridge Resources
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Total No. Resources in County
Jefferson, AR	1
Arkansas, AR	0
Monroe, AR	1
Prairie, AR	1
Lee, AR	0
St. Francis, AR	1
Crittenden, AR	1
Shelby, TN	0
Desoto, MS	0

Source: National Register of Historic Places

Archeological Resources

In Arkansas, archeological sites on the NRHP include prehistoric rock art sites, Caddo Indian mounds in the Ouachita and Saline River valleys, and Mississippian town sites in the Delta. In most instances, the exact site of an archeological site is kept confidential in order to protect the site from vandals or trespassers. However, there are several known archeological sites in Arkansas, located within or proximate to the Highway 79 study area. Some of the major sites include:

- The Menard-Hodges Mounds in Arkansas County dates from the late Prehistoric era to the 1680s and has Baytown and Mississippian components and evidence of contacts with Europeans. It is also designated as a National Historic Landmark.

- Chucalissa is a small Late Mississippian town site that is located on the loess bluffs about 6.2 miles south of downtown Memphis, Tennessee. The site has the remains of potentially two substructural mounds and was occupied for at least 100 years, beginning in approximately A.D. 1400 and continuing to the early 1500s. It is currently managed as an archeological park by the University of Memphis.

Table 3-11 shows the number of archeological sites by county listed on the NRHP.

Table 3-11
Archeological Resources
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Total No. Resources in County
Jefferson, AR	0
Arkansas, AR	2
Monroe, AR	1
Lee, AR	0
St. Francis, AR	0
Crittenden, AR	0
Shelby, TN	1
Desoto, MS	0

Source: National Register of Historic Places

SECTION 4(f) RESOURCES

Section 4(f) declares that the use of protected lands for transportation projects may be approved by the FHWA only if no prudent or feasible alternative exists to avoid the resource and if the project includes all possible planning to minimize harm. A Section 4(f) evaluation must be prepared for each location within a proposed project before the use of a Section 4(f) land can be approved. A Section 4(f) property can include publicly owned land of a public park, recreation area, wildlife/waterfowl refuge, or land of a historic site of National, State, or local significance.

Within the Highway 79 study area, there is potential to impact Section 4(f) resources. If Highway 79 was upgraded to interstate standards or a new Mississippi River crossing was constructed, 4(f) resources in the proposed alternatives' corridors would need to be identified and evaluated.

AIR QUALITY

The Federal Clean Air Act Amendments of 1970 (CAAA) required the adoption of air quality standards. These standards were established in order to protect public health, safety and welfare from unknown or anticipated affects of sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter and lead (Pb). The CAAA of 1970 required all states to submit to the U.S. Environmental Protection Agency a list identifying those air quality control regions, or portions thereof, which meet or exceed the National Ambient Air Quality Standards (NAAQS) or cannot be classified because of insufficient data. Portions of air quality control regions which are shown by monitored data or air quality modeling to exceed the NAAQS for any criteria pollutant are designated "nonattainment" areas for that pollutant.

The 1990 CAAA established procedures for determining the conformity with the requirements of the federal regulations. These regulations are published in 40 CFR Parts 51 and 93.

The Memphis/Shelby County region has been a nonattainment area for both ozone and carbon monoxide with regard to NAAQS, but was redesignated as an attainment area for both pollutants. The Memphis region is currently considered a maintenance area for the purposes of attainment of the NAAQS. The existing Transportation Improvement Plan (TIP) and Long Range Transportation Plan (LRTP) have been found to conform to the requirements of the 1990 Clean Air Act Amendments and the U.S. EPA 1997 Transportation Conformity Rule as well as the State Implementation Plan (SIP). The Memphis region is anticipated to violate the new NAAQS 8-hour ozone requirements and may also violate maximum levels of small particulates (p.m. 2.5). The new NAAQS place more restrictive requirements on the region and conformity determinations may be more difficult to achieve in the future. The EPA has provided a timeline to prepare for the new 8-hour ozone standard. By 2003, states submit plans to the EPA identifying how they will meet the updated ozone standard. For areas that haven't met the 1-hour ozone standard, ongoing efforts are sufficient through the current attainment dates. In 2004 states begin implementing the plan and by 2012 they are following their respective designations. States may have up to 12 years to meet the new ozone standard. Efforts to reduce congestion in the I-55 and I-40 bridge locations may have a positive impact on air quality in the region.

The West Memphis, Arkansas region conducts separate conformity analyses and is neither a maintenance or nonattainment area. According to their 2025 Long Range Transportation Plan, the EPA could declare the area nonattainment for ozone when the new 8-hour standards take effect.

HAZARDOUS MATERIALS

A hazardous material review was conducted for the Highway 79 Corridor and the Memphis metropolitan area. The purpose of the review was to identify major sites within the corridor that are contaminated, or potentially contaminated, with hazardous materials or waste that pose a significant potential of impacting improvements or relocation of the Highway 79 transportation facility. Particular attention was given to the location of Superfund level sites. Sites such as service stations (underground storage tanks), dry cleaners, auto repair shops and generators of designated regulated material were not included in the review.

For the purposes of this review, hazardous wastes and materials are defined as products or wastes regulated by the U.S. Environmental Protection Agency (EPA) or the Arkansas Department of Environmental Quality (ADEQ). These include substances and sites regulated under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA).

The hazardous waste assessment for the Highway 79 Corridor involved a review of regulatory databases that was conducted by viewing Internet files of the EPA, with mapped locations dated August 20, 2002. Field surveys or investigations were not conducted for this study.

The databases searched include:

- NPL – National Priorities List is EPA's list that identifies sites for remedial actions under the Superfund program.

- CERCLIS – Comprehensive Emergency Response, Compensation, and Liability Act is EPA's list of sites which are either proposed to or on the NPL list, and sites which are in the process of assessment for possible inclusion on the NPL.

- NFRAP – No Further Remedial Action Planned includes CERCLIS sites which following an investigation, no contamination was found, contamination was quickly removed or contamination was not serious enough to require Superfund action.

- RCRA CORRACTS - Resource Conservation and Recovery Act Corrective Action Sites are facilities undergoing corrective action.

- RCRA TSD – Resource Conservation and Recovery Act facilities which transport, store, or dispose of hazardous waste.

Potential Sites

In general, potential sites in the study area counties can be characterized as follows:

- 4 NPL Superfund sites (2 in Arkansas, 2 in Tennessee)
- 56 CERCLIS sites (14 in Arkansas, 1 in Mississippi and 41 in Tennessee)
- 255 NFRAP sites (37 in Arkansas, 13 in Mississippi and 205 in Tennessee)
- 5 RCRA CORRACTS sites (3 in Arkansas, 2 in Tennessee)

RCRA TSD sites were not determined for this level of study. Of the four NPL sites within the study area, only the two in Arkansas have potential to impact the location of a transportation facility for this study. High impact is defined as a site that would require extensive time and cost to assess and remediate. Both sites are closed and should be avoided. The two NPL are described below:

- *Gurley Pit* – The site consists of 3.3 acres located one mile north of Edmondson in Crittenden County. The principle pollutants at the Gurley Pit Superfund site include PCB (sludge and oil), barium, lead and zinc (surface water, soil and sludge). The volume of pollutants includes 20,000 cubic yards of sludge. Gurley Pit is located in the 100-year floodplain of the Fifteen Mile Bayou. The record of decision by the EPA was to stabilize sludges and place within an onsite RCRA vault. The decision also determined to treat and to discharge water. The site was included on the NPL. The Arkansas Department of Environmental Quality (ADEQ) concurred on the deletion of the site from the NPL by letter on 10/11/99 after remedial action had been completed.

- *South 8th St. Landfill* – The site is located in West Memphis in Crittenden County Arkansas, across the Mississippi River from Memphis, Tennessee. The site is comprised of a 16 acre landfill containing industrial and municipal waste. A 2.5 acre oily sludge pit located on the site was treated during the Remedial Action completed in August 2000. The 16 acre landfill has a natural soil cover with a minimum thickness of two feet. It is located on the two-year floodplain between the St. Francis Levee and the Mississippi River. The site was listed on the NPL. All Remedial Action was completed in August 2000 and the EPA and ADEQ conducted a final inspection on 8/22/2000.

An upgrade of Highway 79 or a new Mississippi River crossing would avoid these NPL sites. The known listed NPL Superfund sites in the study area are shown on Figure 3-1.

Thirty-four of the CERCLIS sites in Shelby County, Tennessee are located in Memphis, the rest are in other portions of Shelby County. Since this study looks at tying alternatives into Highway 61, these CERCLIS sites should not be impacted by the project location. In

Arkansas, eight of the 14 CERCLIS sites are located in Pine Bluff and if upgrades to Highway 79 were considered, they would most likely begin east of the city limits of Pine Bluff. The NPL sites are also listed as CERCLIS sites.

While there are numerous NFRAP sites in the study corridors, they are considered sites that have no further remedial action required. One RCRA site is located to the north of Pine Bluff and should not be impacted and two are located in Crittenden County and should be avoided. In Tennessee, both RCRA sites are located in Memphis and should not be impacted by a transportation improvement in this study.

SEISMIC CONSIDERATIONS

Although often overshadowed by the seismicity of the American west coast and the Pacific Rim, the New Madrid, Missouri region is a very significant seismic threat to the midwestern United States. The general public, even if aware that earthquakes often occur in the central United States, does not recognize the potential destruction that would follow a major event, nor do they realize that New Madrid, Missouri is the site of the most severe series of earthquakes known to have occurred. Fortunately, state departments of transportation, the U.S. Federal Highway Administration (FHWA), and many local building code officials are acutely aware of the risk and the potential damage - in terms of loss of life as well as economic losses - which would follow even a moderate event in the New Madrid region.

The New Madrid Seismic Zone is the location of the most violent series of seismic events ever recorded and is a candidate to experience a significant earthquake within the not so distant future. Studies of the available data indicate that the three most significant events of the winter of 1811-1812 had surface wave magnitudes (Ms) of about 8.6, 8.4, and 8.7. It has been suggested that the recurrence interval of magnitude eight quakes in this region is between 550 and 1200 years.

Memphis, Tennessee is located approximately 100 miles from New Madrid, Missouri, and as a result is highly vulnerable to even a moderate event. An earthquake could pose a serious threat to the movement of goods by rail and truck on a local and national basis. Currently, none of the highway or railroad bridges in the Memphis area are designed to meet seismic considerations. However, the Tennessee Department of Transportation is currently performing a seismic retrofit on the I- 40 bridge.

VISUAL QUALITY AND AESTHETICS

The study area is located in the Mississippi Alluvial Plain, also known as the Delta. The Highway 79 corridor encompasses middle-eastern Arkansas as well as portions of De Soto County, Mississippi and Memphis, Tennessee. The Delta is very flat, varying only about 150 feet in its entire 250-mile length of its natural division. The Delta soil is deep but impermeable, making drainage poor and the Delta forests are comprised of mainly bottomland hardwoods adapted to these wet, poorly drained soils and periodic inundation.

The study area includes small portions of Crowley's Ridge, an area of Arkansas where the topography rises steeply 250 feet above the nearly flat Delta. It is covered with loess (wind-blown material). Some sections of Grand Prairie also exist in the study area in Monroe and Arkansas counties, which include large natural grasslands. The primary land uses throughout the corridor are agricultural including the production of rice, corn, and cotton.

The study corridor is very rural with moderate to low population. The cities of Pine Bluff, Marianna, Stuttgart and West Memphis in Arkansas are exceptions and all have populations of over 5,000 persons. The large metropolitan area of Memphis, Tennessee is the eastern terminus of the project.

Visual Quality Rating

The visual impacts of a project may be quite varied in different areas of a project corridor because the areas themselves can be visually distinct and can exhibit unique visual characteristics. Topography and landscape/land use components can be used to define where visual environments change in visual character. The evaluative criteria used in this assessment are taken from federal visual assessment guidelines.

Within the Highway 79 study area, the Mississippi, Arkansas, White, and St. Francis rivers, the nearby White River National Wildlife Refuge and the small areas of natural grasslands are the most scenically significant contributors to the visual quality and identity of the environment. The relative existing visual quality of the visual environments within the study area is presented in **Table 3-12**.

Viewers

Visual impact is determined by change in the visual environment as related to viewer response. For the purposes of a highway or bridge project assessment, there are two distinct categories of viewer response to be considered: viewers who are users of the highway or bridge facility (views from the road) and people who can observe the roadway from an adjacent vantage point (views of the road). Individuals that have the potential for undesirable views of the road are referred to as "Sensitive Visual Receptors". The relative concentration of sensitive visual receptors or viewers is high for residential areas, moderate

Table 3-12
Visual Quality Rating
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Visual Environment	Visual Quality Rating
Forested Areas	High
Rivers and Streams	High
Grasslands	High
Agricultural Land	Moderate
Residential Development	Moderate
Commercial/Industrial Development	Low

for agricultural areas and low in the remainder of the study area. **Table 3-13** shows the views and visual receptors.

Table 3-13
Views and Visual Receptors
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Visual Environment	Quality of Views From the Road	Relative Concentration of Sensitive Visual Receptors
Forested Areas	High	Low
Rivers and Streams	High	Moderate
Grasslands	High	Moderate
Agricultural Land	Moderate	Moderate
Residential Development	Low	High
Commercial/Industrial Development	Low	Low

PERMITS

Upgrading Highway 79 to Interstate standards or constructing a new Mississippi River bridge would require permits from Federal, State, and Local Governments.

- The U.S. Coast Guard (CG) regulates bridges over navigable waterways through Section 9 of the Rivers and Harbors Act of 1899.

- The U.S. Army Corps of Engineers (USACE) also regulates structures and work in navigable waterways through Section 10 of the Rivers and Harbors Act of 1899.

- The USACE regulates the placement of fill and dredged material in "Waters of the U.S.", including wetlands, through the Clean Water Act, Section 404 permit. The Arkansas Department of Environmental Quality (ADEQ) administers the Section 401 Water Quality Certification in accordance with Section 401 of the Clean Water Act. This program evaluates applications for federal permits (USACE Section 404 Permit) and licenses that involve the discharge to waters of the state and determines whether a proposed activity complies with Arkansas surface water quality standards.

The Highway 79 project will comply with Arkansas, Tennessee, and Mississippi Floodplain Management Act.

If the project is determined to be feasible for either an upgrade of Highway 79 to an Interstate-type facility or construction of a new Mississippi River crossing, appropriate permits will be applied as needed during design and as funding is secured.

This chapter documents the alternative improvement concepts considered in this study and the evaluation process and criteria used for identifying impacts and benefits for the *Highway 79 and Mississippi River Crossing Study*. The impacts and feasibility of various Mississippi River crossing concepts within the Memphis, Tennessee metropolitan statistical area related to traffic/mobility, social, environmental, engineering considerations and costs, and benefit/cost analysis are summarized in Chapters 5-9.

DISMISSAL OF UPGRADING HIGHWAY 79 TO AN INTERSTATE-TYPE FACILITY

The initial purpose of this study was to determine the feasibility of constructing an Interstate-type facility in the vicinity of Highway 79 (either on new or existing location) between Pine Bluff, Arkansas and Highway 61 near Memphis. After data collection, field investigations, analysis of existing and future demographics, as well as existing and projected travel demand, it was concluded that it is not feasible to construct an Interstate-type facility in the vicinity of Highway 79 (on either new or existing location) between Pine Bluff, Arkansas and Highway 61 near Memphis. The following is a synopsis of the rationale for this recommendation:

- Traffic Impacts: As shown in Figure 2-3, Year 2001 traffic volumes range from 820 vehicles per day (vpd) on Highway 79 just east of Highway 49 to 5,400 vpd near Stuttgart. Traffic volumes average between 3,500 vpd to 3,600 vpd in the southern section (between Pine Bluff and Stuttgart), between 820 vpd to 5,400 vpd in the central section (between Stuttgart and Marianna) and between 1,200 vpd to 2,800 vpd in the northern section (between Marianna and Highway 70). The figure also shows the historical traffic volume growth during the five-year period between Year 1996 and Year 2001. The average annual traffic growth rate ranged from a minus one percent to two percent in the southern section, two percent in the central section (with an exception of a nine percent growth rate near the community of Roe), and between zero to four percent in the northern section. The existing level-of-service for Year 2001, as shown in Figure 2-4, indicates LOS C or better on Highway 79 within the project corridor. LOS C is considered to be the limit of acceptable operation in most rural areas.

  Future traffic volume forecasts were developed for Highway 79 using the national travel demand model developed by Wilbur Smith Associates as part of the Interstate 69 Feasibility Study (1,650 mile corridor from Mexico to Canada) and consideration of historical traffic growth. The modeling for this study assumed that the I-69 corridor (NAFTA) would be implemented. Projected LOS on Highway 79 within the study corridor in Year 2023 is also shown in Figure 2-4. Year 2023 projected traffic volumes range from 1,400 vpd near Chatfield to 4,500 vpd near Stuttgart. The highest annual growth is approximately two percent, although some locations showed no growth due to the implementation of the I-69 corridor.

Highway 79 is anticipated to operate generally at an acceptable LOS C or better in Year 2023.

- Crash Rates: Crash data was provided for the five-year period from 1997 to 2001 and included information on fatality, incapacitating injury, non-incapacitating injury, possible injury, and property damage only crashes. After an increase in crashes between 1997 and 1998, total number of crashes has decreased in 1999 and 2000 and remained relatively constant at 107 total vehicle crashes in 2001.

  The crash rate per roadway section was calculated based upon the number of crashes per million vehicle miles traveled (MVMT). During the last five year period, only four sections had crash rates greater than the statewide average rate for rural, two-lane, undivided roadways with no control of access, but none of the sections crash rates were greater than the statewide average for more than two of the five years. In Year 2000, all of the sections had crash rates lower than the statewide average and in Year 2001 only one section in Monroe County south of Clarendon had a crash rate higher than the statewide average.

- Demographics: Historical and projected population and employment growth along Highway 79 in the seven Arkansas counties have been nominal and are projected to remain negligible to Year 2025. The historical population growth from Year 1990 to Year 2000 ranged between minus one percent to about a half percent growth per year. Projected population growth from Year 2000 to Year 2025 ranges from minus half a percent to approximately a half percent growth.

  The historical and projected employment growth rates are also very low. Between Year 1990 and Year 2000 the historical employment growth ranged from minus half a percent to one and half percent per year in the Arkansas counties. The projected employment from Year 2000 to Year 2025 ranges from zero to two percent per year.

If the projected demographics change considerably in the future, the option of widening Highway 79 to an Interstate-type facility should be re-examined. Preliminary costs to upgrade Highway 79 to a four-lane facility is approximately $565 million (includes right-of-way and design). Costs to construct a new four-lane Interstate-type facility would be approximately $939 million (includes right-of-way and design). Based on the current conditions and existing projections for Highway 79, there does not appear to be a need for upgrading this facility to Interstate standards.

The remainder of this study has focused on the feasibility of various Mississippi River crossing concepts between Highway 79 and Highway 61 in either Mississippi or Tennessee. Based on existing structural conditions, existing and projected traffic volumes on the existing I-40 and I-55 bridges, and projected demographics in the Memphis metropolitan area, there is a need for river crossing improvements in the area.

GOALS OF MISSISSIPPI RIVER CROSSING CONCEPTS

There are a number of corridor-wide goals for the Mississippi River crossing concepts, which include:

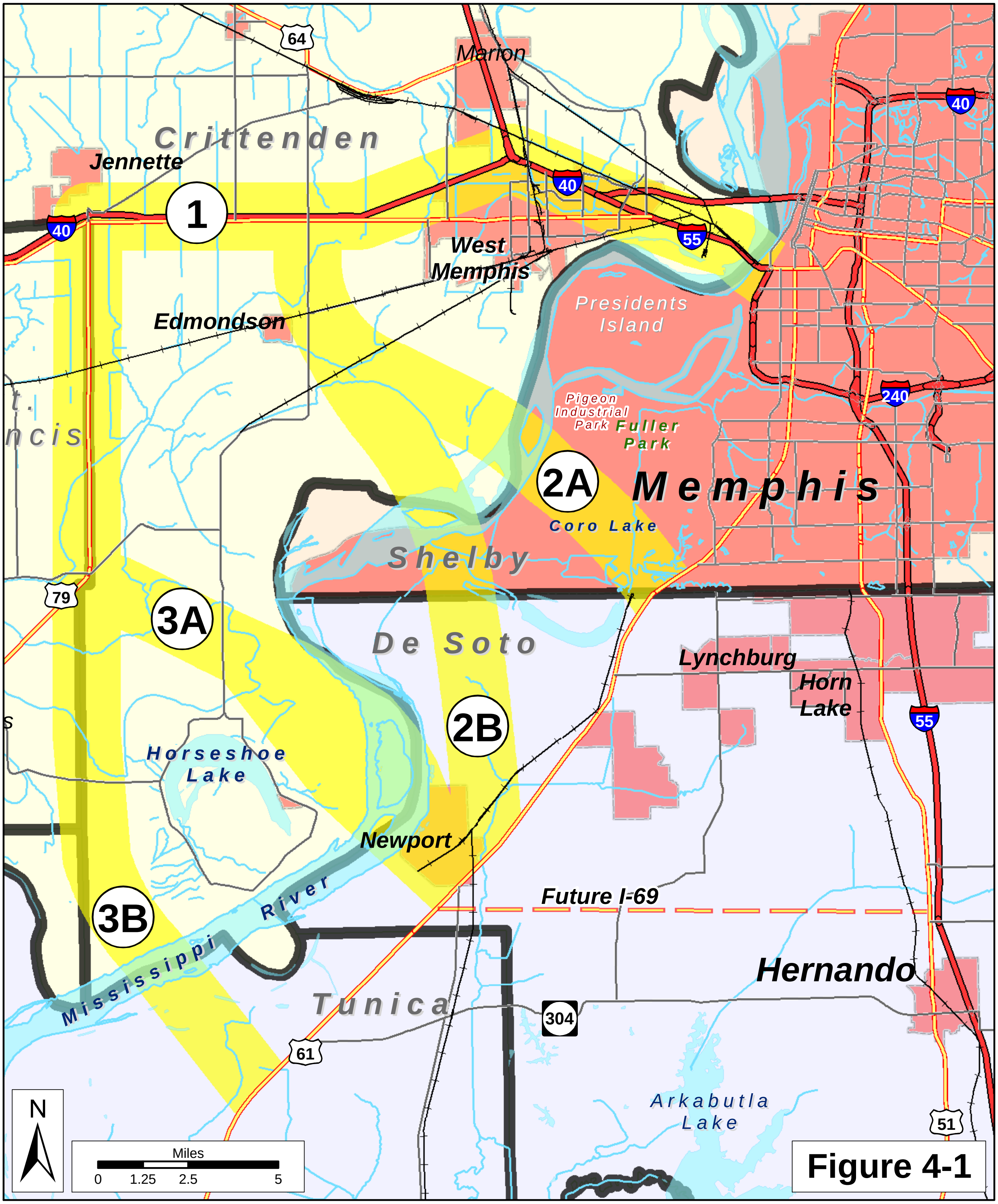
- Enhancing the connectivity of the major roadway system in Arkansas, Mississippi, and Tennessee including I-40, I-55, Highway 79, Highway 61, and the Future I-69 Corridors;
- Improving regional and local transportation systems by increasing transportation capacity to meet current and future demand;
- Providing connections to intermodal facilities and industrial interests within the study area;
- Facilitating the safe and efficient movement of persons and goods by fostering a reduction in incident risk and addressing existing safety concerns; and,
- Encouraging economic development and growth opportunities within the Mississippi Delta Region.

CROSSING CONCEPTS

An initial screening process was used to identify conceptual Mississippi River crossing concepts for the Memphis metropolitan area that could be feasible from an engineering, traffic, environmental, economic, and socioeconomic standpoint. This study required each of the concepts to provide connectivity and access to existing Highway 79 and Highway 61, which precludes identifying any crossing corridors to the north of the I-40/I-55 bridges within the Memphis metropolitan area. The Mississippi River is the primary constraint in determining the location of the concept route within the study area. As a result, the best rough locations for the crossing of the river will generally control the location of the roadway and approaches for each concept. Once the most feasible crossing locations were identified, a range of corridors that is practical and reasonable within the crossing areas were defined and assessed.

The following Mississippi River crossing concepts were identified for this study. The concepts are shown on **Figure 4-1**.

Concept 1: Improvement of Existing Bridge – This concept represents an improvement to the existing I-55 Mississippi River crossing corridor but does not include construction of a third Mississippi River crossing in the Memphis metropolitan area. The current I-55 bridge is over 50 years old and carries four 12-foot lanes of traffic with inside and outside shoulders less than one foot wide. Under Concept 1, the existing I-55 bridge would be replaced and relocated just south of its present location due to the rail crossings to the north. I-55 would be widened to three lanes in each direction, and the common



Highway 79 Feasibility Study: Candidate Concepts Map

Limited Access Higway
Highway
Local Roads
Railroads
Rivers/Streams
Incorporated Areas
Proposed Bridge Crossing Concepts
Arkansas Counties
Mississippi Counties
Tennessee Counties

HWY 79

segment of I-40 and I-55 would be widened to four lanes in each direction. This concept is not a no-build, no-cost option, since reconstruction of the existing structure is needed to ensure the continued integrity of the structure and its ability to meet future traffic demands. Cost considerations and social and environmental constraints were examined for Concept 1 from the I-40/Highway 79 Interchange to the I-55 Crump Interchange in Memphis, Tennessee. Due to the complexity of the existing corridor, this study does not address improvements that may be needed to I-55's current connection to Highway 61. The study does recognize that improvements may be needed to this corridor to improve the access and connectivity between Highway 79 and Highway 61 for this concept. The existing I-55 bridge would either be converted to public use, such as a bicycle or pedestrian bridge, or it would be removed.

Concept 2A: Industrial and Intermodal Connectivity – Concept 2A represents a new, third Mississippi River crossing in the vicinity of Pigeon Industrial Park, just south of President's Island. This concept would provide access to the metropolitan area industrial complexes. Concept 2A starts at I-40 west of West Memphis near Highway 147, where it provides connectivity to the Highway 79 Corridor and continues southward to Edmonson. It extends southeast of Edmonson crossing the Mississippi River near the Pigeon Industrial Park (approximately 10 miles downstream of the I-55 bridge), southward near Coro Lake to a terminus at Highway 61.

Concept 2B: Mississippi-Tennessee Border - Concept 2B begins at I-40 west of West Memphis near Highway 147, where it provides connectivity to the Highway 79 Corridor, and continues southward to Edmonson. It extends south-southeast of Edmonson and crosses the Mississippi River near the Tennessee-Mississippi state line (approximately 15 miles south of the I-55 bridge) and continues southward approximately paralleling the Mississippi River and intersects near the interchange of Highway 61 and Future Highway 304 (Future I-69) near Newport, Mississippi.

Concept 3A: North of Horseshoe Lake - Concept 3A begins at the I-40/Highway 79 interchange and continues southward paralleling existing Highway 79 until Highway 79 curves southwest towards Hughes, Arkansas. At this point, the concept extends southeast just northeast of Horseshoe Lake and intersects near the interchange of Highway 61 and Future Highway 304 (Future I-69) near Newport, Mississippi. This concept is located approximately 26 miles downstream of the I-55 bridge.

Concept 3B: South of Horseshoe Lake - Concept 3B begins at the I-40/Highway 79 interchange and continues southward paralleling existing Highway 79 until Highway 79 curves southwest towards Hughes, Arkansas. It continues on new alignment due south and then extends southwest of Horseshoe Lake and veers southeast to connect to Highway 61 at the interchange of existing Highway 304 and Highway 61. This terminus is roughly seven miles from the Future Highway 304 (Future I-69) and Highway 61 interchange. This concept is located approximately 35 miles downstream of the I-55 bridge.

The following sections describe the screening process used to develop the crossing concepts and the criteria they were evaluated against.

EVALUATION PROCESS

An evaluation process was used to reduce the number of possible locations for a new Mississippi River crossing between Interstate 40 and Highway 61 in either Mississippi or Tennessee. For each candidate concept information was compiled as part of a preliminary evaluation process. The process consisted of an evaluation of the major natural, physical, and environmental barriers and constraints, combined with public and agency coordination. Each concept was given equal consideration as part of this process.

The evaluation process included the following major categories:

- Public Input
- Transportation/Mobility Impacts
- Economic Development Considerations
- Social Impacts
- Environmental/Land Use Constraints
- Engineering/Cost Considerations

CONSIDERATION OF FATAL FLAWS

This evaluation process consisted of identifying any areas where it would not be feasible to locate a Mississippi River crossing concept. This is referred to as the "fatal flaw" evaluation process. Concept locations that were not considerable feasible due to extreme flaws such as severe engineering constraints, major community impacts, or very high costs were dismissed at this time.

The following areas were considered to be major obstacles with environmental and social constraints and were avoided when developing the candidate concepts for the study area:

- **Horseshoe Lake** – Horseshoe Lake was avoided because of the residential community and recreational activities located within the area as well as lake crossing constraints (refer to Figure 3-2).
- **Presidents Island –** Presidents Island was avoided to minimize impacts to industrial interests on or in close proximity to the island and wetland management areas (refer to Figure 8-1).
- **Town of Edmondson, Arkansas –** The town was avoided to minimize residential displacements and avoid segmentation of the community (refer to Figure 3-2).
- **Midway Lake** – Midway Lake was avoided because it has greater floodplain area concerns and since it is located farther from the Memphis metropolitan area it may not attract as much traffic as other locations (refer to Figure 3-2).

- **Cow Island/Armstrong Bar –** This area has floodplain crossing concerns that offer more challenging constructability issues and therefore was avoided (refer to Figure 3-2).
- **Horn Lake Community –** The Horn Lake area was avoided because of the residential community and recreational activities located within the area as well as lake crossing constraints. There are also wetlands located in proximate to the lake (refer to Figure 3-2).
- **T.O. Fuller State Park and Chucalissa Archeological Site –** These resources were avoided to minimize or avoid impacts to Section 4(f) properties in the study area and protect public lands (refer to Figure 3-2).
- **City of West Memphis, Arkansas** - The city was avoided to minimize residential and business displacements and avoid segmentation of the community and its industrial and commercial interests (refer to Figure 3-2).

Table 4-1 lists the evaluation criteria that the concepts were screened against.

Table 4-1
Evaluation Criteria
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

CRITERIA
Public Input
Preferred Concept Location
Most Important Criteria
Traffic
Projected Traffic Volumes
Level-of-Service
Vehicle Miles of Travel
Vehicle Hours of Travel
Safety
Connectivity
Economics
Vehicle Operating Cost Savings
Travel Time Savings
Crash Cost Savings
Benefit/Cost Ratio
Social
Residential/Commercial Displacements
Environmental Justice
Economic Development Potential
Visual Quality and Aesthetics
Cultural Resources
Section 4(f)/Sensitive Land Uses
Environmental
Floodplains
Natural Community and Habitat
Wetlands
Hazardous Materials Sites
Noise
Air Quality

Table 4-1 (continued)
Evaluation Criteria
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

CRITERIA
Water Quality
Farmlands
Threatened and Endangered Species
Secondary and Cumulative Impacts
Engineering/Costs
Concept Lengths
Constructability
Drainage
Topography
Geometry
Dredge Disposal
Navigation Clearance
Seismic Potential
Cost Estimates
Roadway Construction Costs
Bridge Construction Costs
Operations and Maintenance Costs
Right-of-Way
Utilities

The following chapters discuss the various impacts and benefits of the different Mississippi River crossing concepts.

This chapter documents the impacts that the concept crossings would have on traffic and mobility within the study area. Transportation-related evaluation criteria included projected traffic volumes, level-of-service (LOS), vehicle miles of travel (VMT), vehicle hours travel (VHT), and safety impacts.

PROJECTED TRAFFIC VOLUMES

Using the refined I-69 travel demand model, future Year 2023 traffic volume projections were developed for the Mississippi River concepts, as well as a Year 2023 No-Build condition. The use and refinement of the I-69 travel demand model was discussed in detail in Technical Memorandum No. 3, *Travel Demand Model/Forecasts*, developed for this study. Future Year 2023 traffic volume projections for the various concepts, as well as the existing I-55 and I-40 bridges, are identified in **Table 5-1**.

Table 5-1
Projected Year 2023 Traffic Volumes
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Projected Year 2023 Traffic Volumes (vehicles per day)		
	I-40	I-55	New Bridge
No-Build	46,200	49,300	---
Concept 1	46,000	49,600	---
Concept 2A	46,000	32,300	17,800
Concept 2B	45,900	28,300	22,900
Concept 3A	45,000	31,600	20,600
Concept 3B	46,000	39,500	10,600

Projected Year 2023 traffic volumes along the I-40 and I-55 crossings for the No-Build alternative and Concept 1 alternative are virtually the same at around 46,000 vehicles per day (vpd) and 49,000 vpd, respectively. This represents a compounded annual growth rate of 1.2 percent per year over the 2003 volume of 38,000 vpd.

For the remaining build concepts, projected traffic volumes are generally the same along the I-40 bridge crossing at around 46,000 vpd. Nearly all of the traffic projected to use the bridge concepts is projected to divert from the existing I-55 bridge crossing. Concept 2B results in the most significant diversion and improvement in traffic flows on I-55. Projected traffic volumes on a new bridge crossing range from a high of 23,000 vpd on

Concept 2B, to approximately 11,000 vpd on Concept 3B. Projected traffic volumes along the new bridge crossings support development of four-lane freeway facilities.

LEVEL-OF-SERVICE

An important factor in evaluating projected traffic volumes and roadway utilization is the determination of level-of-service (LOS). LOS is a qualitative measure of operating conditions and is directly related to a roadway's volume to capacity (v/c) ratio (ratio of flow rate to capacity), as indicated in **Table 5-2**. LOS is given a letter designation from A to F, with LOS A representing very good operating conditions and LOS F representing poor operating conditions with high delays and heavy congestion. LOS D is generally considered to be the limit of acceptable operations in an urban area. **Table 5-3** presents the different levels-of-service and their respective volume/capacity ratios for two-lane and four-lane facilities.

Roadway capacity is defined as the maximum number of vehicles that can be accommodated on a roadway facility during a particular time period under prevailing roadway, traffic, and control conditions. Roadway capacities are based on existing traffic characteristics in the Memphis area and utilize the procedures identified in the 2000 Highway Capacity Manual.

Table 5-2
Level-of-Service Definitions for Roadways
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

LOS	Description
A	Highest quality of traffic service; free-flow conditions; motorists drive at desired speed; minor traffic flow disruptions.
B	Good quality of traffic service; reasonable flow conditions; noticeable presence of other vehicles; ability to maneuver is slightly restricted.
C	Stable traffic flow; noticeable increase in platoon formation; ability to maneuver noticeably restricted; minor disruptions could cause traffic service deterioration.
D	Approaching unstable traffic flow; speed and ability to maneuver severely restricted; limit of acceptable operations.
E	Unstable traffic flow; travel demand approaching or at roadway capacity.
F	Heavily congested flow; traffic demand exceeds roadway capacity; forced or breakdown traffic flow.

Source: Highway Capacity Manual, Special Report 209, TRB, 2000.

Table 5-3
Level-of-Service and Respective Volume/Capacity Ratio
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Level-of-Service (LOS)	Two-Lane Roadways V/C Ratios	Four or Six-Lane Freeways V/C Ratios
LOS A-B	<0.20	<0.40
LOS C-D	0.21 – 0.60	0.40 – 0.80
LOS E-F	>0.61	>0.80

Source: Wilbur Smith Associates and Highway Capacity Manual, 2000

Projected year 2023 LOS on the existing I-55 bridge during the PM peak hour is LOS F, with a predicted free flow speed of approximately 47 mph, which identifies a significant need for improvement on this facility. By improving capacity along existing facilities (such as Concept 1) or constructing new bridge crossings (Concepts 2 and 3), level-of-service along the I-55 bridge improves from projected LOS E/F conditions to LOS C/D conditions. The projected level-of-service on the new bridge crossing concepts is LOS A/B. **Table 5-4** illustrates the V/C ratios and level-of-service of the existing bridges and the concepts.

Table 5-4
Projected Year 2023 V/C Ratio and Level-of-Service
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Projected Year 2023 V/C Ratio and Level-of-Service		
	I-40	I-55	New Bridge
No-Build	0.48 (LOS C/D)	0.90 (LOS E/F)	---
Concept 1	0.48 (LOS C/D)	0.52 (LOS C/D)	---
Concept 2A	0.48 (LOS C/D)	0.59 (LOS C/D)	0.26 (LOS A/B)
Concept 2B	0.48 (LOS C/D)	0.51 (LOS C/D)	0.34 (LOS A/B)
Concept 3A	0.47 (LOS C/D)	0.57 (LOS C/D)	0.30 (LOS A/B)
Concept 3B	0.48 (LOS C/D)	0.72 (LOS C/D)	0.16 (LOS A/B)

STUDY AREA TRAFFIC IMPACTS

Study area traffic impacts were measured using the following two standard measures of effectiveness:

- **Vehicle Miles of Travel (VMT)** – Daily vehicle travel is reported in terms of total vehicle miles of travel and is a function of the traffic volume and travel distance for each alternative. This measure represents the length of vehicle trips and the distance motorists travel to get to their destination; and,

- **Vehicle Hours of Travel (VHT)** – Total daily vehicle hours of travel is a function of traffic volume, travel speed, and travel distance. This measure is representative of the total amount of travel time for each alternative and the amount of time motorists spend traveling in their vehicles.

The fewer the miles traveled and the less time spent getting to a destination is preferred. VMT and VHT impacts for the bridge alternatives are identified in **Table 5-5**. Concept 2B provided the largest decrease VHT and Concept 3B provided the larges decrease in VMT when compared to the No-Build alternative. The bridge build concepts exhibited similar savings in VMT and VHT, with VMT decreasing by 0.30 percent or less for the build concepts and VHT decreasing by 1.01 percent or less.

Table 5-5
Projected Year 2023 VMT and VHT
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Regional Vehicle Miles Traveled		Regional Vehicle Hours Traveled	
	Regional VMT	% Change from No-Build	Regional VHT	% Change from No-Build
No-Build	28,671,256	---	507,937	---
Concept 1	28,668,802	-0.01%	504,207	-0.73%
Concept 2A	28,651,945	-0.07%	503,598	-0.85%
Concept 2B	28,631,700	-0.14%	502,811	-1.01%
Concept 3A	28,655,312	-0.06%	503,262	-0.92%
Concept 3B	28,585,155	-0.30%	505,599	-0.46%

SAFETY

Along the existing I-40 and I-55 bridges, crash locations during the last five year period were typically concentrated in the higher traffic volume areas with more vehicle conflict points. During the last five-year period, the I-40 and I-55 bridges each had at least one time period where crash rates were greater than the statewide average crash rate for Interstate roadways. Additional detail regarding the existing crash history on the Mississippi River bridges was discussed previously in *Technical Memorandum Number 2 - Evaluation of Existing Conditions.*

Construction of a new crossing over the Mississippi River is projected to divert traffic off the I-55 bridge crossing. In addition, the new structure will be built to current safety standards, including adequate inside and outside shoulders and wider travel lanes. The combination of lower traffic volumes on the existing bridge structure and the new structure built to current standards should provide for a reduction in traffic crashes, and improved safety for regular users of the roadways.

In addition, the new structure would provide an additional route across the Mississippi River for emergency evacuation purposes, as well as during a major incident or catastrophe which could cause one or both of the existing bridges to be closed to traffic.

CONNECTIVITY

One of the most important goals of the Mississippi River crossing concepts is to improve access and connectivity in the Mississippi Delta Region. The ability of each concept to provide improved connectivity to the major roadway corridors in the study area including I-40, I-55, Highway 61, and the planned I-69 Corridor that reaches from Port Huron, Michigan to the Texas/Mexico border could expand economic growth and development for the region.

Currently, two highway and two rail bridges provide connections across the Mississippi River within the Memphis metropolitan area. Essentially only one crossing corridor exists from West Memphis, Arkansas to Memphis, Tennessee since the two corridors of I-55 and I-40 share the same corridor alignment west of the river crossing. The risk of a major earthquake proximate to Memphis reinforces the need for improved connectivity across the river since none of the roadway or rail bridges currently have been designed for seismic considerations. The I-40 bridge is currently being seismically retrofitted but there are no plans proposed to seismically retrofit the remaining bridges. This could pose a serious threat to freight and rail transportation as well as the economy of the region and the nation as a whole.

Memphis, Tennessee refers to itself as “North America’s Distribution Center” and is home to the largest cargo airport in the world. Memphis is an important trucking hub and has five Class-I railroads, which makes it an important rail hub as well. Memphis also has an active river port on the Mississippi River and there has been some discussion of a future water/rail/truck intermodal facility to be located in the Pigeon Creek Industrial Park.

There are existing rail/truck intermodal terminals in West Memphis, Arkansas and Marion, Arkansas. Potential improved connections for these terminals include the airport in Memphis, Tennessee and the industrial clusters in south Memphis and Holly Springs, Mississippi. Trucks carrying containerized goods to and from the terminals in West Memphis and Marion with an origin or destination in south Mississippi would be well served by a new route crossing the river south of Memphis. Primary routes in south Memphis connecting industrial/intermodal facilities to a new crossing would be Highway 61, I-55 and Future Highway 304 (Future I-69).

Better connectivity to intermodal freight and other industrial interests in the region could help expand the region's economic growth potential. Stronger connections between downtown Memphis and Tunica, Mississippi would also improve access to other economic generators, such as the casinos, in the region.

Concept 1 would connect with the Memphis metropolitan area interstate system. By virtue of the existing system, connectivity to Highway 61 and future I-69 would be provided. Impacts to the existing system are undetermined and depend on the location of the I-69 Corridor. It is assumed for this study that nothing would preclude this concept from being considered. The remaining concepts terminate at existing Highway 61 and would need to consider an upgrade to Highway 61 to bring it up to current freeway standards in order to provide a good connection to future I-69.

This chapter discusses the engineering impacts and costs associated with the different Mississippi River crossing concepts. Engineering elements examined include length of concept, constructability, drainage, topography, geometry, dredge disposal, navigation clearance, seismic issues, design characteristics, and the various costs and methodologies assumed for the concepts.

ENGINEERING CONSIDERATIONS

A new Mississippi River crossing in the general locations of the candidate concepts shown on Figure 4-1 would have varying degrees of engineering impacts and associated costs.

Concept Lengths

The candidate concepts limits and their assumed lengths are defined as follows:

Concept 1: Improvement of Existing Bridge – Engineering considerations were examined for Concept 1 from the I-40/Highway 79 Interchange to just south of the I-55 Crump Interchange in Memphis, Tennessee. Due to the complexity of the existing corridor, this study did not address improvements that may need to be made to I-55's current connection to Highway 61. The study does recognize that improvements may need to be made to this corridor to improve the access and connectivity between Highway 79 and Highway 61 for this concept. The general corridor length for Concept 1 is approximately 22 miles.

Concept 2A: Industrial and Intermodal Connectivity – Concept 2A starts at I-40 west of West Memphis, AR near Highway 147, where it provides connectivity to the Highway 79 Corridor and continues southward to Edmonson. It veers southeast of Edmonson crossing the Mississippi River near the Pigeon Industrial Park, southward near Coro Lake to a terminus at Highway 61 in Mississippi. This concept length is approximately 15 miles.

Concept 2B: Mississippi-Tennessee Border - Concept 2B begins at I-40 west of West Memphis, AR near Highway 147, where it provides connectivity to the Highway 79 Corridor, and continues southward to Edmonson. It veers south-southeast of Edmonson and crosses the Mississippi River near the Tennessee-Mississippi State line and continues southward approximately paralleling the Mississippi River to Highway 61 near Newport, Mississippi. This concept length is approximately 19 miles.

Concept 3A: North of Horseshoe Lake - Concept 3A begins at the I-40/Highway 79 interchange in Arkansas and continues southward paralleling existing Highway 79 until Highway 79 curves southwest towards Hughes, Arkansas. At this point, the concept veers southeast just northeast of Horseshoe Lake and intersects near the interchange of Highway 61 and Future Highway 304 (Future I-69) near Newport, Mississippi. This concept length is approximately 24 miles.

Concept 3B: South of Horseshoe Lake - Concept 3B begins at the I-40/Highway 79 interchange in Arkansas and continues southward paralleling existing Highway 79 until Highway 79 curves southwest towards Hughes, Arkansas. It continues due south and then curves southwest of Horseshoe Lake and veers southeast to connect to Highway 61 at the interchange of existing Highway 304 and Highway 61 in Mississippi. This terminus is roughly seven miles from the Future Highway 304 (Future I-69) and Highway 61 interchange. This concept length is approximately 26 miles.

Table 6-1 shows the range of roadway, bridge and total concept length for the candidate concepts.

Table 6-1
Summary of Concept Length
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

General Characteristics	Concept 1	Concept 2A	Concept 2B	Concept 3A	Concept 3B
Roadway Length (miles)	21	11-12	14-15	20-21	22-23
Bridge Length[1] (miles)	1	3-4	4	3	3
Total Concept Length (miles)	22	14-16	18-19	23-24	25-26

1: Bridge length represents length in miles from abutment to abutment.

Constructability

Primary elements that would influence the constructability of roadways within the study corridors involve:

- Construction conflicts with existing roadways;
- Constraints due to topographic features; and,
- Inadequate subsurface soils support values.

It is expected the any connections made to the existing freeways and major highways (I-40, I-55, Highway 79 or Highway 61) would consist of a fully directional system-to- system interchange. These connections would be constructed in multiple stages and would require extensive traffic control. These considerations would increase engineering and construction costs and construction time, but would not preclude construction.

Any facility constructed within the Mississippi Valley Loess Plains escarpment area would require careful design and construction to prevent creating conditions that induce erosion. Construction of deep cuts would be avoided and any back slopes would have to be designed for slope stability and armored to be protected from erosion. The approach to the Loess Plains escarpment would be a sensitive area requiring planning for both a functional connection to Highway 61 and an inappropriate crossing of the escarpment. The Loess Plains are located in Tennessee and Mississippi, as shown on **Figure 6-1**, Topography Map. The southern terminus for Concept 2A would be located in the Loess Plains.

Due to poor surface drainage and frequent flooding within the Mississippi River floodplain, roadways planned within the study area would be constructed on embankments of at least five to ten feet in height. Common soils within the study area consist of either highly active clays or weak organic muck materials and would require embankment designs to provide for adequate long term stability. Design considerations would include undercut and replacement of undesirable material, importing higher quality embankment materials, and utilizing flat side slopes. These would be engineering and construction considerations that would increase the cost of a facility but would not preclude construction.

Concept 1 would have the highest level of constructability impacts since it is an improvement of an existing bridge and roadway corridor. Maintenance of traffic during bridge and roadway corridor construction may be a constructability impact. Congestion, delays, and safety issues with traffic during construction would need to be considered and planned for as a part of this concept.

It is anticipated that a new crossing would be constructed parallel to, and downstream of the existing I-55 bridge due to the location of the two railroad bridges upstream. This bridge would be required to have a navigation opening of at least 770 feet to match the existing I-55 and railroad bridges adjacent to it. The primary congestion and maintenance of traffic issues associated with the construction of a new bridge occur at the connections to the existing roadways on each side of the river. Coordination would occur with the U.S. Coast Guard to determine if the existing I-55 bridge would remain in place since it is on the National Register, or if removal of the bridge would be required.

Other than the specific issues involved with construction within an existing roadway corridor, many of the bridge-related construction issues are the same for all of the concepts considered. Grade separation structures and stream crossings would be of conventional steel or concrete girder construction with relatively short span lengths and moderate structure depths. Generally, these bridges would have spans of 100 to 125 feet and be supported on multi-column concrete bents and pile foundations. It is not anticipated that these structures include any specialty construction techniques, unique materials, or site characteristics that increase the complexity of construction.

Constructability of the Mississippi River crossing is a little more complex. The bridge contractor would be required to build the bridge over the navigation channel of the river with minimal disruption to barge traffic. Generally, this would require very specialized construction equipment and techniques, considered both during design and as construction progresses. These issues are reflected in the estimated project costs.

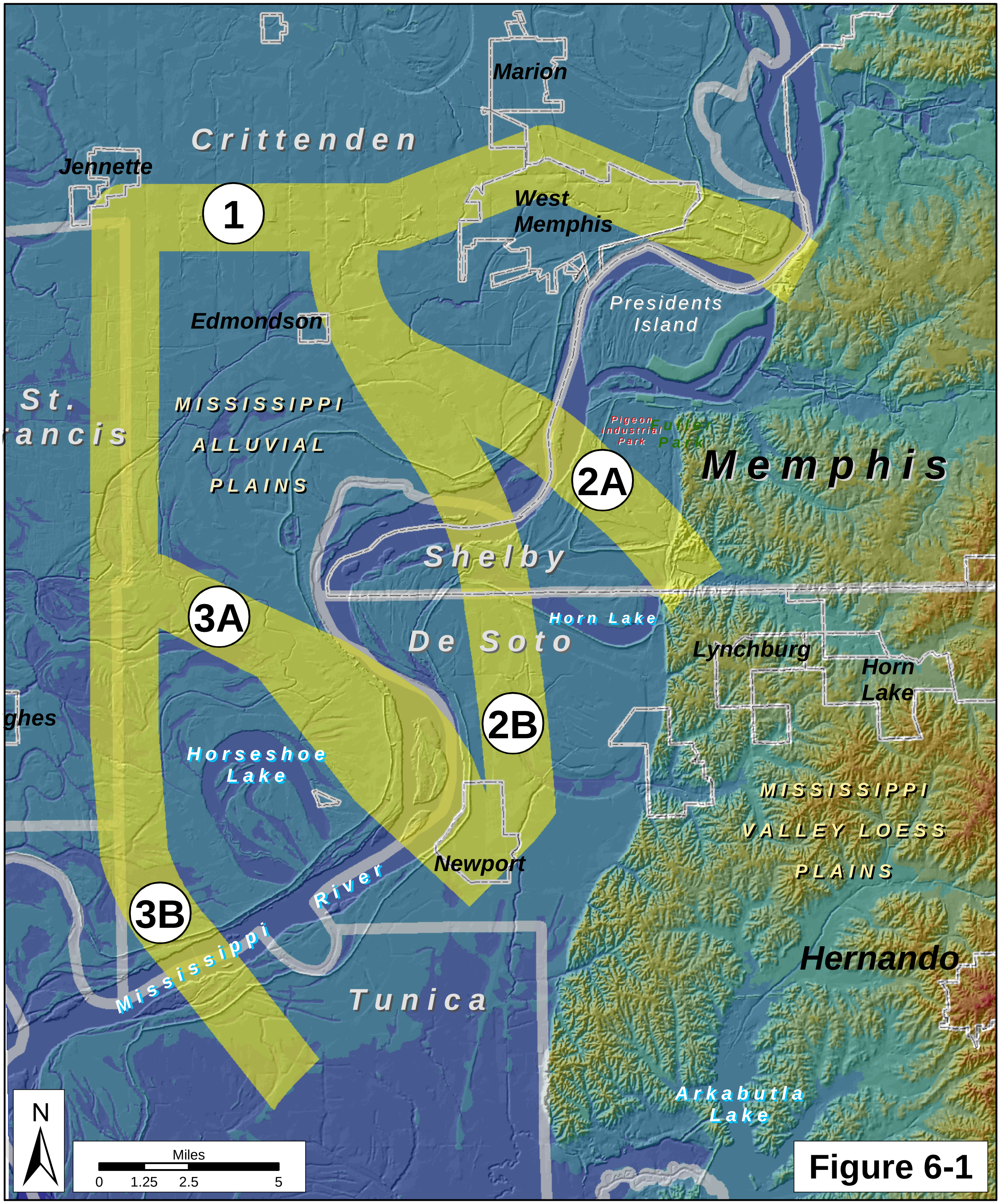


Figure 6-1

Highway 79 Feasibility Study: Topography Map

Proposed Bridge Crossing Concepts

Incorporated Areas

Elevation (Meters)

- 47 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 110
- 110 - 120
- 120 - 126

Constructability of a bi-modal bridge including a rail component would have additional constructability considerations. Generally, it would require very specialized construction equipment and techniques, for both the design and construction processes. A combination bridge would, because of maximum railroad grades, be much longer than a typical highway bridge. The minimum navigation vertical clearance would remain at 55 feet, thereby requiring a taller structure. The depth of structure would increase because of the significantly higher live load due to train loads.

Drainage

The majority of the study area lies within the Mississippi River floodplain. This area is nearly level and consists of poorly drained soils. Surface runoff collects into drainage features such as bayous and sloughs containing standing water. Because the study area is generally flat, extensive surface areas are inundated annually due to backwater flooding. Careful attention would be necessary during both design and construction to provide an adequate number of relief structures to allow for equalization of backwater and to provide adequate roadside drainage to prevent ponding of surface runoff.

Topography

The dominant topographic feature within the study area is the Mississippi River and its floodplain. The Mississippi River floodplain is a nearly level alluvium area that is several miles wide, varies in width, and grows wider on the west side of the river. It consists of recent natural levees, older natural levees, former stream channels, and slackwater areas. Large cultivated areas dominate the landscape; however, inland marshes, bayous, and sloughs are also common. The soils of this region have formed mainly from Mississippi River alluvial sediments, which may reach a thickness of 200 feet.

The Mississippi alluvium plain area is limited on the east by the Loess Plains and on the west by Crowley's Ridge. Each of these topographic features has formed from deposits of loess over coastal plain material. Crowley's Ridge is well west of the study area. However, the Loess Plains would be encountered to some degree for Concept 2A. A pronounced escarpment defines the boundary between the Mississippi River alluvium plain and the Loess Plains. For Concept 2A, engineering challenges would exist within the Mississippi River alluvium plain just south of the bridge crossing because it has a more complex area encompassing the levee system and because of the transition to the pronounced escarpment. The locations of all concept corridors relative to these topographic features are shown in Figure 6-1.

Geometry

The geometry of the candidate concepts is an important engineering consideration for safety and the efficient operation of the roadway system. Geometry considerations take into account the existing connections and facilities, terrain conditions, and horizontal and vertical alignment. Concept 1 would be the only concept located on existing alignment, which ties this concept to the existing geometric constraints. The terrain conditions and existing horizontal and vertical alignments are generally satisfactory for I-55, although there could be some improvements to interchanges along I-55. An example would be the Crump Interchange just east of the current I-55 bridge. Currently all traffic crossing the I-55 bridge and continuing southbound on I-55 must use a one-lane loop ramp at Crump Interchange, which is currently in the process of being redesigned.

Concepts 2 and 3 and their variations would be located on new alignment and designed to meet current design standards and geometric requirements for a freeway facility. Although Concepts 3A and 3B could be located on existing Highway 79 alignment from I-40 to the point where Highway 79 shifts southwest towards Hughes, it may be more feasible and cost effective to construct a new freeway parallel to the current Highway 79 alignment rather than bring the current Highway 79 up to current freeway standards.

None of the concepts have major geometric deficiencies that would preclude them from further study.

Dredge Disposal

Contractors would be required to comply with U.S. Army Corps of Engineers and U.S. Coast Guard regulations for both excavation and disposal of excavated materials. The contractor would not be permitted to dispose of excavated material in the waters of the Mississippi River or within the regulatory floodway of the Mississippi River except as approved by the Corps of Engineers. Excavated materials not used for backfill or embankment construction would require disposal at an upland, non-wetlands site. Excess excavation material from caissons, drilled shafts, and footings in the floodway must be hauled away to maintain the hydraulic characteristics of the river. No excavation would be permitted outside of caissons, and the natural stream bed adjacent to the structure should not be disturbed without the written permission of the Corps of Engineers.

Navigation Clearance

The U.S. Coast Guard is responsible for the governance of the navigable waters of the United States. This includes not only enforcement of U.S. Maritime Law, but also providing for the safety and security of the nation's inland rivers. In this role, the U.S. Coast Guard sees bridges as potential obstructions to navigation and has the jurisdictional authority to issue permits for crossing the nation's waterways. Although there are no written guidelines for the required horizontal clearance, it is expected that the minimum would be on the order of 1,000 feet, depending on the geometry, depth, and current in the vicinity of the bridge. A minimum of 55 feet of vertical clearance is required over the maximum river level as defined by the U.S. Army Corps of Engineers. For this study, coordination with the US Coast Guard will be conducted.

Seismic Issues

Although often overshadowed by the seismicity of the American west coast and the Pacific Rim, the New Madrid, Missouri region is a very real and significant seismic threat to the Midwestern United States. The general public, even if aware that earthquakes often occur in the central United States, does not recognize the potential destruction that would follow a major event, nor do they realize that New Madrid, Missouri is the site of the most severe series of earthquakes known to have occurred. Fortunately, state departments of transportation, the Federal Highway Administration (FHWA), and many local building code officials are acutely aware of the risk and the potential damage - in terms of loss of life as well as economic losses - which would follow even a moderate event in the New Madrid region.

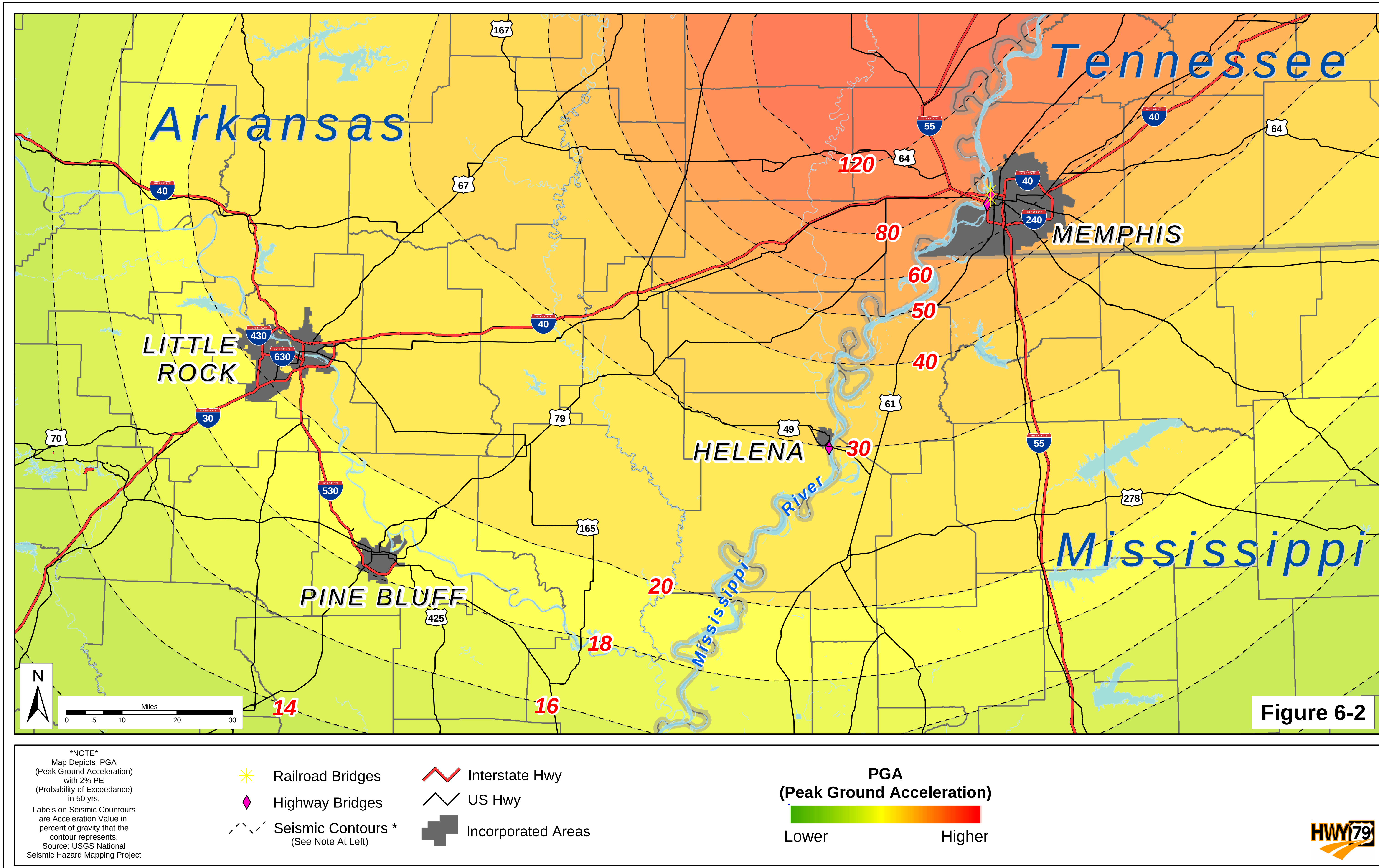
The New Madrid Seismic Zone is the location of the most violent series of seismic events ever recorded and is a candidate to experience a significant earthquake within the not so distant future. Studies of the available data indicate that the three most significant events of the winter of 1811-1812 had surface wave magnitudes (Ms) of about 8.6, 8.4, and 8.7. It has been suggested that the recurrence interval of magnitude 8 quakes in this region is between 550 and 1200 years and the recurrence interval of magnitude 7.0 earthquakes is approximately 200 years. Therefore, there is a high probability that the Memphis area could experience a significant earthquake during the design life of a new bridge.

Memphis, Tennessee is located approximately 100 miles from New Madrid, Missouri, and as a result is highly vulnerable to even a moderate event. In fact, the Tennessee Department of Transportation is currently performing a seismic retrofit on the I-40 bridge over the Mississippi River. Any new structure built over the Mississippi River in Memphis would require careful consideration of the seismic forces induced on the bridge. **Figure 6-2** graphically shows the expected peak ground acceleration (PGA) in the Midwest based on an event with a two percent probability of nonexceedence in 50 years (roughly a 2,500-year event). The other bridges in the area, particularly the I-55 bridge and the Highway 49 bridge at Helena, were designed and built at a time when seismic considerations were minimal, if not nonexistent, and are susceptible to major damage should a significant event occur in the New Madrid seismic zone.

DESIGN CHARACTERISTICS

The new Mississippi River crossing concepts are defined as a proposed multi-lane freeway and bridge crossing over the Mississippi River, connecting with the major highway systems of Arkansas, Mississippi, and Tennessee, located in close proximity to the Memphis metropolitan area. The freeway sections would have fully controlled access, with access being limited to grade separated interchanges.

The typical right-of-way width for the proposed facility would be within a range of 250 feet to 350 feet for concepts on new alignment. The freeway would be constructed on earthen embankment with occasional bridge or culvert structures for the crossing of other



Arkansas
Tennessee
Mississippi
MEMPHIS
LITTLE ROCK
HELENA
PINE BLUFF
Mississippi River
120
80
60
50
40
30
20
18
16
14
40
30
430
630
530
55
240
167
67
64
79
49
61
70
165
425
278
N
Miles
0 5 10 20 30
NOTE
Map Depicts PGA (Peak Ground Acceleration) with 2% PE (Probability of Exceedance) in 50 yrs.
Labels on Seismic Countours are Acceleration Value in percent of gravity that the contour represents.
Source: USGS National Seismic Hazard Mapping Project
Railroad Bridges
Highway Bridges
Seismic Contours *
(See Note At Left)
Interstate Hwy
US Hwy
Incorporated Areas
PGA
(Peak Ground Acceleration)
Lower
Higher
HWY 79

Figure 6-2

roadways, minor streams, railroads, or drainage ways. Between the Mississippi River levees, the improvements would be constructed entirely on bridge structures. The crossing of the main Mississippi River channel would be accomplished in accordance with the navigational requirements of the US Coast Guard.

Roadway and Bridge Design Criteria

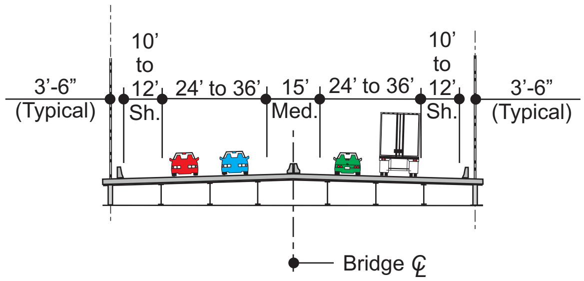
The design criteria were established in coordination with AHTD, MDOT, and TDOT policies and standards. The American Association of State Highway and Transportation Officials' (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 2000, was a resource used. The following summarizes the primary design elements used for the freeway:

- Traffic Design Year – 2023
- Level of Service – LOS C for rural sections and LOS D for urban sections
- Design Speed – 70 mph

Roadway Design Standards

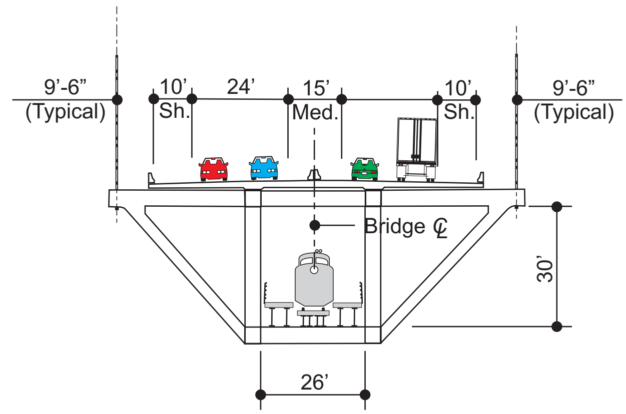
For the crossing concepts on new alignment, the roadway section would consist of two twelve-foot travel lanes, a ten-foot outside shoulder, and a six-foot inside shoulder in both directions of travel, as determined by the projected traffic volumes and level of service shown in Chapter 3. The two directions of travel would be separated by a 60 to 80-foot depressed grass median. The facility would be designed to AHTD, MDOT, and TDOT specifications for a rural freeway with a design speed of 70 mph. Frontage roads are not included adjacent to the roadway section, but could be provided as needed to address access to existing residential and business development. **Figure 6-3** shows the roadway typical section for the proposed new concepts.

For Concept 1, the design standards were assumed to be different since the concept is an improvement to the existing I-55 Corridor and Mississippi River crossing. The facility would be designed to AHTD and TDOT specifications for an urban freeway with a design speed of 70 mph. From the I-40/Highway 79 interchange to the I-40/I-55 interchange the section would remain a four-lane freeway with fully controlled access and no additional improvements are assumed since reconstruction has been completed in recent years; from the I-40/I-55 interchange east to the I-40/I-55 split the section would be widened from the current six-lane freeway to an eight-lane freeway with fully controlled access that would consist of four twelve-foot travel lanes, a twelve-foot outside shoulder, and a six-foot inside shoulder in both directions of travel; and from the I-40/I-55 split to the I-55 Mississippi River crossing approach the section would be widened from the current four-lane section to a six-lane section and would consist of three twelve-foot travel lanes, a twelve-foot outside shoulder, and a six-foot inside shoulder in both directions of travel. The two directions of travel would be separated by a concrete median barrier. The I-55 bridge would be replaced with a new six-lane bridge between Arkansas and Tennessee. For the section east of the I-55 bridge, the segment from the east bridge

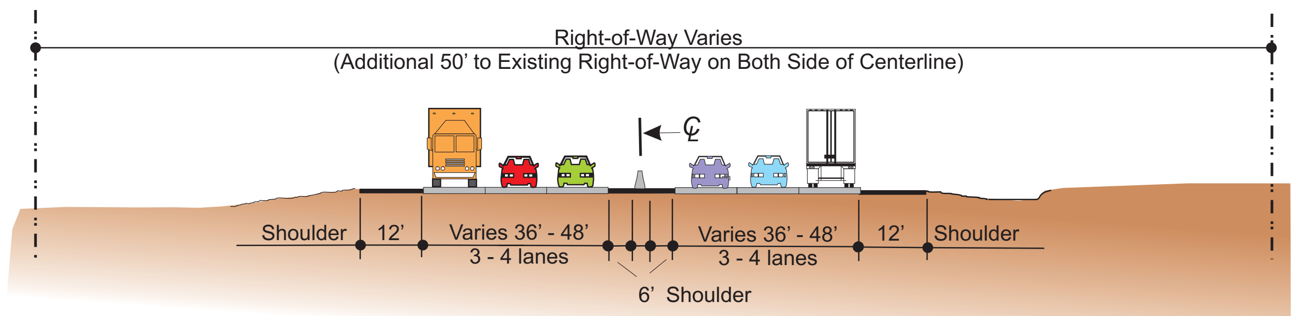


Bridge Main Span

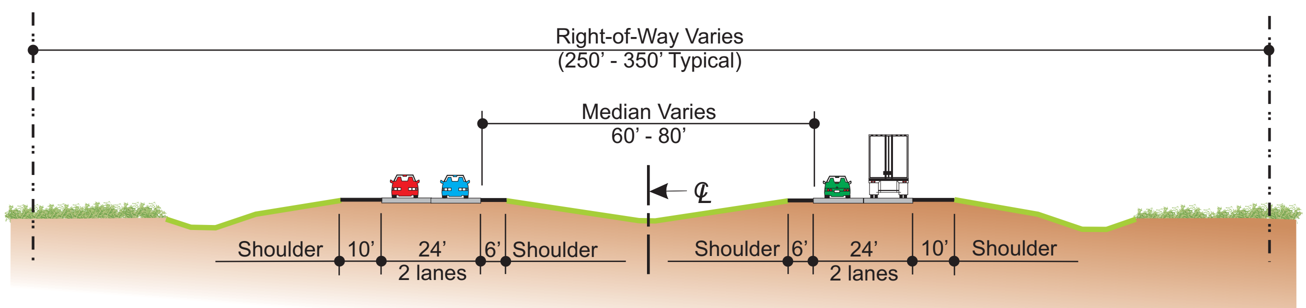
(Number of Lanes and Shoulder Widths Vary by Concept)



Bridge Main Span with Railroad Option



Widening to the Outside: 4-Lane to 6 or 8-Lane Freeway Typical Section



4-Lane Freeway Typical Section

Figure 6-3

Highway 79 Feasibility Study: Typical Sections

HWY 79

approach to just west of the Crump Interchange would be widened to six-lanes with three twelve-foot travel lanes, a twelve-foot outside shoulder, and a six-foot inside shoulder in both directions of travel. It is assumed within this section that the interchange just west of the Crump Boulevard Interchange (Metal Museum Drive) would be removed and not replaced as a part of the I-55 and US 64 (Crump Boulevard) Interchange Modification Study.

Improvements identified in this study within Concept 1 terminate at the southern limits of the I-55 and US 64 (Crump Boulevard) Interchange Modification Study, which includes approximately 2000 feet of roadway to the south of the Crump Interchange. For purposes of this study, it is assumed that one eastbound lane would exit into downtown Memphis, Tennessee, and two southbound lanes would continue on I-55 after the Crump Boulevard Interchange is modified.

Since I-55 in Arkansas is currently being reconstructed improvements to the I-55 Corridor would only consist of adding one-lane to the outside and replacement of the outside shoulder for this concept. This leaves the current six-foot inside shoulders in-place and only provides widening improvements to the outside shoulders. The existing lanes are not assumed to be reconstructed within this concept.

Existing frontage roadways would be replaced if impacted by the widening improvements. It is assumed that frontage roads would consist of two twelve-foot lanes with an eight-foot outside shoulder and a four-foot inside shoulder in both directions of travel. If frontage roads do not currently exist on some segments of I-55, they are not being added in this concept unless needed to provide access due to additional right-of-way acquisition.

Bridge Design Standards

It is anticipated that all of the highway bridges in the corridor, including the Mississippi River bridge, would be designed to the current AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications and AHTD construction specifications. Generally, these standards are appropriate for all types of bridges for all types of service. Any railroad structures would be required to comply with the requirements of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

Depending on the location and type of service, bridges for two-way traffic may be comprised of a single structure or twin parallel bridges with as little as two inches between bridge roadways. Roadway and shoulder widths, cross slope, and superelevation transitions would be established based on AASHTO and AHTD design standards in effect for the type of service. Railroad bridges would be either single-track or double-track depending on the existing system.

For the concepts on new alignment, the proposed bridge main span section at the Mississippi River would consist of two twelve-foot travel lanes, a ten-foot outside shoulder, and a six-foot inside shoulder in both directions of travel. The two directions of travel would be separated by a concrete median barrier.

For the improvement to existing I-55, Concept 1 would include a replacement of the existing I-55 bridge. The proposed I-55 bridge main span would consist of three twelve-foot travel lanes, a twelve-foot outside shoulder, and a six-foot inside shoulder in each direction of travel. The two directions of travel would be separated by a concrete median barrier.

Figure 6-3 shows the bridge typical section for the proposed concepts on new alignment. The figure also shows a bridge main span with a railroad option, in order to provide a general layout of a multimodal bridge. Railroad design standards are not addressed in detail in this report since at this time a multimodal bridge is being considered at a very preliminary planning level.

CONSTRUCTION COSTS

The following sections discuss roadway costs, bridge costs, operation and maintenance costs, and right-of-way and utility costs for the concepts.

Roadway Costs

The total construction cost for the different improvement concepts include design, right-of-way acquisition and construction. The costs are preliminary and reflect the level of detail of a corridor planning and feasibility study. The costs are provided in a range, since this study examines potential concept corridors, but not specific alignments. Construction cost estimates include grading, drainage, bridges and paving for new four-lane freeway facilities or expanded existing freeway facilities constructed to interstate standards. For new construction, unit costs per mile for a freeway facility were developed based on AHTD bid tabs, planning procedures, and earlier studies for various terrain conditions. Terrain conditions were identified based on USGS mapping, GIS topography data, and field observation. The major Mississippi River bridge crossing, interchange, railroad, and stream crossing bridges and other special features were added accordingly. Other incidental costs considered in the unit cost per mile include erosion control, signing and paving, maintenance of traffic, and utility relocations for the concepts on new alignment. Right-of-way costs were estimated based on the average market value of property within the concept locations. Design and construction administration costs were also included on a percentage basis. Costs for frontage roads were not included in the estimate for concepts on new alignment.

More details regarding the construction cost estimates can be found in **Appendix C**. As shown in the Appendix, grading, drainage, and paving unit costs range from $5.5 to $8.6 million per-mile depending on the terrain type for the proposed concepts on new alignment. Special considerations were given for interchanges on an individual lump sum basis. $4.5 million per local service interchange was assumed for concepts on new alignment and $5.5 million per local service interchange upgrade was assumed for concepts on existing alignment. For the concepts on new alignment, it was assumed that each concept ended with a system-to-system interchange, estimated at $6.5 million per interchange. A present worth cost of $480,000 per mile was added to reflect a 20-year roadway maintenance cost. A construction cost contingency of 15 percent to account for design unknowns was included. Furthermore, an additional 15 percent of the construction costs were added for design and construction administration. The construction costs are in Year 2003 dollars for each concept. The construction cost estimates include costs in Arkansas, Tennessee, and Mississippi.

For Concept 1, the cost estimate for the roadway improvements was done to a higher level of detail than with the concepts on new alignment. Many of the assumptions made for the concepts on new alignment were not assumed to be the same for this concept. Current ongoing and recently completed studies on or in close proximity to the I-55 Corridor were used for reference, including the I-55 and Highway 64 (Crump Boulevard) Interchange Modification Study.

For Concept 1, it was assumed that cost estimating began at the I-55 southbound and northbound ramps at the I-40/I-55 interchange and ended at the Crump Interchange on the east side of the I-55 bridge. Improvements were not considered for I-40 from the I-40/Highway 79 interchange to the I-40/I-55 interchange since Year 2023 projected traffic and level of service did not indicate a need for additional lanes.

Cost contingencies were assumed to be the same as for the concepts on new alignment. A unit cost per mile for grading, drainage, and surfacing was not assumed for Concept 1; instead unit costs for grading and surfacing material quantities were developed using AHTD bid tabs and drainage was included as six percent of grading and surfacing. Local service interchanges were assumed at $5.5 million each since they are added to an existing route. Other miscellaneous items including lighting, fencing, erosion control, removal of existing structures, signing and paving markings, and maintenance of traffic were included in the cost estimates as either a unit cost or a percent of grading, drainage, and surfacing.

For the high Concept 1 cost estimates, it was assumed that interchange, railroad, ramp and stream bridges were replaced due to considerations for condition and age of structure. For the low cost estimates, it was assumed that these structures could be widened. For the high cost estimate, ramps were assumed to be replaced or widened to accommodate projected traffic volumes or widening constraints on a case-by-case basis. For the low cost estimate, ramps were either widened or assumed to be satisfactory in their present configuration.

More details concerning the cost estimate and unit cost assumptions for Concept 1 can be seen in the cost templates in Appendix C.

The contractor's costs generally consist of direct/indirect labor costs, equipment costs, and construction materials. These costs are generally fixed based on the scope of the improvements and material quantities. Consequently, there exists very little variability in the construction costs for each of the corridors. For this level of conceptual planning, some unknowns relating to design features and construction quantities have been accounted for through design and construction contingency within the cost estimates. It is recommended that this contingency factor be maintained until there is sufficient detail in the development of the construction costs to substantiate its reduction. **Table 6-2** shows the summary of the total roadway construction cost estimates for the different concepts.

Table 6-2
Construction Cost Summary
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Cost Estimates	Concept 1	Concept 2A	Concept 2B	Concept 3A	Concept 3B
Roadway Cost ($Millions)	$120 $190	$130 $140	$150	$210	$230
Bridge Crossing Cost ($Millions)	$190	$250 $360	$400	$250 $390	$270 $370
Total Construction Cost ($Millions)	$310 $380	$390 $490	$550	$460 $600	$500 $600

Note: The high bridge cost estimate corresponds with the low roadway cost estimate and the low bridge cost corresponds with the high roadway estimate. Some costs were not provided as a range due to little variability in low and high cost assumptions.

Bridge Costs

The actual construction cost associated with any specific bridge crossing is dependent on a number of factors including access, the current price of materials and fuel, the type of construction, traffic maintenance, etc. However, most conventional structures may easily be approximated by a generalized cost per square foot basis, with conventional short-span bridge construction at the low end of the scale and high-profile long-span structures at the upper bound. The unit costs for interchange, railroad, and stream bridge crossings were estimated slightly higher than in the concepts on new alignment ($80 per square foot existing versus $75 per square foot new alignment) due to the fact that Concept 1 is located in a more urban area on existing alignment. Bridge approaches were assumed to be $15 per square foot.

In order to provide the best estimate for a new Mississippi River crossing, the crossing was divided into a number of segments assuming the relative complexity of construction in each segment. Outside the Mississippi River levees, it was assumed that conventional bridge construction with short spans would be the most cost effective type structure. This structure would have moderate span lengths, perhaps 140 to 150 feet in length, and multi-column substructures founded on driven piles or drilled shafts. Similar construction could occur between the levees in the overbank areas.

Over the levees, a somewhat longer span requirement exists in that the Corps of Engineers generally would not allow penetration of the levee core with any foundation elements. Thus, it is believed that plate girder spans on the order of 400 feet would be required at the levee crossings. These bridge units may be supported on foundations similar to the foundations outside the levees.

As the roadway approaches the navigation channel, bridge construction may be required over the river, mandating more specialized construction equipment, foundation, and substructure construction in the water, and a higher level of risk for contractors. These sections of the bridge were considered separately and at a higher cost than the levee units or the conventional construction methods outside the levees.

The most expensive and complex piece of the Mississippi River bridge is the navigation unit. Not only does this section require specialized equipment, it would generally require a contractor with specific experience, extensive construction engineering, deep water foundations, etc. The costs included here are based on the trend toward cable-stayed construction for spans from 1,000 to 2,000 feet.

The construction costs associated with the full Mississippi River crossings including the connections are included in the cost estimates for each concept. The river crossing costs are provided as a range, since this study examines potential crossing windows, but not specific alignments. The costs of the river crossings were assumed as follows based on the surface area of the bridge deck:

- Outside Levees - $70/S.F.
- Over Levees - $130/S.F.
- Between Levees - $70/S.F.
- Across River - $200/S.F.
- Across Channel - $400/S.F.

The costs for Concepts 2 and 3 were based on a 90-foot bridge width and the unit price estimates shown above. This would provide for four 12-foot lanes, 10-foot outside shoulders and 6-foot inside shoulders. For Concept 1, however, the bridge width is assumed to be 114 feet. This provides for six lanes at 12 feet with 12-foot outside shoulders, and 6-foot inside shoulders. A contingency of 25 percent was added to the bridge costs to account for variations in alignment, foundation material, inflation and other potential unknowns. The costs do not include any estimate of engineering fee for any stage of the project including construction management and inspection. For Concept 1, it is anticipated that the U.S. Coast Guard would require removal of the existing I-55 bridge. It is estimated that this work would cost approximately $5 million.

Table 6-2 shows a summary of the total bridge construction cost estimates for the different concepts.

OPERATIONS AND MAINTENANCE COSTS

The current operations and maintenance cost of $13,000 per mile of a four-lane highway was developed from past AHTD state wide expenditures. A cost of $240,000 per mile has been applied to cover 20 years of roadway operation and maintenance costs.

Maintenance costs which are generally considered in an economic evaluation for a bridge are the probable major maintenance costs that would occur during the assumed life of the structure. The anticipated frequency and cost of projected maintenance events are estimated.

Major maintenance may include such events as repainting a painted steel structure; stay cable or hanger replacement; and deck, bearing, or expansion joint replacement. For the approach spans, it is anticipated that maintenance costs would be similar for prestressed concrete girder bridges and for unpainted weathering steel bridges and therefore, the type of structure is not an issue in the evaluation of concepts. It is also assumed that maintenance costs of typical bridge structures is included in the per mile O&M cost for the roadways. In addition, even with the construction a new bridge, both the existing bridges will continue to require maintenance.

For the navigation unit, the following assumptions may be made:

- **Expansion Joints**. The expansion joints may require replacement every 25 years because of the constant exposure to direct wheel impact, road salts and continuous thermal and load-induced movement of the bridge.
- **Bearings**. The bearings may require replacement in as little as 25 years, but could last much longer depending upon the location and design. The bearings near open or damaged expansion joints would be the first to require replacement.
- **Concrete Railings and Median Barriers**. Barriers and railings are exposed to salt spray and are often struck and damaged by errant vehicles. Additionally, protection of motorists is a continuous research topic and it is not unreasonable to believe that barrier design would change during the life of the bridge requiring either modification or replacement at least once, and perhaps several times during the life of the structure. It is recommended on planning a replacement for every 30 to 35 years.
- **Concrete Deck Overlay**. A concrete overlay may be provided as an expendable protection for the structural concrete deck. Observation of the riding surface during periodic inspections would ensure that the overlay may be replaced before chlorides penetrate and damage the structural deck. It is anticipated that an overlay would need replacement approximately every 30 to 35 years.

- **Stay Cables**. Although there is no long-term data available, it would be anticipated that the stay cables would require replacement once during the life of the structure.
- **Painting of Structural Steel**. It is anticipated that exposed structural steel for non-weathering structural steel would require painting approximately every 30 to 35 years.

Without knowing either the type of structure or the span lengths involved, it becomes very difficult to project what the life cycle and operations and maintenance cost of the bridge would be. However, it is estimated from other projects that the present value over 20 years of these costs could be as much as 6 to 8 percent of the initial cost, or perhaps as much as $32 per square foot. For this report, it is assumed to be six percent of the initial cost. **Table 6-3** shows a summary of the estimated operation and maintenance costs.

Table 6-3
Operation and Maintenance Cost Summary
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Cost Estimates	Concept 1	Concept 2A	Concept 2B	Concept 3A	Concept 3B
Roadway O&M Cost ($Millions)	$1.2	$2.8 $2.9	$3.5 $3.5	$4.8 $5.0	$5.3 $5.4
Bridge Crossing O&M Cost ($Millions)	$11.4	$15.2 $21.4	$23.8	$14.9 $23.5	$16.2 $22.3
Total O&M Cost ($Millions)	$12.6	$18.0 $24.3	$27.3 $27.3	$19.7 $28.5	$21.5 $38.4

Note: The high bridge O&M cost estimate corresponds with the low roadway O&M cost estimate and the low bridge O&M cost corresponds with the high roadway O&M cost estimate. Some costs were not provided as a range due to little variability in low and high cost assumptions.

RIGHT-OF-WAY AND UTILITIES

The following sections discuss the costs associated with right-of-way acquisition and utility relocation.

Right-of-Way

The typical right-of-way width for the facilities on new alignment would be within a range of 250 feet to 350 feet. For Concept 1, an additional 50 feet of right-of-way outside of the existing right-of-way limits on either side of centerline was assumed to be acquired. Right-of-way costs were estimated based on a discussion of current land prices with realtors in the area and also by referencing current projects for the I-55 Corridor in Memphis, Tennessee at the Crump Boulevard interchange. In the I-55 and US 64 (Crump Boulevard) Interchange Modification Study a right-of-way cost per acre of $75,000 was used. For this study, the right-of-way cost per acre was adjusted to

$50,000 per acre to account for the differences in urban conditions between these two project locations.

Relocations of residences and businesses were included in the right-of-way costs as an added contingency for the concepts on new alignment. For this level of study, the exact number of relocations cannot be identified since the concept locations are general in nature and do not have a definite alignment.

For Concept 1, right-of-way costs were assumed to be different than for the other concepts since the concept is an improvement to existing I-55 and is located in an urban setting with a higher density of development. Right-of-way was assumed to be $50,000 per acre with commercial displacements estimated at $1,000,000 each and residential displacements at $100,000 each.

For Concepts 2 and 3 and their variations, right-of-way costs were assumed to be $5,000 per acre, which includes an estimate of $2,900 per acre plus 50 percent for relocations and an additional 15 percent for contingencies. The right-of-way cost estimate of $2,900 per acre was based on farmland in the Delta currently estimated to sell for $1,600 to $1,700 per acre and including acquisition costs under the Uniform Act and the associated administrative costs. Right of way cost was estimated based upon uniform widths of 250 foot and 350 foot.

Utilities

Cost of relocating utilities, such as electric, gas, water, telephone, local fiber optics, small pipelines and sewers would be computed as a lump sum per utility crossing of $200,000 each crossing for concepts on new alignment. For Concept 1, utility costs were estimated at $200,000 per mile. Major utility corridors can be seen in Figure 7-1, Social Constraints Map.

Railroad Considerations

In addition to the highway bridges presented in Concepts 1 through 3, there is a need to consider the potential for a new railroad crossing of the Mississippi River.

The Frisco Bridge, immediately upstream of the Interstate 55 bridge is a single-track, pinned through truss railroad bridge designed by George S. Morison. This bridge was constructed in 1893. Immediately upstream from the Frisco Bridge is the Harahan Bridge. This structure is a double-track, through truss railroad bridge currently owned by the Union Pacific Railroad Co. It was built in 1916 by the Arkansas and Memphis Railway Bridge & Terminal Co. Due to their age and the design standards in effect at the time of their original construction, both bridges are potentially vulnerable to the effects of any moderate to severe earthquake in the New Madrid fault zone.

It is possible that any new Mississippi River crossing would be a multi-modal bridge carrying both highway and rail traffic over the river. A combination bridge would, because of maximum railroad grades, be much longer than a typical highway bridge. The minimum navigation vertical clearance would remain at 55 feet, thereby requiring a taller structure. And, because of the significantly higher live load, the depth of structure would increase.

Although no specific studies have been undertaken of the concepts presented herein, it is anticipated that only the navigation spans would be a combination structure, with the railroad and highway alignments separating at an optimum location. The elevation changes would be a factor in the feasibility of adding a rail component to the crossing locations, especially for Concepts 2A due to the escarpment. For the purposes of this study, it is estimated that adding freight rail to the Mississippi River bridge could increase the cost by as much as $80,000,000. No costs have been provided for railroad connections; further study would be necessary in order to include costs to a sufficient level of detail.

A new Mississippi River crossing in the general locations of the candidate concepts, as shown on **Figure 7-1**, Social Constraints, would have varying degrees of potential impacts to the study area's social and economic environment. This chapter discusses the following social and economic elements: residential/commercial displacements, environmental justice, economic development potential, visual quality and aesthetics, cultural resources, and Section 4(f)/sensitive land uses.

RESIDENTIAL/COMMERCIAL DISPLACEMENTS

The construction of transportation projects can require the acquisition of properties. Private property that is required for a federally funded project is acquired under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. Right-of-way is acquired based on fair market value.

The Arkansas State Highway and Transportation Department (AHTD), Mississippi Department of Transportation (MDOT), and Tennessee Department of Transportation (TDOT) provide relocation assistance programs for residents and businesses that are displaced by a transportation project. The programs assist all persons who are displaced and, under many circumstances make payments to help offset some of the expenses that are incurred by those who are displaced. The highway agencies are committed to providing safe, decent, and sanitary replacement housing to all persons who are displaced by a transportation project. Relocation specialists work closely with the affected persons to achieve satisfactory results.

No person shall be displaced from his or her residence unless a comparable replacement dwelling is available and provided for the displaced occupant. Residents who are displaced may be eligible for the following types of compensation:

- Payments for the costs of moving;
- Payments for replacement housing;
- Payments for closing costs;
- Payments for increased interest for loan; and,
- Payments for increased real estate taxes.

Businesses, farms, and non-profit organizations may also be eligible, providing certain conditions are met, for the following:

- Payments for the costs of moving;
- Actual direct loss of personal property;
- Costs associated with reestablishing the small business (1-500 employees), the farm operation, or nonprofit organizations; or,
- A fixed payment, based on income, in lieu of moving, searching costs, and direct loss of personal property and reestablishment expenses.

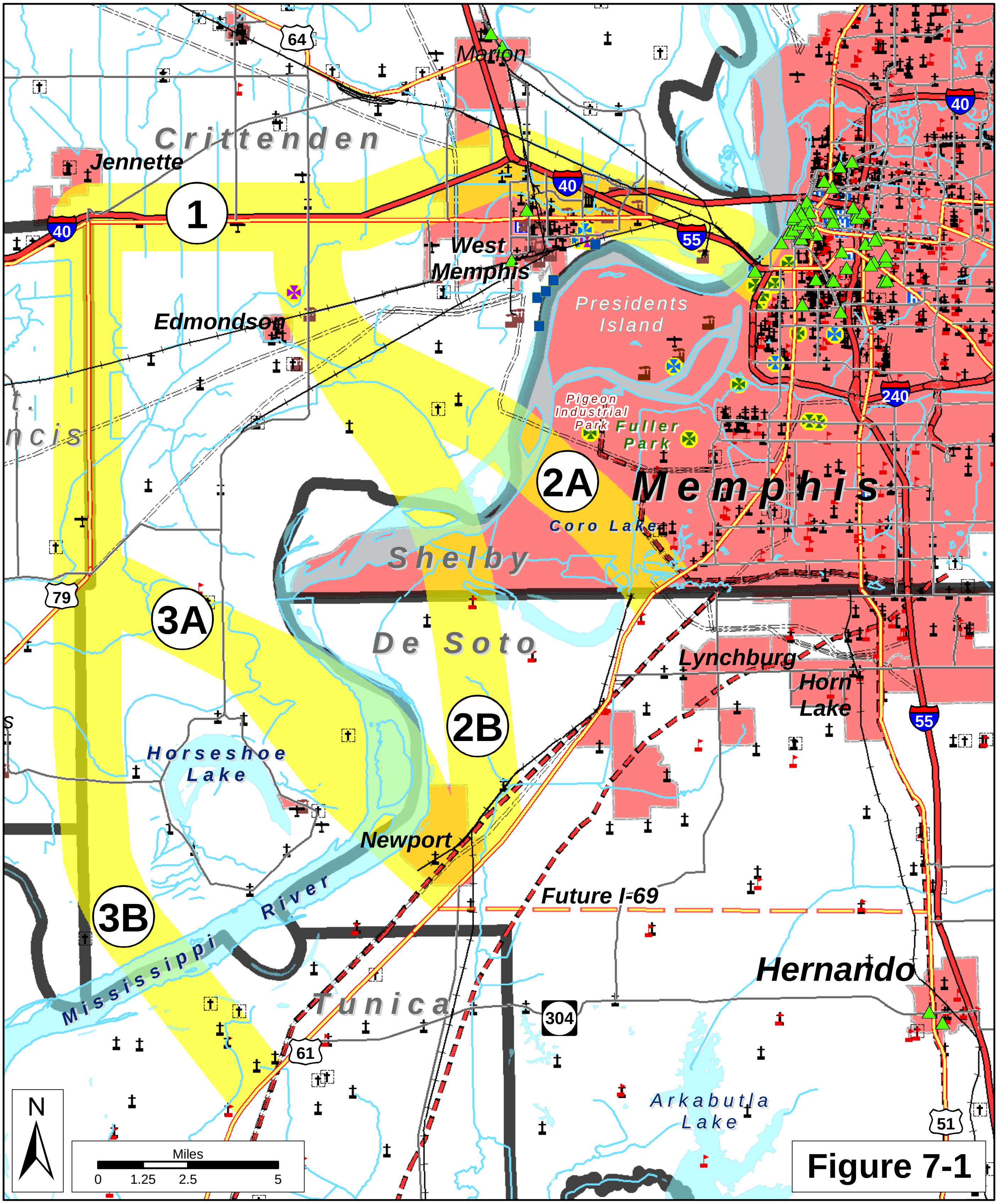


Figure 7-1

Highway 79 Feasibility Study: Social Constraints

- Limited Access Higway
- Highway
- Local Roads
- Railroads
- Rivers/Streams
- Incorporated Areas
- Historic Monument or Site
- Port/Terminal
- Pub/Priv. School or Coll.
- Airports/Airfield
- Cemetery
- Factory/Plant Locations
- Church
- Hospital

Haz. Waste Sites

- CERCLIS
- NPL
- RCRA

Proposed Bridge Crossing Concepts

HWY 79

For this corridor planning level study, the actual number of displacements cannot be quantified, since a specific alignment has not been identified. Displacements were included as an added percentage to the right-of-way cost estimate per acre of $5,000 per acre for Concepts 2 and 3 and their variations. Displacements for Concept 1 were estimated at $100,000 per residential displacement and $1,000,000 per business displacement. More details can be found in Chapter 9, Engineering Impacts/Costs.

When determining where to locate the candidate concepts, areas with greater potential for relocations were identified and efforts were made to minimize or avoid these higher displacement areas. The following cities or communities were identified:

- Horseshoe Lake Community in Arkansas;
- Edmonson, Arkansas;
- West Memphis, Arkansas;
- Horn Lake Community in Tennessee; and,
- Newport, Mississippi.

Concept 1 was determined to have the highest potential number of displacements since it is an improvement of existing I-55, located in an area where development has built up along the existing I-55 Corridor. This is especially true for I-55 from the Crump Interchange at the east end of the I-55 bridge to Highway 61 and in close proximity to West Memphis, Arkansas. Concepts 2A and 2B would be located just east of Edmondson, Arkansas, but should not cause relocations within the community. Concepts 2B and 3A would have their southern terminus points near the community of Newport, Mississippi. Efforts would need to be made to minimize impacts to Newport if an alignment was developed in this area. Concept 3A also crosses the Mississippi River just north of Horseshoe Lake, which has a residential community; however, the concept should not result in a large number of displacements. Concept 3B would result in few displacements, since it is mainly confined to a largely agricultural area with sparser development. Measures to minimize or avoid relocating residences and businesses within the concept corridors would be made.

ENVIRONMENTAL JUSTICE

On February 11, 1994, President Clinton issued Executive Order on Environmental Justice 12898. This Executive Order requires all federal agencies to address the impact of their programs with respect to environmental justice. The Executive Order states that, to the extent practicable and permitted by law, neither minority nor low-income populations may receive disproportionately high or adverse impacts as a result of a proposed project. It also requires those members of any low-income or minority communities that could be affected by a project to be given the opportunity to be included in the impact assessment and public involvement process.

To briefly summarize the intent of this Executive Order, an analysis of any proposed action must be conducted to determine effects on Minority Populations and/or Low-Income Populations. This is done by development of demographic baseline conditions and social impacts.

The candidate river crossing concepts mainly encompass three counties in three states: Crittenden County, Arkansas, De Soto County, Mississippi and Shelby County, Tennessee. The Census 2000 data for Crittenden County shows that the minority population is approximately 50 percent of the total population, with just over 47 percent African American. For De Soto County, it shows that the minority population is approximately 14 percent of the total population, with 11 percent African American, and for Shelby County approximately 53 percent of the total population is minority with nearly 49 percent African American. The percentage of Hispanic or Latino persons in all three counties is very small at less than three percent of the population per county.

The Census 2000 also shows that in 1999, approximately 25 percent of the persons in Crittenden County were below the poverty level and the median household income per year was about $30,100. In De Soto County only about seven percent of persons in the county were below poverty and the median household income was $48,206 per year. For Shelby County, 16 percent were below poverty and the median household income was $39,593. Both Crittenden and Shelby Counties were lower than the state averages of Arkansas and Tennessee as a whole for median income, while De Soto County was significantly higher for median income than the state average for Mississippi.

Table 7-1 shows the demographic characteristics of three towns or cities which could be most affected by the river crossing concepts. The community of Newport was not available from the US Census 2000.

Table 7-1
Demographic Characteristics
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Demographic Characteristic	Edmondson, AR	West Memphis, AR	Horseshoe Lake, AR
Minority Population (%)	73%	58%	6%
• African American (%)	71%	56%	5%
• Hispanic or Latino (%)	0.4%	1%	0.3%
Median Household Income, 1999 ($)	$28,056	$27,399	$30,083
Percent Below Poverty Level (%)	25%	28%	10%

Source: Census 2000

When a project does have a minority population and low-income population that is affected by the proposed Federal Action and its alternatives, an evaluation is completed with regard to the specific characteristics of the minority population and low-income population that are affected. This can include impacts to traditional cultural properties in the case of Native Americans and others; impacts to ecosystems that the minority or low income populations are dependent on; impacts to the availability of replacement housing in minority population and low-income population areas; and impacts to the business sector, both for business owners and employees, in minority populations and low income populations.

Executive Order 12898 also addresses the importance of providing the opportunity for the affected population to be informed of a proposed action and its alternatives. It is likewise important to provide the affected population the opportunity to provide comments throughout the bridge location and route selection process. The *Highway 79 and Mississippi River Crossing Study* had public information meetings and public involvement throughout the study process and any future subsequent studies would continue to include public involvement as a major element of their study.

Concept 1 is the concept which may have the greatest potential impact to minority or low income populations, especially in close proximity to the Crump Interchange at the east end of the I-55 bridge. Concept 1 is also located near the city of West Memphis, Arkansas, in which roughly half of the population is a minority and 28 percent of the population is below poverty level.

Concept 2A and 2B are located in close proximity to Edmondson, Arkansas, which has approximately a 73 percent minority population with 71 percent from the same minority group, African American. A quarter of the town's population is also below the poverty level. Since the concept's corridor is very preliminary at this time, it should be possible to avoid environmental justice impacts to the town of Edmonson. The racial and income demographics of Concept 3A and 3B would not have environmental justice impacts. Measures would be taken to minimize or avoid impacts to low income or minority groups for all concepts within the study corridors.

In contrast, benefits could also be realized by environmental justice populations if a new bridge was located within the study area. Environmental justice populations could have improved access to work opportunities and community activities in the metropolitan area if a new bridge was constructed.

ECONOMIC DEVELOPMENT POTENTIAL

The Mississippi River crossing concepts could improve general transportation accessibility of the region, on both a local level between communities and points in the adjacent states and on a broader regional or national level to more distant sources. While travel conducted for many reasons would be affected, the emphasis for local economic development concerns is to attract new industry and expand existing industry in the region. By bringing in new jobs, expanding regional income and adding to the tax base, local leaders hope to improve the economic and social status of the region's residents and businesses. Benefits that may be realized include: reduced unemployment, reduce reliance on public assistance programs, expanded public and private investment in the region, and enhanced self-image and self-esteem.

This study recognizes that transportation infrastructure alone does not create employment opportunities. However, historical trends show that transportation is one of the most important factors considered in industrial location decisions. Transportation access is crucial to the overall manufacturing process as it facilitates the bringing together of the various inputs and the shipment and distribution of products to consumers. **Table 7-2** shows a comparison of the economic development potential of the candidate crossing concepts.

Table 7-2
Potential Economic Development Benefits
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Potential Economic Development Benefits	Con. 1	Con. 2A	Con. 2B	Con. 3A	Con. 3B
Would best increase tourism related travel in the region, especially to destinations such as Horseshoe Lake recreational area or the casinos in Tunica County, MS.			✓	✓	✓
Would best increase awareness of the region to individuals who affect commercial and industrial business location decisions.		✓	✓		
Would best improve intra-regional accessibility to alternative education and training, employment, recreation and medical opportunities.	✓	✓	✓	✓	✓
Improved access may reduce agricultural transportation and shipping costs.			✓	✓	✓
Construction of a new Mississippi River bridge would result in a temporary increase in local employment, income, business revenues and sales taxes during the construction period.	✓	✓	✓	✓	✓
Increased access may expand the intermodal interests of rail, trucking and shipping throughout the study area to other national or regional markets, including the proposed "super terminal".	✓	✓			
Could increase access to industrial interests including President's Island and Pidgeon Industrial Park.	✓	✓			
Would best improve connectivity to Memphis area economic center.	✓				

VISUAL QUALITY AND AESTHETICS

The following sections discuss the visual quality rating and the viewers within the corridors of the river crossing concepts.

Visual Quality Rating

The visual impacts of a project may be quite varied in different areas of a project corridor because the areas themselves can be visually distinct and can exhibit unique visual characteristics (**Table 7-3**). Topography and landscape/land use components can be used to define where visual environments change in visual character. The evaluation criteria used in this assessment are taken from federal visual assessment guidelines.

Within the area encompassed by the candidate concepts, the Mississippi River and Horseshoe Lake are the most scenically significant contributors to the visual quality and identity of the environment. The following visual quality ratings are used to assess the visual impacts of the concepts.

Table 7-3
Visual Quality Rating
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Visual Environment	Visual Quality Rating
Forested Areas	High
Rivers, Lakes and Streams	High
Grasslands	High
Agricultural Land	Moderate
Residential Development	Moderate
Commercial/Industrial Development	Low

Viewers

Individuals that have the potential for undesirable views of the road or bridge are referred to in this discussion as "Sensitive Visual Receptors". The relative concentration of sensitive visual receptors or viewers is high for residential areas, moderate for agricultural areas and low in the remainder of the study area.

Concept 1 would have little effect on current visual quality and aesthetics in the area, since it is generally an improvement to the existing I-55 bridge and roadway corridor. The I-55 Corridor has a high level of commercial and industrial development which is considered to have a low visual quality rating. However, since the I-55 bridge is designated as historic and listed on the National Register of Historic Places, a new modern bridge may alter the current visual setting.

Concept 2A crosses the Mississippi River in close proximity to commercial and industrial interests in the Memphis metropolitan area, including President's Island and Pidgeon Industrial Park, which are considered to have low visual quality ratings. There may be a slight effect on the visual quality of Concepts 2A and 2B near Edmondson since agricultural land may be taken by the concepts and a higher level of residential sensitive visual receptors are located there. Also, the concepts cross the river near Coro Lake and Fuller State Park in Memphis, which may slightly alter the current visual quality of these attractions.

Concepts 3A and 3B would have the most significant changes in visual quality. Horseshoe Lake is a popular recreational attraction near the Mississippi River and has areas of residential development. Also, since there is no current crossing of the Mississippi River in this area, a new bridge would alter the current landscape. Rivers and lakes are considered a high quality view and residential developments are considered high areas of sensitive visual receptors.

CULTURAL RESOURCES

The following discussions regarding cultural resources are separated into two categories – architectural resources and archeological resources.

Architectural Resources

National Register Properties listed on the National Register of Historic Places (NRHP) were identified for the counties crossed by the candidate concepts. The number of NRHP sites by county is shown in **Table 7-4**.

Table 7-4
Architectural Resources[1]
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

County	Total No. Resources in County[1]
Lee, AR	10
St. Francis, AR	7
Crittenden, AR	9
Shelby, TN	146
Desoto, MS	6

1: Resources include Architectural Resources and Bridge Resources.
Source: National Register of Historic Places

For this level of study, only sites listed on the NRHP were included in the evaluation of impacts. Field investigations were not conducted to determine if other sites in the area may be eligible for listing on the National Register of Historic Places. The National Register sites as shown in Figure 7-1, Social Constraints.

Concept 1 has four NRHP listed sites located in close proximity to the I-55 existing alignment; one site is in West Memphis, Arkansas and three in Memphis, Tennessee. Since Concept 1 is an improvement of the existing I-55 bridge and roadway corridor, three of the sites should be able to be avoided by potential improvements. The remaining site, located near the Crump Interchange, may be impacted by interchange modifications within the concept. The existing I-55 bridge, the Memphis-Arkansas Memorial Bridge, was added to the National Register of Historic Places in 2001 and if replaced or significantly modified would be impacted by Concept 1.

None of the remaining concepts would impact any known listed NRHP sites. At this time the remaining concepts have equal potential to impact currently unknown non-listed NRHP sites. A field survey for eligible architectural resources would have the potential to increase the current number of NRHP listed sites within the study area.

Archeological Resources

In Arkansas, archeological sites on the National Register of Historic Places include prehistoric rock art sites, Caddo Indian mounds in the Ouachita and Saline River Valleys, and Mississippian town sites in the Delta. In most instances, the exact site of an archeological site is kept confidential in order to protect the site from vandals or trespassers.

There are numerous known archeological sites within the concept study area, only one of which is listed on the National Register of Historic Places. Chucalissa is a small Late Mississippian town site that is located on the loess bluffs about six miles south of downtown Memphis, Tennessee at Fuller State Park. The site has the remains of potentially two substructural mounds and was occupied for at least 100 years, beginning in approximately A.D. 1400 and continuing to the early 1500s. It is currently managed as an archeological park by the University of Memphis. Concepts 2A would cross the river in close proximity to this archeological site but would not impact it.

There are likely additional unknown archeological sites throughout the concept study area. At this time, Concepts 2 and 3 and their variations have equal potential to impact these unknown archeological sites. More is known about the Concept 1 crossing since it is an existing bridge corridor. The remaining concepts would cross the river at locations that have likely not been surveyed for archeological sites. The Mississippi River Valley has been settled for centuries and the likelihood of discovering additional archeological sites is very high. Generally, archeological sites can be encountered along waterways and the floodplains of rivers. For this study, only NRHP listed archeological sites were evaluated for impacts. Field surveys of potential sites would generally be conducted after an alignment is designated.

SECTION 4(f)/SENSITIVE LAND USES

Section 4(f) of the Department of Transportation Act of 1966 declares that the use of protected lands for transportation projects may be approved by the FHWA only if no prudent or feasible alternative exists to avoid the resource, and if the project includes all possible planning to minimize harm. A Section 4(f) evaluation must be prepared for each location within a proposed project before the use of a Section 4(f) land can be approved. A 4(f) resource can include publicly owned land of a park, recreation area, wildlife/waterfowl refuge, or land of a historic site of national, state or local significance.

Potential Section 4(f) resources in the concept study area include T.O. Fuller State Park, De Soto Park, Martin Luther King Park, Riverside Public Golf Course, and NRHP listed and eligible architectural and archeological sites and properties. It is not anticipated that the concepts would directly impact any of these known Section 4(f) resources.

Concept 1 is located in close proximity to De Soto Park near the I-55 Crump Interchange; also Martin Luther King Park and Riverside Golf Course are located along the I-55 Corridor south of the Crump Interchange location. A new I-55 bridge is anticipated to be located to the south of the existing I-55 crossing due to the railroad bridges to the north. The new crossing locations should avoid impacts to De Soto Park. Improvements to the I-55 Crump Interchange and the I-55 Corridor south of the Mississippi River crossing would need to consider the location of these resources in order to avoid or minimize impacts.

Concept 2A crosses the Mississippi River in close proximity to T.O. Fuller State and the Chucalissa archeological site, but should not impact either resource. Concepts 3A and 3B cross near Horseshoe Lake, which has recreational uses that may qualify as a 4(f) resource. Concepts 3A and 3B would not impact this resource.

For this planning level study, field investigations and surveys of NRHP eligible archeological and architectural sites were not conducted. There is potential for more sites that are eligible to be listed on the National Register if further, more detailed evaluation of a specific, defined alignment was conducted in a future study. Measures would be taken to minimize or avoid impacts to these 4(f) resources.

A new Mississippi River crossing in the general locations of the candidate concepts shown in **Figure 8-1**, Environmental Constraints, would have varying degrees of potential impacts to the surrounding natural environment. The environmental constraints that may be impacted by the candidate concepts are:

- Floodplains
- Natural Community and Habitat
- Wetlands
- Hazardous Material Sites
- Noise
- Air Quality
- Water Quality
- Prime Farmland
- Threatened and Endangered Species

FLOODPLAIN ISSUES

The Mississippi River floodplain varies in width throughout the study area. The Mississippi River is controlled by a flood protection levee system. In general, a crossing of the river would need to span this levee system. USGS mapping and Electronic Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps were used to evaluate floodplain constraints within the study area. The range of conceptual crossing locations was chosen based on their ability to minimize the length of the floodplain crossing. The floodplain limits and the levee boundaries can be seen in **Figure 8-2**, Water Resources.

The following are locations where it was considered not feasible to locate a river crossing due to floodplain considerations:

- The Cow Island/Armstrong Bar river crossing area. The floodplain is very wide at this point and the distance from levee to levee is a significant distance for a bridge to span in the study area. It also would have to cross islands and sand bars.
- The river crossing area between Concept 2A and 2B. This is a small area between these two concepts which was not feasible for a river crossing due to the length of the floodplain from levee to levee and the potential need for two separate river crossings.
- President's Island, which falls between the existing I-55 bridge and Concept 2A. A crossing here has constraints with the industrial development at President's Island and is also one of the greater distances for a bridge to span due to the size of the floodplain.

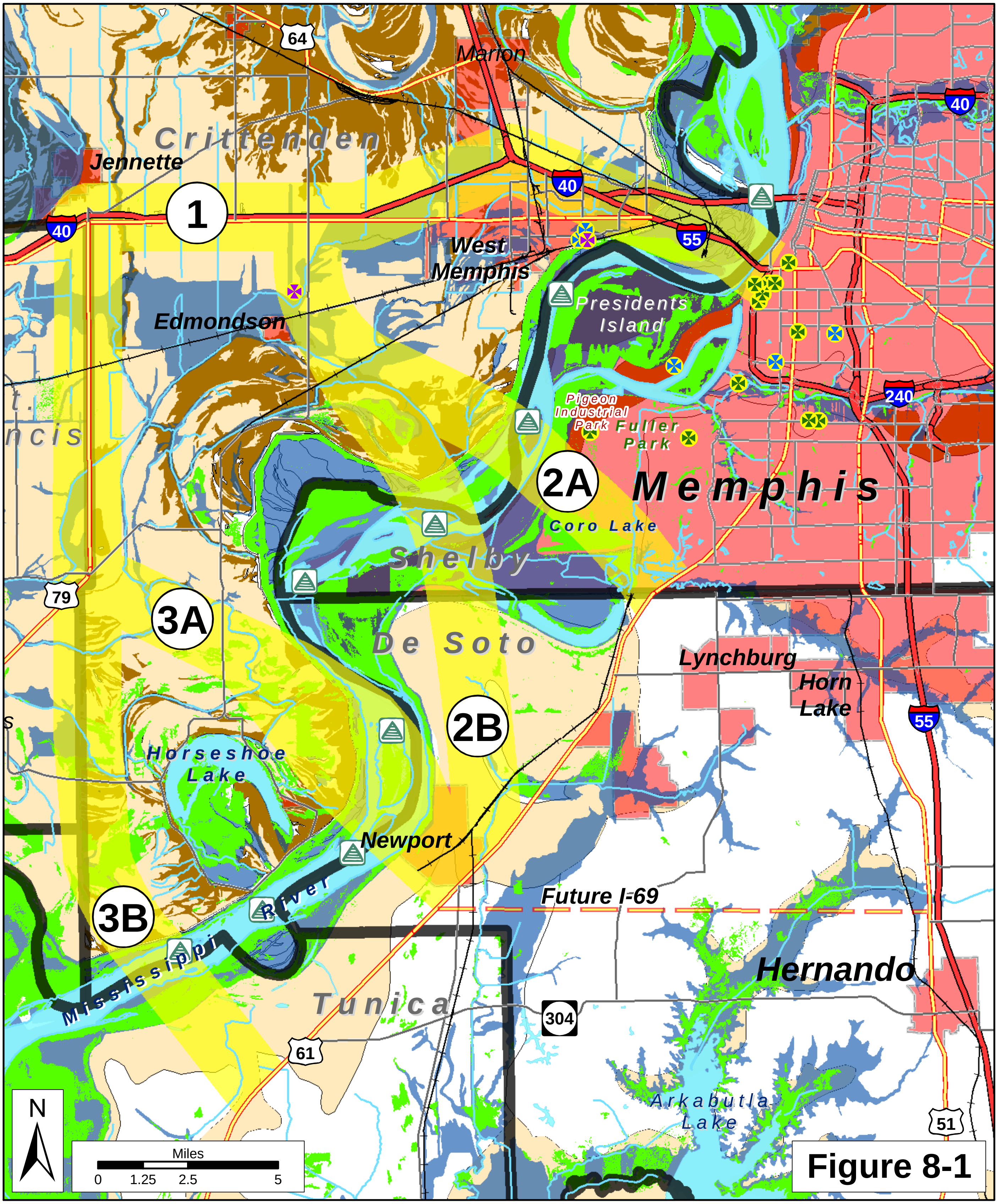


Figure 8-1

Highway 79 Feasibility Study: Environmental Constraints

- Limited Access Higway
- Highway
- Local Roads
- Railroads
- Rivers/Streams
- Incorporated Areas
- 100 Year Floodplain
- Proposed Bridge Crossing Concepts
- Wooded and Emerg. Herb. Wetlands
- Prime Farmland
- Conditional Prime Farmland
- Not Prime Farmland
- Threatened & Endangered Species

Haz. Waste Sites

- CERCLIS
- NPL
- RCRA

HWY 79

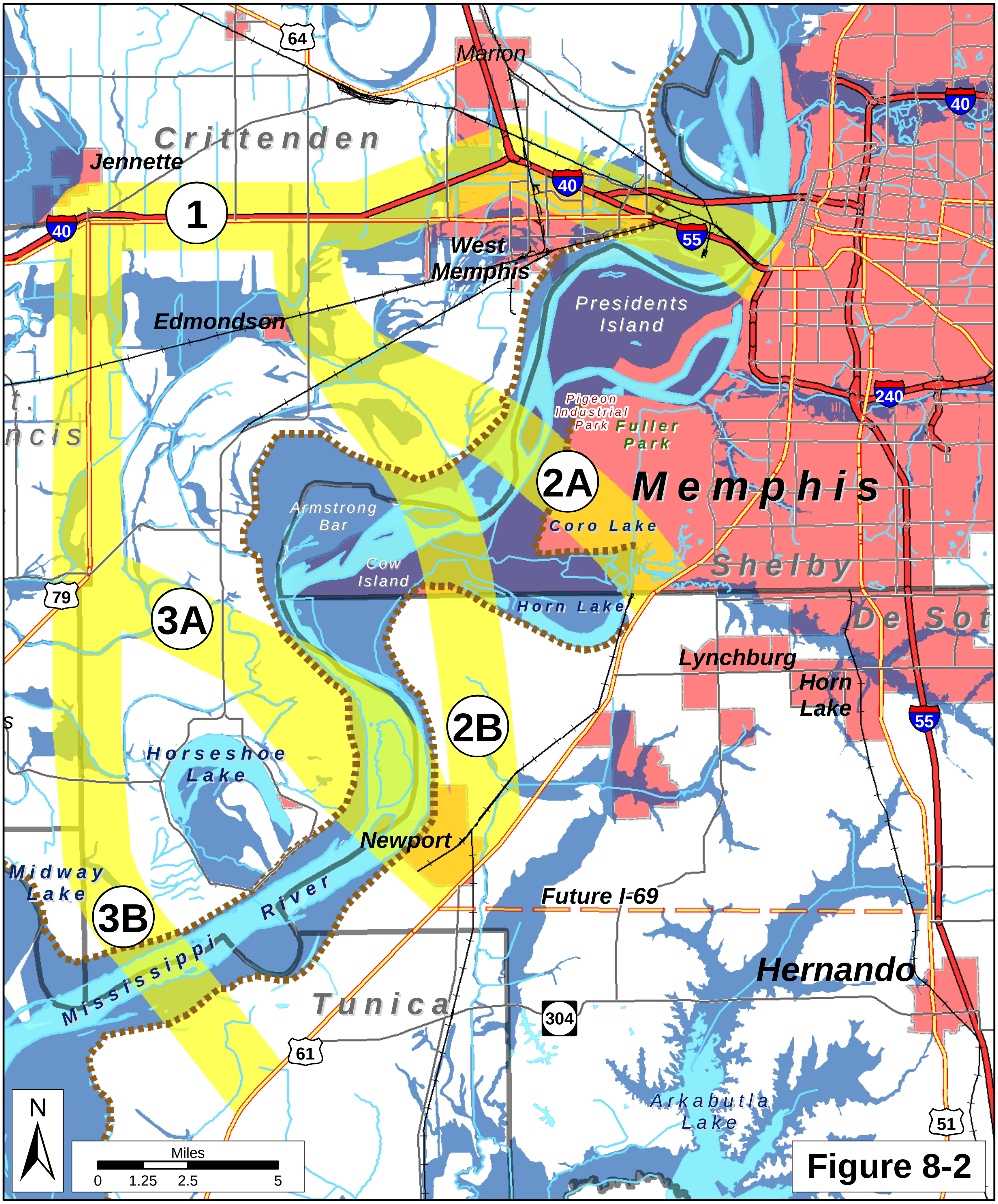


Figure 8-2

Highway 79 Feasibility Study: Water Resources

- Limited Access Higway
- Highway
- Local Roads
- Railroads
- Rivers/Streams
- Incorporated Areas
- 100 Year Floodplain
- Proposed Bridge Crossing Concepts
- Levee
- Future 304

HWY 79

None of the candidate concepts have any fatal flaws associated with floodplain crossings that would preclude them from further study. Concept 1 would have a similar floodplain crossing as the existing I-55 bridge. Concepts 2A could potentially have two crossings of the floodplain, once at the Mississippi River and once near Coro Lake. Concept 2B crosses the floodplain near the Tennessee-Mississippi state line and requires the longest floodplain crossing. Concept 3A has the shortest floodplain crossing, resulting in the shortest bridge length needed.

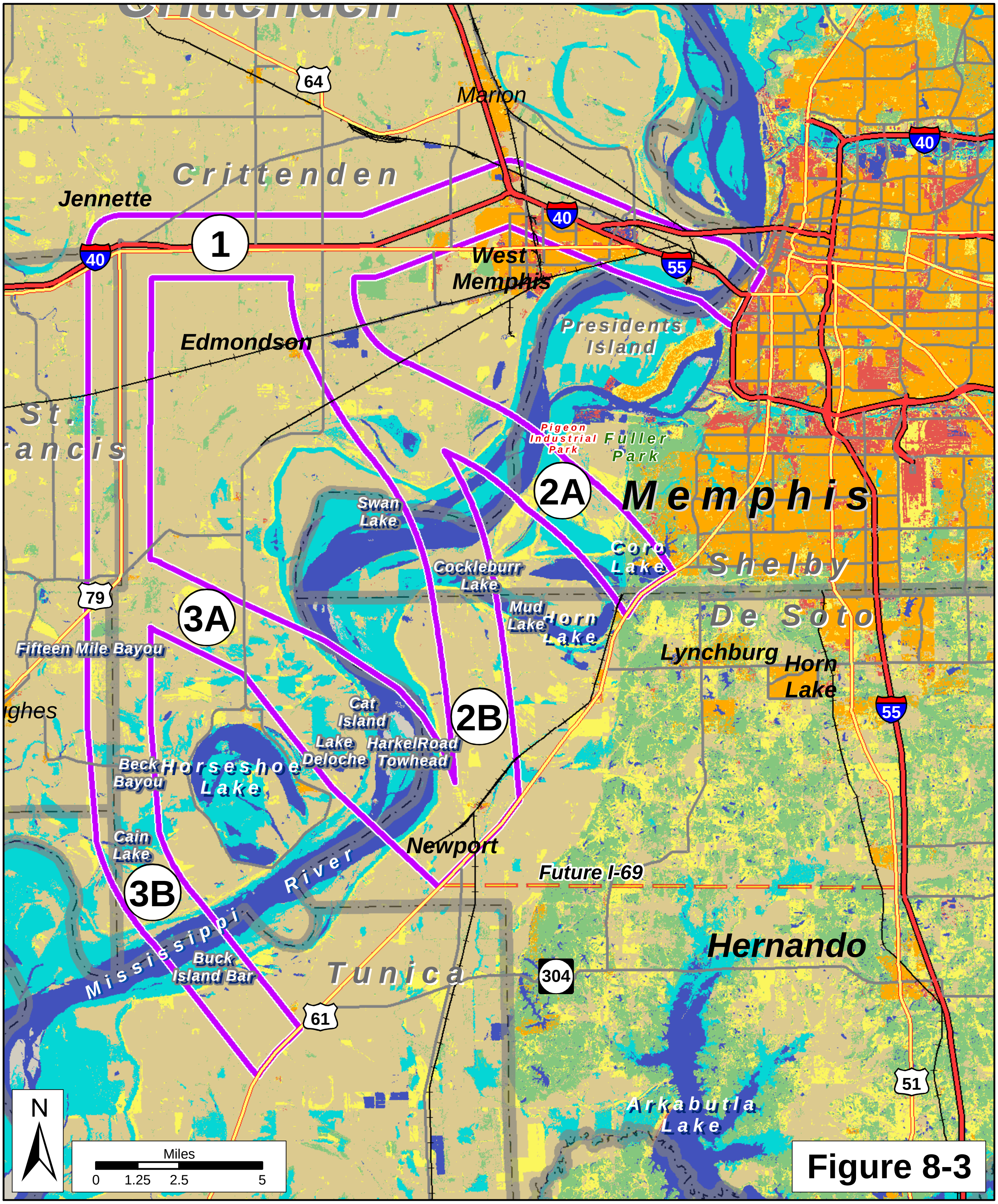
NATURAL COMMUNITY AND HABITAT

The satellite imagery shown in **Figure 8-3**, Landcover Map, provides a regional perspective on the extent of vegetated habitat within the candidate concept locations. The map offers perspective on the relative size of the forested wetlands that exist in the study area, particularly the important forested wetlands existing between the Mississippi River levee system.

The portions of the concepts that require construction on new right-of-way are likely to impact natural communities, both terrestrial and aquatic, directly through acquisition and indirectly through habitat modification and fragmentation. Right-of-way acquisition and clearing results in direct, quantifiable losses of habitat. Indirect impacts include the reduction in size of remaining blocks and the resulting modification of habitat caused by fragmentation. When a transportation project bisects a large continuous block of habitat, or crosses a stream by means of a culvert, the resulting fragmentation creates two smaller islands of habitat. Each island is adversely affected through reductions in block size, reductions in carrying capacity, introduction of predatory species, or creation of barriers to normal wildlife movements. Species with narrowly defined habitat requirements are often displaced, while other species adapt and continue to maintain breeding populations. However, because there is a reliable correlation between the destruction of habitat and the degree of impacts on faunal communities, the overall species diversity is usually impaired.

Perhaps no other species group is more adversely affected by fragmentation than neotropical migrant bird species. However, it is difficult and problematic to identify one specific, minimum fragment size with which to judge the nature and severity of fragmentation impacts. Generally speaking, contiguous forested tracts of 500 acres or more are considered the minimum fragment size necessary to maintain limited populations of neotropical migrant bird species. However, such fragments should be generally free of hard edge influences (edge created by permanent structures like paved roads) and have a minimum of interior disturbances (soft edge influences like forest roads and logging decks). Fragments of this size afford adequate protection from predators and nest parasites. Also important are riparian passageways associated with the forested fringe of bayous, sloughs, swales, and other stream systems, as well as aquatic habitat.

Elevated sections would be used for areas lying between the Mississippi River levee system. These areas would require the clearing of right-of-way. Additional clearing to facilitate construction may also be required. Some of this clearing would certainly occur in



Highway 79 Feasibility Study: Landcover Map

HWY 79

- Limited Access Higway
- Highway
- Local Roads
- Railroads
- Proposed Bridge Crossing Concepts
- Open Water
- Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Forested Areas
- Agricultural Uses
- Grasslands/Pasture
- Wooded and Emerg. Herb. Wetlands

wetland habitat and would need to be included in potential vegetative restoration and mitigation measures.

The new facility would come down to grade after crossing the levees on both sides of the Mississippi River. Roadway sections are assumed to require 250 to 350 feet of right-of-way and would be constructed on embankment, with either low-profile bridges or culverts across drainages and riparian corridors. Most of the lands over which embankment sections would cross are in active cultivation.

Fragmentation of the larger blocks of forested habitat (500 acres or more) would occur, to a large extent within the levees. This fragmentation would occur mainly because of construction impacts within the levees when constructing the bridge and its approaches. These areas would be crossed by bridge structure and would somewhat rehabilitate after construction is completed. The habitat blocks inside the levees are relatively narrow; however, they may connect to larger blocks on both sides of the river. These connections are important to wildlife, which are constrained by either the river or the proximity to man in cultivated fields beyond the levee.

Potential impacts fall into three categories: (1) construction impacts, (2) operational impacts, and (3) indirect impacts. Careful consideration of potential impacts during the planning and design phases of the project would be necessary and appropriate to minimize the severity of these impacts. Other measures would be carried out during the construction phase through the implementation of best management practices and proper erosion control measures.

Construction impacts would result from the preparation of the site and the disturbance to surface materials inherent in this activity. Soils may be compacted from the traffic of heavy equipment, and plant materials would be physically removed. Fuels, lubricants, and other fluids would be present on the site and could be accidentally dispersed over the construction site. In addition, air and noise quality may show temporary adverse impacts. It is intended that some construction haul roads and most staging areas would be located within the acquired right-of-way. However, it may be necessary to improve or modify some existing roads to facilitate access to the site. These activities could disturb sites outside the right-of-way, but adequate construction planning can minimize this.

The use and maintenance of the proposed new bridge and roadway concepts could contribute to operational impacts. Operational impacts include the dispersal of fuel and lubricant spills into the natural environment and vegetation loss by herbicides and mechanical means. As with all major transportation routes, there is also a small potential for accidental catastrophic spills, since fuels and chemicals would likely be transported on the new roadway. However, the proposed facility represents an improvement in roadway design over existing facilities and would provide safer transport of these materials.

The natural vegetation would be impacted primarily by activities involved in preparing the right-of-way. Plant materials are often wind-rowed and disposed of on site. Natural re-vegetation could be further impacted by loss of topsoil and soil compaction. Reclamation on embankments and along ditches and medians is usually accomplished according to a re-vegetation or landscaping plan, which may include natural succession.

Indirect impacts may occur because of induced development in the area of the new crossing. The project could stimulate commercial and residential development in the immediate area. This would also require an infrastructure to service this development -- expanded water, sewer, and electric service; expanded fire and police protection; and full range of commercial services. This secondary development would most likely occur at or near key nodes in the project where interchanges are constructed.

All of the candidate concepts would have some impacts to natural community and habitat, especially between the levees of the Mississippi River crossing areas. Concept 1 would have the lowest impacts to natural communities and habitat, since it is an improvement to existing I-55 and is located in an area which is already heavily developed. Concept 2A has impacts at the Mississippi River crossing area and south of the river crossing to Coro Lake. In this area there are some areas of wooded wetlands and some grasslands and pasture. Concept 2B mainly has impacts to agricultural uses and would likely have fewer impacts to natural communities and habitat than the other concepts since the land has already been converted to farmland. Concepts 3A and 3B have a higher percentage of wooded wetlands than the other concepts, especially in the Horseshoe Lake area. Impacts to natural communities and habitat would be higher for these two concepts.

WETLANDS

The satellite imagery shown in Figure 8-3 provides a regional perspective on the scope of wetland issues. The view shown contrasts the impact area of the candidate concepts with vegetation zones and offers some perspective on the relative size of the forested wetlands that exist in the overall study area, particularly important wooded wetlands existing between the Mississippi River levee system. Both wooded wetlands and emergent herbaceous wetlands are identified on Figure 8-1 and Figure 8-3.

The study area contains areas of land which meet the three mandatory technical criteria for determination as jurisdictional wetlands. The technical criteria are:

- **Hydrophytic vegetation** – macrophytic plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content;
- **Hydric soils** – soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (oxygen deficient) conditions in the surface layer; and,
- **Wetland hydrology** – hydrologic input to the system causing inundation or soil saturation to the surface, at least seasonally, thereby creating the anaerobic

conditions which affect hydric soil formation and limit the types of vegetation that can grow.

Because so much of the lands in the project area have been cleared of natural vegetation and the hydrology altered to facilitate agriculture, the only remaining contiguous acreages of jurisdictional wetlands lay in the floodplain between the levee systems. These lands are subject to periodic inundation by seasonal overflows of the Mississippi River. Overflow conditions may also influence lands surrounding the numerous small bayous, sloughs, and chutes in the project area. The alluvial soils of this area are either hydric by designation or contain hydric inclusions and, as such, support a preponderance of wetland vegetation.

For this planning level study, wetlands were not field surveyed or verified. NWI mapping, USGS mapping, and the satellite imagery shown in Figure 8-3, Landcover Map, were used to identify major wetland areas. During the early stages of identifying candidate concept corridors, potential wetland areas were assessed and used to avoid or minimize, wherever practicable, encroachments into jurisdictional wetlands and waters of the U.S.

Concept 1 would have the least impact to wetland areas since it is already located within a highly developed area, and wetland areas have already been affected by previous transportation improvements as well as commercial and industrial development.

Concept 2A would mainly impact wetland areas between the Mississippi River levees at the river crossing location, however there are some potential impacts to wetlands near North Horn Lake near the De Soto-Shelby county line, and near Coro Lake in close proximity to Highway 61. Concept 2B would impact wetlands between the Mississippi River levees, potential wetlands near Swan Lake just north of the Mississippi River crossing location and Cockleburr Lake and Mud Lake just south of the river crossing near the De Soto – Shelby county line. All portions of the corridor south of the county line are located in a dominantly agricultural use area.

Concept 3A would have the highest potential wetland impacts, especially within the area north and east of Horseshoe Lake. This includes Lake Deloche and its surrounding area. Cat Island and Harkel Road Towhead within the Mississippi River also have high potential for wetland areas between the Mississippi River levees. Concept 3B has potential wetland impacts just south of where existing Highway 79 veers southwest to Hughes, Arkansas near Fifteenmile Bayou as well as large areas south and west of Horseshoe Lake near Beck Bayou and Cain Lake. There is also a large potential wetland area just south of the Mississippi River crossing at Buck Island Bar.

The extent of wetland involvement and the degree of impact to existing wetlands would depend on the final alignment of a chosen concept, design features, and construction methods chosen. Appropriate and practicable compensatory mitigation would be required for unavoidable adverse impact to wetlands.

Wetlands Reserve Program

The wetlands reserve program is an important consideration for evaluating wetland constraints in the study area. The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect and restore wetlands on their property. The USDA Natural Resource Conservation Service (NRCS) provides support to help landowners restore or protect their wetlands. WRP is reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The program provides landowners financial incentives to enhance wetlands in exchange for retiring marginal land from agriculture. The landowners voluntarily limit the future use of that land, but retain private ownership.

The landowners maintain access to the WRP land and may lease the land for hunting, fishing, and other recreational activities. A request can be made by the landowner to have permission to cut hay, graze livestock, or harvest wooded areas. WRP land can be permanent easements or a 30-year term easement.

Both Arkansas and Mississippi participate in the WRP. According to the NRCS, Arkansas currently has 67,165 active acres of WRP lands and a backlog of more than 32,000 acres on unfunded registers. Since the 1992 Pilot Program, there have been 249 easements enrolled in the state of Mississippi, encompassing 100,000 acres. This gives Mississippi the second largest enrollment in WRP acres in the nation. The NRCS has mapped WRP project locations in Arkansas and Mississippi counties; however, no WRP sites are currently located within the study area for the river crossing concepts. The source maps available from the NRCS are dated March 1999, Map ID: 4273 for Arkansas and Map ID: 4260 for Mississippi.

HAZARDOUS MATERIAL SITES

For the purposes of this review, hazardous wastes and materials are defined as products or wastes regulated by the U.S. Environmental Protection Agency (EPA) or the Arkansas Department of Environmental Quality (ADEQ). These include substances and sites regulated under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA).

The hazardous waste assessment involved a review of regulatory databases that was conducted by viewing Internet files of the EPA, with mapped locations dated August 20, 2002. Field surveys or investigations were not conducted for this project. The following three hazardous waste categories are shown on Figure 8-1 and assessed in relation to the candidate concepts:

- NPL – National Priorities List is EPA's list that identifies sites for remedial actions under the Superfund program.

- CERCLIS – Comprehensive Emergency Response, Compensation, and Liability Act is EPA's list of sites which are either proposed to or on the NPL list, and sites which are in the process of assessment for possible inclusion on the NPL.
- RCRA CORRACTS - Resource Conservation and Recovery Act Corrective Action Sites are facilities undergoing corrective action.

The candidate concepts have been located to avoid or minimize impacts to hazardous waste sites. For Concept 1, approximately six CERCLIS sites are located in close proximity to the I-55 Crump Interchange. If interchange modifications or I-55 widening is recommended at this location, careful consideration would have to be taken to avoid or minimize impacts to these sites.

Concepts 2A and 2B are located in close proximity to a de-listed NPL site, Gurley Pit, which is located one mile north of Edmondson in Crittenden County. However, Gurley Pit would be avoided by these concepts and the site has had remedial action and been deleted from the NPL.

No known RCRA sites should be impacted by the candidate concepts. Concepts 3A and 3B avoid all known hazardous waste sites in the previously mentioned categories.

NOISE

Sound is the sensation produced in the hearing organs when waves are created in the surrounding air by the vibration of some material body. Noise is defined as unwanted sound. A sound-level meter is the basic instrument of noise measurement. The American Standard (ANSI SI.4-1971) specifies that sound level meters have the capability of measuring three alternate frequency response characteristics designated as A, B and C. The Federal Highway Administration (FHWA) has specified that noise be predicted and evaluated in decibels weighted with the A-level frequency response; this unit of measure is referred to as dBA. **Table 8-1** shows noise levels (in dBA) common to our everyday activities.

The range of sound pressure levels most frequently encountered in evaluating traffic-generated noise on highways is 50 to 95 dB.

23 CFR 772 contains noise abatement criteria, which is based on the equivalent level (Leq) noise descriptor. Leq(h) is the equivalent steady state sound level, which during the hour under consideration contains the same acoustic energy as the time-varying traffic sound level during that same hour. **Table 8-2** shows the noise abatement criteria (NAC) established by 23 CFR 772. Any noise levels that approach or exceed these criteria would be considered a noise impact.

Table 8-1
Common Noise Levels
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Common Noise Levels	Lmax Noise Level (dBA)
Rock Band at 16 ft.	110
Jet Flyover at 985 ft.	105
Gas Lawn Mower at 3 ft.	95
Diesel Truck at 50 ft.	85
Normal Speech at 3 ft.	65
Birds Chirping	50
Leaves Rustling	40
Threshold of Hearing	0

Table 8-2
Noise Abatement Criteria - Hourly A-Weighted Sound Level
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Activity Category	Hourly Noise Levels Leq(h) dBA	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, play grounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Code of Federal Regulations, Title 23 Part 772, Revised October 1997

The selection and analysis of all individual noise sensitive receptors are based on the data included in the above table. Most areas come under Activity Category "B" or "C". Activity "C" mostly pertains to commercial land use or business offices, but would not necessarily include such things as a factory, machine shop or a service station. Also, storage buildings or warehouses are not usually considered to be noise sensitive. Primary consideration is to be given to exterior areas; therefore, all noise levels referred to in this study are exterior noise levels unless otherwise stated. Activity Category "E" is only applied when a receptor does not have any exterior land uses.

Noise abatement measures would be considered when the predicted noise levels "approach" or exceed those values shown for the appropriate activity category of the FHWA Noise Abatement Criteria (Table 8-2), or when the predicted traffic noise levels "substantially" exceed the existing noise levels. "Approach" values are defined as being one dBA less than the noise levels shown in Table 8-2. The AHTD has defined an increase over existing of 10 decibels or more as being "substantial" and this is used for the Highway 79 Feasibility Study. At this time, noise abatement measures were not considered for the concepts. For this planning level study, noise modeling was not conducted and specific noise receptors were not identified. A general discussion and comparison of potential noise impacts is provided.

Concept 1 has the highest potential for increase in current noise levels since it is already an interstate corridor with heavy traffic and future Year 2023 traffic projections shown in Chapter 3 indicate that average daily traffic will increase for this concept. The more traffic the concept generates, the higher the noise impacts. The outward expansion of lanes could bring the traffic closer to existing development, depending on the corridor adjacencies. The concept would likely fall into Category C from Table 8-2. Since the I-55 Corridor mainly has industrial and commercial development, the increase in current noise impacts may not be as significant to the potential receptors.

The remaining concepts would cause some increase in noise levels since the majority of their corridors are located in undeveloped lands, Category D. Concept 2A would have some areas near the industrial parks and Coro and Horn Lake where noise levels might fall into Categories B and C above. Noise impacts would be considered highest to residential and recreational uses in the area. Concept 2B would likely have the least receptors to noise impacts since it is located in a sparsely populated area, having the most noise impacts near Edmondson, Arkansas. Concepts 3A and 3B would have residential and recreational areas around Horseshoe Lake that fall into Category B. Noise impacts would be considered highest to residential and recreational uses in the area. However, since the majority of the residential development in the study corridors is low density, shifts could be made in the final alignments to avoid proximity to residences and minimize noise impacts.

The evaluation and control of construction noise must be considered as well as traffic noise. The major construction elements of this project are expected to be earth moving, hauling, grading, paving, and bridge construction. General construction noise impacts for passersby and those individuals living or working near the project can be expected, particularly from earth moving and paving operations. During design and construction, every effort should be made to ensure community awareness of the project, control source and site noise emissions, and manage work hours on the construction site to minimize noise emissions.

Noise Abatement Criteria would likely not be exceeded by Concepts 2 and 3 and their variations. Concept 1 is an improvement of existing I-55 located in a mainly industrial/commercial area where noise impacts may already exist and where noise impacts may not be considered as substantial due to the type of development. Further more detailed planning studies may require a formal noise study and noise modeling effort to determine if Noise Abatement Criteria are exceeded.

AIR QUALITY

The Highway 79 study area is located within the Metropolitan Memphis Interstate Air Quality Control Region (AQCR #18), which includes the counties of Crittenden County, Arkansas; De Soto County, Mississippi; and Shelby County, Tennessee. As mentioned in Technical Memorandum 2, *Evaluation of Existing Corridor*, the Memphis/Shelby County region has been a nonattainment area for both ozone and carbon monoxide with regard to National Ambient Air Quality Standards (NAAQS), but was redesignated as an attainment area for both pollutants. The Memphis region was declared a maintenance area under the NAAQS in November 1991 and continues in that classification. However, the region is anticipated to violate the new NAAQS 8-hour ozone standard and may also violate maximum levels of small particulates (P.M. 2.5).

A small portion of the study area is located within Tunica County, Mississippi which is a part of the Mississippi Delta Interstate Air Quality Control Region (AQCR #134). This area is in attainment for all pollutants and not currently expected to exceed the new NAAQS. The West Memphis, Arkansas region (Crittenden County) is also currently an attainment area, but considered at risk for violating the 8-hour ozone standard.

On July 15, 2003, Governor Mike Huckabee included Crittenden County on a list of Arkansas counties submitted to US EPA for preliminary designation as nonattainment areas for ozone under the 8-hour standard. However, Crittenden County has entered into an Ozone Early Action Compact with US EPA and its formal designation may be deferred indefinitely with the successful completion of an Ozone Early Action Plan.

It is difficult to predict the impact of a new Mississippi River crossing on the region's air quality at this point in time. If in fact portions of the region officially become nonattainment areas, the metropolitan planning organizations (MPOs) for those areas will be required to conduct conformity analysis on the long range transportation plan and transportation improvement program. A new Mississippi River crossing within the nonattainment area would have to be included in such an analysis, which would demonstrate compliance with either an emissions budget or a build/no-build test. Conformity analysis is a complex process involving the interaction of both transportation demand models and emissions estimating models. While the conventional wisdom may indicate that capacity and/or access improvement projects such as a major new crossing may make conformity determinations more difficult to achieve, reduction of congestion bottlenecks has also shown positive air quality results in many areas.

Reduction of congestion on the I-55 and I-40 bridges locations may have a positive impact on air quality in the region. Concept 1 could have a positive air quality impact since this concept includes consideration of additional lanes on both the I-55 bridge and roadway sections between West Memphis, Arkansas and Memphis, Tennessee. This may reduce congestion in this location and positively impact emissions of ozone precursors. However, Year 2023 traffic projections shown in Chapter 3 show an increase in traffic on the I-55 bridge, which could negate an earlier benefit.

All of the remaining concepts fall within the boundaries of the Memphis metropolitan area. However, all of the concepts are located to the south of the main core of Memphis. Concepts 3A and 3B are located in sparsely populated areas with mainly agricultural uses. These locations raise the potential issue of spurring development and latent traffic demand. Yet, Year 2023 traffic projections shown in Chapter 3 indicate that the new concepts should not result in significant increases in emissions. While air quality may show some degradation in these areas, it should not be at a level that would highly impact the Memphis region's ability to meet NAAQS current standards. (However, conformity determinations are generally made by very small margins, and a slight increase in emissions could negatively impact the regional transportation plan.)

It is generally expected that imposition of the 8-hour ozone standard and P.M. 2.5 standard could have major impacts on the planning and programming of transportation projects. The air quality impacts of a new Mississippi River crossing in the Memphis vicinity will be studied in detail at both the planning and project development phases. The outcome of these studies will also be impacted by the regional selection of other transportation improvements, as well as proposed improvements in engine and fuels technologies.

WATER QUALITY

Generally, all forms of highway construction and maintenance contribute to water runoff. Operation and maintenance creates runoff that contains various pollutants such as oils, coolants, and wear pollutants from tires, brakes, etc. Motor vehicle crashes can also contribute to the pollutants as chemicals spilled could be flushed into the drainage systems. Deicing minerals and chemicals may also contribute to the pollutant load. These pollutants can accumulate over a period of time. Pollutant load on receiving waters usually displays an initial flushing action during a precipitation event typified by an initial spike of loading followed by a marked decline. Ninety percent of the pollutant loading occurs during the first one-half inch of rainfall. The order of magnitude of loading is usually controlled by the time in between storms that pollutants are given to accumulate. Other variables that could possibly impact the magnitude of water quality include traffic composition and volume, maintenance activities, adjacent land use, climate, types of roadside vegetation, and characteristics of the local and regional drainage area.

Water quality impacts during roadway construction are primarily due to the erosion of cleared areas, operation of earth-moving equipment, and storage of construction materials and supplies.

At the time of construction, storm water runoff at the projected traffic volumes shown in Chapter 3 puts forth minimal to no impact on the aquatic environments of most receiving waters, as stated by the Federal Highway Administration; *Effects of Highway Runoff on Receiving Waters*; Report No. FHWA/rd-84/062-066, June 1987. Potential effects can be minimized if design features are incorporated using the Best Management Practices as stated in Federal Highway Administration Publication No. FHWA-PD-96-032, June 1996, Evaluation and Management of Highway Runoff Water Quality.

Temporary impacts to streams in the study corridor can be minimized if general Best Management Practices are followed. Those practices include seeding and mulching as soon as possible. Disturbance to the stream banks and riparian zones should also be minimized. All standard erosion protection devices such as ditch checks and silt fences should be installed at the outset of construction and maintained throughout the period. Care should be given that slopes and ditches are properly designed to prohibit or reduce erosion.

Impacts to groundwater are similar to surface water. The highway is also not thought to be significantly detrimental to the groundwater of the region. Nearly all of the runoff would be transmitted to surface waters. A facility having less than 30,000 vehicles per day (vpd) is not thought to add loading to the basin when evaluating the basin as a whole. All of the concepts, aside from Concept 1, have Year 2023 projected volumes under 30,000 vpd. Concept 1, improvement of the existing I-55, has a current vpd of 38,000 vpd and an estimated Year 2023 of 49,600 vpd.

The areas public water is supplied from groundwater taken from deep aquifers whose recharge is mainly outside the study area. Present regulations regarding well construction would prevent any contamination to local wells from surface contaminants. Private water wells may be impacted on a local basis, particularly improperly constructed wells. During the construction phase, these private wells would be identified and impacts remediated. Many agricultural wells exist in the study area as well since the majority of the land use is agricultural.

FARMLAND IMPACTS

In accordance with the Farmland Protection Policy Act (FPPA) of 1981, Federal Programs that contribute to the necessary and irreversible conversion of farmland to nonagricultural uses should be minimized. The FPPA also states that Federal programs shall be administered in a manner that, as practicable, is compatible with state and local government and private programs and policies to protect farmland.

For highway-related projects, impacts to prime farmland are determined by the amount of land taken for right-of-way plus those construction easements that extend beyond the edge of the right-of-way. For this planning level study, the right-of-way was assumed to be in a range of 250 feet to 350 feet for Concepts 2 and 3 and 50 feet additional on either side of the centerline of I-55's existing right-of-way for Concept 1.

Impacts to farm operations are another important factor. Property lines would be taken into consideration during the alignment selection process if a decision was made to further study any of the candidate concepts. Agriculture operations are conducted on a large scale and it is unavoidable that some farm operations may be impacted by the construction of the proposed limited access freeway portions of the concepts.

All of the candidate concepts except for Concept 1 would impact prime farmlands and conditional prime farmlands in the study area. The majority of the freeway portions of the candidate concepts are mainly agricultural land uses today. This can be seen on Figure 8-1, Environmental Constraints Map, and Figure 8-3, Landcover Map.

As described in Technical Memorandum 2, *Evaluation of Existing Corridor*, Chapter 3, the prime farmland soils series units within the study area are divided into two categories: 1) those that are designated as prime farmland with no restrictions or qualifications, and, 2) those that are considered prime farmland only if drainage or flooding protection measures have been implemented. Category 2 is identified on Figure 8-1 as conditional prime farmland. Within the study area, the majority of the conditional prime farmland has been drained and converted to agricultural uses and is considered a part of the prime farmland impacts for the project. Soil Survey Geographic (SSURGO) data were used to determine areas of Prime Farmland and conditional prime farmland in Arkansas. SSURGO is the most detailed level of soil mapping done by the Natural Resources Conservation Service (NRCS). State Soil Geographic Database (STATSGO) data were used in Mississippi and Tennessee since SSURGO data were not available. This data set is a digital general soil association map developed by the National Cooperative Soil Survey and distributed by the NRCS of the U.S. Department of Agriculture. It consists of a broad based inventory of soils and nonsoil areas that occur on the landscape and the soil maps for STATSGO are compiled by generalizing more detailed soil survey maps.

Concept 1 would not generally impact prime or conditional prime farmland since it is an improvement of the existing I-55 Corridor and bridge crossing and is located in an area of commercial and industrial development. Approximately 75 percent of Concept 2A is prime farmland or conditional prime farmland. Concept 2B is nearly 100 percent prime or conditional prime farmland, excluding its Mississippi River crossing area. This concept could have high impacts to prime farmland. Concept 3A is roughly 80 percent prime or conditional prime farmland. It could have medium to high impacts to prime farmland, depending on how close a new parallel route to the existing north-south Highway 79 right-of-way could be located to minimize new impacts in this section. Concept 3B is approximately 90 percent prime or conditional prime farmland. Concept 3B could have high impacts to prime farmland. Acreages of prime or conditional prime farmland affected by the concepts were not determined in this study since defined alignments have not been identified; only conceptual representative corridors.

THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service's Threatened and Endangered Species System (TESS) was consulted to find listings of federally-listed threatened and endangered species by state. The Arkansas Game and Fish Commission's website and the Arkansas Natural Heritage Commission's Rare Elements search engine were also reviewed for primary baseline information on state-listed or candidate species that have a historical record of occurrence within Arkansas and potentially within the Highway 79 study area.

Table 8-3 shows the species that were known to be found in Crittenden County, Arkansas according to the Natural Heritage Commission's Rare Elements search engine.

Table 8-3
Threatened, Endangered and Rare Species in Concept Study Area
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Common Name	Scientific Name	Federal Status	State Status
Western fanshell	*Cyprogenia aberti*	-	Inventoried
Hickorynut	*Obovaria olivaria*	-	Inventoried
Ohio pigtoe	*Pleurobema cordatum*	-	Inventoried
Pink heelsplitter	*Potamilus capax*	-	Inventoried
Fat pocketbook	*Potamilus capax*	Listed Endangered	Listed Endangered Inventoried
Purple liliput	*Toxolasma lividus*	-	Inventoried
Pondhorn	*Uniomerus tetralasmus*	-	Inventoried
Swamp darter	*Etheostoma fusiforme*	-	Inventoried
Bald eagle	*Haliaeetus leucocephalus*	Listed Threatened – Proposed for De-listing	Listed Threatened Inventoried
Taillight shiner	*Notropis maculatus*	-	Inventoried
Interior least tern	*Steerna antillarum*	Listed Endangered	Listed Endangered Inventoried
Water spider orchid	*Habenaria repens*	-	Inventoried
Bristly greenbriar	*Smilax tamnoides*	-	Inventoried
Cypress swamp	-	-	Inventoried
Colonial nesting site water birds	-	-	Inventoried

Section 6 of the Endangered Species Act provides for coordination with states through funding conservation actions involving listed species. In Arkansas, the Arkansas Game and Fish Commission has a Cooperative Agreement with the U.S. Fish and Wildlife Service for Section 6 activities for animal species and the Arkansas Natural Heritage Commission for plants. However, the Arkansas Natural Heritage Commission provided the information on threatened and endangered species for this project. Staff members of the Arkansas Natural Heritage Commission reviewed their Natural Heritage Inventory for records indicating the occurrence of rare plants and animals, outstanding natural communities, natural or scenic rivers, or other elements of special concern within or near the Highway 79 Mississippi River crossing concepts. Records from the Arkansas Natural Heritage Commission indicated the occurrence of the interior least tern (Sterna antillarum athalassos) and the pink heelsplitter mussel (Potamilus alatus) within the study area. The threatened and endangered species locations in the study area can be seen in Figure 8-1, Environmental Constraints Map.

The interior least tern is listed as endangered by the U.S. Fish and Wildlife Service and the terns have been recorded nesting at eight locations within the limits of the study area. Least terns nest on relatively barren sand and gravel bars in the Mississippi River from May until August. According to the Arkansas Natural Heritage Commission, actual nesting locations vary from year to year with fluctuating water levels as the river reshapes its sandbars.

There are no recorded sites for the interior least tern within the crossing location for Concept 1. As shown in Figure 8-1, for each of the remaining concepts, there are recorded nesting sites for the Interior least tern at sand bars within each concept's crossing location. This makes impacts to this species equal for all of these concepts. Since corridors shown for these concepts are approximately one mile wide, any future defined alignment may be able to avoid specific nesting locations.

The Pink heelsplitter mussel is a species of state concern. This species is considered to be on the fringe of its range in Arkansas, where it is known to be located at a single location. The Pink heelsplitter mussel has been recorded just north of Concept 1, in close proximity to the I-40 Mississippi River bridge. The location should be far enough north of Concept 1 to be avoided. There are no recorded sites for the remaining concepts.

Staff members of the Arkansas Natural Heritage Commission have not conducted a field survey of the study corridors and their review was based on data available to the program at the time of this project and the study area may contain important natural features of which the commission is unaware.

SECONDARY AND CUMULATIVE IMPACTS

The Council on Environmental Quality defines cumulative impacts as: *The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions* (40 CFR 1508.7). Direct effects are caused by the project and occur at the same time and place. Indirect (secondary) effects are caused by the project and are later in time or further removed. The focus of cumulative effect analysis is on resource sustainability in an expanded geographic and time limit.

Some of the past, present and reasonably foreseeable future actions within the study area include:

- The I-69 Special Environmental Study;
- Interstate 55 and US 64 (Crump Boulevard) Interchange Modification Study;
- Interstate 55 and Mallory Avenue Interchange Modification Study; and,
- Mississippi Highway 304 Study.

For Concept 1, the proposed action is primarily a bridge replacement project that does not introduce a new transportation facility or corridor into the region. For the I-55 Corridor, existing trends in development would likely continue, but may accelerate due to an increase in access and mobility.

There is much research and empirical evidence to support the theory that economic development would follow significant improvements in transportation and access, such as those improvements included in the remaining concepts. The remaining concepts may have secondary economic development impacts due to the implementation of a new river crossing and a new freeway corridor into the area. Current development patterns in the Memphis metropolitan area could shift southward.

Roadway construction results in habitat fragmentation that creates variable sized parcels or "islands" of wildlife habitat. As the carrying capacity of one habitat unit declines and migration to better habitat becomes necessary for a species, this migration may be impaired by the distance, the lack of cover along the way, human development, or limitations of the species itself. Species diversity can be lowered to a point that only those species with a high tolerance for man and development are those that survive within the disturbed habitat. These secondary impacts due to habitat fragmentation have a cumulative affect as wildlife species either adapt or relocate over time in response to the gradual depletion of habitat and resources. The highest level of secondary and cumulative impacts due to habitat fragmentation may be seen in Concept 3 and its variations since in close proximity to Horseshoe Lake there are extensive potential forested wetland areas. As stated earlier in the report, the majority of the concepts are located in a mainly agricultural area that has already impacted habitat and natural communities through farming land uses.

The concepts could also result in secondary and cumulative impacts to threatened and endangered species by reducing available habitat, by habitat fragmentation, and by a decrease in diversity of the landscape. Since the concepts may secondarily attract more development, the potential for disturbance of species habitat increases. Also, the Mississippi River crossings could impact sand bars located in the river which some threatened and endangered species use for habitat or migration.

Cumulative impacts or effects on the natural resources within the geographic area of this project are not expected to be significant due to the high level of farming for Concepts 2 and 3 and the prior high development along Concept 1. Based on existing regulations and procedures, impacts to wetlands, habitat, threatened and endangered species, the Mississippi River flood plain, and prime farmland, would be avoided, minimized, and if impacted, mitigated. For this planning level study specific alignments were not defined, therefore, if or when an alignment for any of the candidate concepts is set in a future study, careful consideration can be taken when locating the alignments to minimize or avoid high levels of secondary or cumulative impacts.

This chapter documents the travel efficiency benefits that the alternative crossings would provide to the traveling public, as well as the benefit-cost ratios of implementing the alternative crossings. Travel time savings, vehicle operating cost savings, and crash cost savings are all discussed.

TRAVEL EFFICIENCY BENEFITS

The economic benefits derived from a major transportation improvement can be classified in two ways: First, there are the direct benefits to the users of the facility due to travel efficiencies and induced travel. These are the cost savings that result from an improved facility that are in the form of travel time savings, vehicle operating cost savings, and crash savings. The reduced travel time and vehicle operating cost also lead to a second, indirect, benefit. This indirect benefit is in the form of economic development that potentially results in an increase in industrial employment and production in the region served by the proposed improvement. This chapter will highlight the economic impact of the travel efficiencies.

To facilitate sound economic decisions, all costs and benefits are considered in constant dollars. In the assessment of the costs and the benefits, a life cycle approach is used. In other words, the costs and the benefits in the years in which they occur over the life of the facility are considered. These costs and benefits that are included in the evaluation are the costs and the benefits relative to the base case. The costs are the difference between the base case (existing plus committed network) costs and the improved concepts' costs. Similarly, the travel efficiency benefits are the net savings between the traveler costs on the existing plus committed network and the traveler costs on each candidate improvement alternative. Through the consideration of both the costs and benefits, the feasibility of a proposed highway improvement can be made. The following sections detail the costs and benefits of the preferred alternative, as well as each segment of the preferred alternative.

TRANSPORTATION INVESTMENT COSTS

The cost side of the benefit-cost calculation includes two costs: 1) the net "capital costs" of improving/constructing of concepts, and 2) the annual net change in administration, operation, and maintenance costs. Only the net costs attributable to the new highway are included, i.e., there are no costs associated with the existing plus committed roadway network.

- **Capital Costs** - Capital costs comprise the cost of the alternative highway improvement, including right-of-way acquisition, planning, design, and construction; and,

- **Annual Operations and Maintenance Cost** - Once the alternative highway improvement is in place, it must be operated and maintained. The resulting net change in maintenance and operations cost is estimated.

Capital costs and annual operations and maintenance costs were previously developed for each alternative, as discussed in detail in Chapter 6.

Due to the magnitude and complexity of the improvements being studied, the total time frame for the analysis is dependent on the concept under consideration. For consistency purposes, a 30-year full benefit is considered upon completion of each concept. Partial benefits, during the construction period, were considered where it was relevant. After 30-years of use, a substantial portion of the facility will have depreciated (used some or all of the useful life of the facility). To account for the depreciation, a residual value is calculated as a benefit. To estimate the residual values, composite residual factors can be developed, based on the useful lives of the various construction cost elements within each construction item. To recognize the residual value's benefit, a residual value for each of the cost components is added as a discounted benefit to the benefit-cost analysis. The useful life of the costs components of the facility is displayed in **Table 9-1**.

Table 9-1
Useful Lives of Cost Components
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Cost Item	Useful Life
Roadway (base, pavement, etc.)	30 years
Earthwork	100 years
Drainage	30 years
Bridges and Structures	60 years
Miscellaneous	30 years
Right-of-Way Acquisition	Infinite

In addition to the cost of constructing a facility, there is the incremental cost of maintaining the facility. An annual operation and maintenance costs of about $13,000 per mile was assumed, as discussed in detail in Chapter 6. This cost was adjusted to reflect an increase of 3.5 percent over 20 years with a discount rate between 3.5 to 5.0 percent, resulting in a present worth of $240,000 per mile. A summary of the additional annual average operation and maintenance costs is presented in **Table 9-2** for the various concepts.

Table 9-2
Average Annual Operation and Maintenance Costs
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Additional Annual Maintenance Costs
Concept 1	$800,000
Concept 2A	$2,907,500
Concept 2B	$2,907,500
Concept 3A	$3,124,600
Concept 3B	$3,115,200

Note: Costs are in 2002 dollars.

Both the capital costs and the operations and maintenance cost are considered as part of the cost side of the equation when doing the benefit-cost analysis. The next section will detail the benefit side of the equation required for the benefit-cost analysis.

Travel Efficiency Benefits

Highway improvements create direct benefits to the users of the facility in the form of travel efficiencies. The benefits from travel efficiencies include reduction in expenses to operate vehicles (vehicle operating cost savings), reduction in time spent traveling between destinations (travel time savings), and reduction in the frequency and severity of crashes (crash savings). The benefits are based on the results of the travel demand model analysis conducted for each concept. These benefits accumulate over the lifetime of the facility.

Vehicle Operating Cost Savings

The costs of operating motor vehicles can be a significant portion of the total cost of transportation. Vehicle operating costs are comprised of a number of components, some of which are use-related and others are time-related (e.g., insurance and license fees). It is the savings in use-related costs (e.g., engine oil, gasoline, maintenance, and tires) that are considered as vehicle operating cost savings. For each cost component, different levels of impact result when highway attributes are changed. These attributes include distance, running speeds, grades, horizontal curves, roadway surface, and speed change cycles. Vehicle operating cost savings are generated by:

- Reducing the distance that vehicles travel;
- Reducing stops, starts and delay associated with congested areas; and,

- Improving the general operational efficiency of roadways by improving curvature and gradient changes and reducing the number of speed changes that occur with braking, acceleration and deceleration.

The traffic model results presented in an earlier chapter indicated that most of the concepts resulted in a decrease in travel distances, based on VMT. This represents that vehicles were using shorter routes when utilizing the proposed concepts as opposed to the existing conditions in which vehicles were driving out of their way. The estimated cost savings are determined by using average vehicle operating cost rates by functional class of facility, as derived from the national HPMS database.

For the Memphis metropolitan area, savings in vehicle operating costs for each of the concepts are depicted in **Table 9-3** for the Years 1999 and 2023. By using both 1999 and 2023, both short-term and long-term impacts are illustrated. Annual vehicle operating costs were positive for both automobiles and trucks in all concepts during both analysis years with the exception of the Concept 3A automobile vehicle operating costs during 1999. The Concept 3A automobile annual vehicle operating cost during Year 1999 was negative, meaning that annual vehicle operating costs are projected to be higher with the Concept 3A alignment than with the existing roadway system. This non-benefit is caused by automobiles choosing longer trip routes to reach their destination in order to save travel time. By traveling a longer distance (and increasing vehicle miles traveled) significant time savings were realized but vehicle operating costs actually increased. The highest overall auto operating cost savings during Year 2023 are estimated to be more than $8.5 million for Concept 2A while the highest overall truck annual vehicle operating cost savings are estimated to be more than $9.0 million for Concept 3B.

Table 9-3
Annual Vehicle Operating Cost Savings
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Year 1999 Savings		Year 2023 Savings	
	Autos	Trucks	Autos	Trucks
Concept 1	$500	$300	$170,900	$116,500
Concept 2A	$2,532,300	$1,408,800	$8,594,300	$6,370,500
Concept 2B	$1,324,000	$1,728,500	$7,239,100	$7,627,700
Concept 3A	$(554,400)	$1,420,100	$3,711,400	$6,152,300
Concept 3B	$2,573,600	$3,446,700	$8,100,100	$9,052,700

Note: Costs are in 2002 dollars

Travel Time Savings

Travel time savings are created by increasing the speed of travel and by reducing the delay effects of traffic congestion. The travel time savings due to the concept improvements are estimated using the VHT savings from the developed I-69 national travel demand model, the Crittenden County travel demand model, and the Memphis MPO travel demand model, as discussed previously. To include time savings in the travel efficiency valuation, a monetary value is placed on the amount of time saved. The value of time varies by person and type of trip. For purposes of this study, values of time are based on average hourly wage rates, while average vehicle occupancy and cargo values (for commercial vehicles) were developed using the FHWA methodology outlined in the Highway Economic Requirements System (HERS). The evaluation of time is separated into two categories: business travelers and non-business travelers. Values of travel time used in this study are reported in **Table 9-4**.

Table 9-4
Values of Travel Time
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Vehicle Type	Value of Time (Per Hour)
Per Commercial Truck Hour	$28.89
Per Business-Related Auto Hour	$33.48
Per Non-Business Auto Hour	$16.76

Note: Values are in 2002 dollars

By providing faster and more direct access to and around the Memphis metropolitan area, alternative highway improvements will save travel time for the motoring public that include both local and tourists-related travel. A summary of the anticipated travel time savings is provided in **Table 9-5**. Concept 2B is estimated to offer the highest annual travel time savings during analysis Year 2023 for both automobiles and trucks.

Crash Cost Savings

The proposed highway improvements could reduce crash risk by offering improved design standards and increased safety features in and around the Memphis metropolitan area. Crash savings are based on average crash rates per hundred million vehicle-miles of travel, which vary by class of facility. Average rates were derived from the Federal Highway Administration's (FHWA) publication "Highway Statistics". Crash savings were determined using average crash rates and VMT savings calculated using the I-69 national travel demand model discussed previously.

Table 9-5
Annual Travel Time Savings
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Year 1999 Savings		Year 2023 Savings	
	Autos	Trucks	Autos	Trucks
Concept 1	$12,741,000	$4,947,600	$20,257,500	$7,866,500
Concept 2A	$14,077,100	$5,466,500	$24,406,800	$9,477,700
Concept 2B	$14,517,000	$5,637,300	$27,839,100	$10,810,600
Concept 3A	$12,089,300	$4,694,600	$25,389,800	$9,859,400
Concept 3B	$6,047,100	$2,348,200	$12,695,700	$4,930,000

Note: Costs are in 2002 dollars

To account for the impact of reducing crashes in the transportation efficiency evaluation, it was necessary that a monetary cost be established per crash. Monetary values per crash type (fatal, serious injury, other injury, property damage) consist of suggested values reported by the National Highway Traffic Safety Administration and are provided in **Table 9-6**. Using the crash savings predicted for each alternative and the monetary values listed in Table 9-6, the savings potentially provided by each alternative are shown in **Table 9-7**. Concept 2B is projected to present the highest annual crash savings during future Year 2023.

Table 9-6
Standard Highway Crash Costs
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Crash Type	Cost (1)
Per Fatality	$3,030,000
Per Serious Injury Crash	$700,000
Per Other Injury Crash	$21,000
Per Property Damage Crash	$2,000

(1) Based upon “The Economic Cost of Motor Vehicle Crashes,” National Highway Traffic Safety Administration (NHTSA) 1994 data, adjusted to 2002 dollars.

Table 9-7
Annual Crash Savings
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Year 1999 Savings	Year 2023 Savings
Concept 1	$100	$28,700
Concept 2A	$1,254,400	$6,693,500
Concept 2B	$2,706,500	$9,735,400
Concept 3A	$2,875,600	$9,358,600
Concept 3B	$3,677,700	$9,034,400

Note: All savings are in 2002 dollars

Total Travel Efficiency Benefits

The total travel efficiency economic benefits are listed in **Table 9-8** for the concepts. Overall Concept 2B provided the highest travel efficiency benefits to the traveling public with over $63.2 million in annual savings during projected Year 2023. The second and third highest travel efficiency benefits were provided by Concept 2A and Concept 3A respectively. The difference of additional benefits provided by Concept 2B and the second highest travel efficiency benefits alternative, Concept 2A, is more than $7.7 million in annual travel efficiency benefits to the traveling public.

Table 9-8
Total Travel Efficiency Benefits
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	Year 1999 Savings	Year 2023 Savings
Concept 1	$17,689,500	$28,440,100
Concept 2A	$24,738,900	$55,542,800
Concept 2B	$25,913,200	$63,251,900
Concept 3A	$20,525,200	$54,471,600
Concept 3B	$18,093,300	$43,812,900

Note: All savings are in 2002 dollars

COST EFFECTIVENESS

To determine whether a highway investment is economically feasible, the costs of building and operating a new highway are compared with the economic travel efficiency benefits estimated to be attributable to that highway. This cost and benefit comparison yields three indicators of "economic feasibility" for the proposed highway improvement.

- **Net Present Value** - All costs and benefits in future years are discounted back to the base year using a seven percent real (constant dollar) discount rate. The future stream of discounted costs is subtracted from the future stream of discounted benefits. When the sum of the discounted benefits is greater than the sum of the discounted costs, the "net present value" is positive and the highway improvement is deemed to be "economically feasible." The net present value is the best indicator of whether or not the highway is economically feasible because it takes into account the magnitude of the costs and benefits.

- **Discounted Benefit/Cost Ratio** - After the future streams of costs and benefits are discounted, the sum of the discounted benefits are divided by the sum of the discounted costs. When the result is 1.0 or greater, the highway is considered to be "economically feasible."

- **Internal Rate of Return** - This calculation determines the discount rate that would result in the net present value difference between costs and benefits being zero. If the rate of return, expressed as a percentage, is equal to or greater than seven percent, then the investment is deemed to be "economically feasible."

Included in the economic feasibility calculations for travel efficiency benefits are all quantifiable direct economic costs attributable to the highway project (cost of planning, designing, building, right-of-way, maintaining and operating the highway). These costs are compared to all quantifiable economic benefits relating to travel efficiency (user benefits) that include vehicle operating cost savings, travel time savings, and crash cost savings.

Recognizing these facts, this study seeks to determine whether or not any of the alternative highway investments make economic sense, and whether any of those levels of investment are efficient (neither under-invested nor over-invested), which implies efficient and feasible use of tax dollars. The proper level of investment is calculated in terms of national travel efficiency feasibility and corridor economic development impacts. Excluded from the economic calculations are those implications that cannot reasonably be tabulated in monetary terms (e.g., environmental or social implications, impacts on other modes of transportation, etc.). As a result, the economic feasibility analyses should be important to the highway investment decision, but should not be viewed as the only criterion.

Life Cycle Cost Analysis

To facilitate sound economic decisions, all costs and benefits in constant dollars should be considered. In the assessment of the costs and the benefits, a life cycle approach is used. In other words, the costs and the benefits in the years in which they occur over the life of the facility are considered. These costs and benefits that are included in the evaluation are the costs and the benefits relative to the base case. The costs are the difference between the base case (existing plus committed network) costs and the improved concepts' costs. Similarly, the travel efficiency benefits are the net savings between the traveler costs on the existing plus committed network and the traveler costs on each candidate improvement alternative. Through the consideration of both the costs and benefits, the feasibility of a proposed highway improvement can be made. The following sections detail the resulting feasibility indicators of the preferred alternative, as well as each segment of the preferred alternative.

To enable a direct comparison between each of the concepts, all cost and benefit streams were determined in constant dollars. Capital costs are uniformly distributed over the construction time frame for each of the concepts. All capital costs assumed a four-lane freeway with grade separations at Highway 61 with the exception of Concept 1. Concept 1 capital costs assumed adding an additional lane to I-55 from its west intersection with I-40 to the Crump Interchange.

Engineering design, environmental studies, and right-of-way acquisition were assumed to be initiated in Year 2003 and last for three years, with construction to begin in Year 2006. Construction of the proposed concepts is projected to last for five years if built all at once.

Therefore, for the initial life-cycle cost analysis, full benefits were assumed to begin in Year 2011 for the full concept, with partial benefits during Years 2007, 2008, 2009, and 2010. The specific benefits were calculated for the Years 1999 and 2023 for each of the concepts, as discussed in a previous section. The intermediate year benefits were interpolated and benefits after 2023 were extrapolated.

The values (benefits and costs) for each year are then discounted to a 2002 present value using a constant dollar 7 percent discount rate as suggested by the Office of Management and Budget (OMB). Present values of the benefits are then compared with the present values of the costs using the conventional feasibility indicators.

The travel efficiency feasibility of the concepts is summarized in **Table 9-9**. In interpreting the summary results, the following guidelines should be considered:

- The travel efficiency feasibility considers only direct user benefits and does not include any transfer of benefit or economic development benefits. It is representative of the feasibility of the project on a "national" level;

- A feasible project is one which has a positive Net Present Value (NPV);
- An Internal Rate of Return (IRR) that is higher than the opportunity cost of money, which is assumed to be 7 percent for our analysis, is a feasible project;
- A benefit-cost (b/c) ratio of 1.0 or higher indicates that the project is feasible; and,
- The higher the NPV, IRR, and b/c ratio, the more feasible the project.

Based upon the feasibility results for the concepts, the following conclusions can be drawn (exclusive of the economic development benefits) and a summary of the results in shown in Table 9-9):

- Concept 2B is the most economically feasible concept with a b/c ratio of 1.30, a NPV of $88,609,000, and an IRR of 8.50 percent;
- Concept 2A ranks second among the concepts with a b/c ratio of 1.08, a NPV of $2,262,000, and an IRR of 7.04 percent;
- Concept 3A ranks third with a b/c ratio of 1.06, a negative NPV of -$2,770,000, and an IRR of 6.96 percent (lower than 7 percent);
- Concepts 1 and Concepts 3B are not economically feasible.

Table 9-9
Summary of Feasibility Indicators
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	B/C Ratio	NPV	IRR (%)
Concept 1	0.92	$(39,307,000)	5.93%
Concept 2A	1.08	$2,262,000	7.04%
Concept 2B	1.30	$88,609,000	8.50%
Concept 3A	1.06	$(2,770,000)	6.96%
Concept 3B	0.83	$(95,053,000)	5.33%

Note: All dollar values are in 2002 dollars

Sensitivity Tests of Travel Efficiency Feasibility

The travel efficiency feasibility findings in this study, while valid, are nevertheless dependent on a series of assumptions and decisions, which could have a bearing on what is ultimately determined for the Memphis metropolitan area. To assist in the decision process, a number of "sensitivity tests" were conducted to depict how sensitive the travel efficiency findings are to the assumptions. The following sensitivity tests were conducted:

Variations of the discount rate - As previously discussed, a discount rate of 7 percent was employed for the feasibility analysis. Sensitivity tests were conducted using discount rates of 4 and 10 percent. **Tables 9-10** and **9-11** show these results. As illustrated, all concepts are feasible with a 4 percent discount rate with benefit-cost ratios between 1.35 and 2.15. With a 10 percent discount rate, however, none of the concepts realize a b/c ratio greater than 1.0;

Capital costs that are 10 percent higher and 10 percent lower - This will reflect a margin of error in the estimation of costs. The results are shown in **Tables 9-12** and **9-13**. With the increase in costs, all concepts exhibit benefit-cost ratios below 1.0 with the exception of Concept 2B with a b/c ratio of 1.18. However, with 10 percent lower cost, all concepts exhibit benefit-cost ratios above 1.0 with the exception of Concept 3B which has a b/c ratio of 0.92; and,

Travel benefits that are 10 percent higher and 10 percent lower - This will reflect a margin of error in the estimation of benefits. The results are shown in **Tables 9-14** and **9-15**. All concepts exhibit b/c ratios higher that 1.0 with a 10 percent increase in travel benefits with the exception of Concept 3B with a b/c ratio of 0.91. With 10 percent lower travel benefits, all concepts exhibit benefit-cost ratios below 1.0 with the exception of Concept 2B which has a b/c ratio of 1.17; and,

Table 9-10
Summary of Feasibility Indicators with a 4 Percent Discount Rate
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concepts	B/C Ratio	NPV	IRR (%)
Concept 1	1.52	$115,013,000	5.93%
Concept 2A	1.77	$300,804,000	7.04%
Concept 2B	2.15	$443,588,000	8.50%
Concept 3A	1.78	$312,245,000	6.96%
Concept 3B	1.35	$123,749,000	5.33%

Note: All dollar values are in 2002 dollars

Table 9-11
Summary of Feasibility Indicators with a 10 Percent Discount Rate
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concepts	B/C Ratio	NPV	IRR (%)
Concept 1	0.62	$(98,191,000)	5.93%
Concept 2A	0.73	$(115,249,000)	7.04%
Concept 2B	0.88	$(56,819,000)	8.50%
Concept 3A	0.70	$(123,738,000)	6.96%
Concept 3B	0.56	$(173,482,000)	5.33%

Note: All dollar values are in 2002 dollars

Table 9-12
Summary of Feasibility Indicators with 10 Percent Higher Costs
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	B/C Ratio	NPV	IRR (%)
Concept 1	0.84	$(65,021,000)	5.36%
Concept 2A	0.99	$(38,325,000)	6.41%
Concept 2B	1.18	$51,123,000	7.81%
Concept 3A	0.96	$(43,724,000)	6.36%
Concept 3B	0.75	$(136,365,000)	4.77%

Note: All dollar values are in 2002 dollars

Table 9-13
Summary of Feasibility Indicators with 10 Percent Lower Costs
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	B/C Ratio	NPV	IRR (%)
Concept 1	1.02	$(13,593,000)	6.60%
Concept 2A	1.21	$42,850,000	7.77%
Concept 2B	1.45	$126,096,000	9.30%
Concept 3A	1.18	$38,184,000	7.65%
Concept 3B	0.92	$(53,742,000)	5.98%

Note: All dollar values are in 2002 dollars

Table 9-14
Summary of Feasibility Indicators with 10 Percent Higher Benefits
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Concept	B/C Ratio	NPV	IRR (%)
Concept 1	1.01	$(17,523,000)	6.53%
Concept 2A	1.19	$43,076,000	7.70%
Concept 2B	1.43	$134,956,000	9.22%
Concept 3A	1.17	$37,907,000	7.58%
Concept 3B	0.91	$(63,247,000)	5.92%

Note: All dollar values are in 2002 dollars

Table 9-15
Summary of Feasibility Indicators with 10 Percent Lower Benefits
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

Alternatives	B/C Ratio	NPV	IRR (%)
Concept 1	0.83	$(61,090,000)	5.30%
Concept 2A	0.98	$(38,551,000)	6.34%
Concept 2B	1.17	$42,262,000	7.73%
Concept 3A	0.95	$(43,447,000)	6.30%
Concept 3B	0.74	$(126,860,000)	4.72%

Note: All dollar values are in 2002 dollars

Cost Effectiveness Conclusions

The travel efficiency cost effectiveness analysis involved the comparison of the estimated road user benefits and the anticipated costs for alternative highway improvements in the Memphis metropolitan area. The following set of conclusions can be drawn from this analysis:

- Concept 2B provides the highest travel efficiency benefits;
- Concept 2B is the most economically feasible concept with a b/c ratio of 1.30, a NPV of $88,609,000, and an IRR of 8.50 percent;
- Concept 2B offers the highest b/c ratio in a 4 percent discount rate, 10 percent discount rate, 10 percent higher costs, 10 percent lower costs, 10 percent higher benefits, and 10 percent lower benefits scenarios;

- Concept 2B and Concept 2A are the only two concepts that offer a b/c ratio above 1.0, a positive NPV, and an IRR above 7 percent; and,

- Concept 2B offers the strongest alternative and yields the highest benefits overall.

The travel efficiency analysis is the conventional and traditional method of defining whether or not a highway improvement is economically feasible. It should be noted that these conclusions only consider the benefits provided to highway users and do not account for potential economic development impacts along the corridor. Economic development impacts are considered to be transfers from other parts of the nation. Because they do not account for economic development impacts, the travel efficiency results represent the feasibility of the project on a "national" level. Additional conclusions from the perspective of the States of Arkansas, Mississippi, and Tennessee and the Memphis metropolitan area can be drawn by examining the economic development impacts that are expected to be generated by the proposed highway improvements. Economic development impacts are identified in another section of this report.

Study Findings

This chapter provides a summary of the findings of the impacts and initial feasibility check of the various Mississippi River crossing concepts within the study area. The chapter focuses on the overall rankings of the concepts using the criteria that were shown in Table 4-1 of this report. While this technical memorandum does evaluate the feasibility of each concept based on the criteria shown in the table, it does not recommend any one preferred concept. However, the information used in this report should provide initial findings for potential river crossings for Departments of Transportation to use for further analysis and future environmental documentation.

EVALUATION SUMMARY

The results of the concept evaluation process are shown in **Table 10-1**. This matrix includes a relative rating of the concepts by each public, traffic, social, environmental, and engineering evaluation criteria and an overall rating for each category. Concepts, when a quantitative value was not assigned, were rated as “least/not favorable”, “neutral/favorable”, and “most/very favorable” impacts. It should be noted that these averages are subjective and are determined by comparing the concepts to one another; also the level of detail that the concepts were analyzed in was broad and preliminary.

Table 10-1
Evaluation Summary Matrix
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

CRITERIA	Concept 1	Concept 2A	Concept 2B	Concept 3A	Concept 3B
Public Input					
Preferred Concept Location	◎	●	●	●	●
Most Important Criteria – Economic Development	◎	◎	◎	◎	◎
Public Input Average	◎	●	●	●	●
Traffic					
Projected Traffic Volumes on New Bridges	N/A	17,800 vpd	22,900 vpd	20,600 vpd	10,600 vpd
Projected Level-of-Service	C/D (existing bridges)	A/B	A/B	A/B	A/B
Vehicle Miles of Travel	28,668,802	28,651,945	28,631,700	28,655,312	28,585,155
Vehicle Hours of Travel	504,207	503,598	502,811	503,262	505,599
Safety	◎	●	●	●	●
Connectivity	◎	●	●	●	●
Traffic Average	◎	●	●	●	◎
Economics					
Vehicle Operating Cost Savings	287,400	14,964,800	14,866,800	9,863,700	17,152,800
Travel Time Savings	28,124,000	33,884,500	38,649,700	35,249,200	17,625,700
Crash Cost Savings	28,700	6,693,500	9,735,400	9,358,600	9,034,400
Benefit/Cost Ratio	0.91	1.08	1.30	1.06	0.83
Economics Average	○	◎	●	◎	○

O = Least/Not Favorable ◎ = Neutral/Favorable ● = Most/Very Favorable

Table 10-1
Evaluation Summary Matrix (continued)
Highway 79 Feasibility Study
Pine Bluff, Arkansas to Memphis, Tennessee

CRITERIA	Concept 1	Concept 2A	Concept 2B	Concept 3A	Concept 3B
Social					
Residential/Commercial Displacements	○	●	◎	◎	●
Environmental Justice	○	●	●	●	●
Economic Development Potential	◎	◎	◎	◎	◎
Visual Quality and Aesthetics	●	◎	◎	○	○
Cultural Resources	○	◎	◎	◎	◎
Section 4(f)/Sensitive Land Uses	●	●	●	●	●
Social Average	○	●	◎	◎	●
Environmental					
Floodplains	●	◎	◎	◎	◎
Natural Community and Habitat	●	◎	●	◎	◎
Wetlands	●	◎	◎	○	○
Hazardous Materials Sites	◎	●	●	●	●
Noise	◎	◎	◎	◎	◎
Air Quality	◎	●	●	●	●
Water Quality	◎	◎	◎	◎	◎
Farmlands	●	◎	○	○	○
Threatened and Endangered Species	●	○	○	○	○
Secondary and Cumulative Impacts	●	◎	◎	◎	◎
Environmental Average	●	◎	◎	○	○
Engineering/Costs					
Concept Lengths	22	14-16	18-19	23-24	25-26
Constructability	○	◎	◎	◎	◎
Drainage	●	○	○	○	○
Topography	◎	○	◎	◎	◎
Geometry	◎	◎	●	●	●
Dredge Disposal	◎	◎	◎	◎	◎
Navigation Clearance	◎	◎	◎	◎	◎
Seismic Potential	○	○	○	○	○
Cost Estimates					
Roadway Construction Costs	$120-$190	$130-$140	$150	$210	$230
Bridge Construction Costs	$190	$250-360	$400	$250-390	$270-370
Operations and Maintenance	$12.6	$18.0-24.3	$27.3	$19.7-28.5	$21.5-38.4
Right-of-Way	$60-65	$420-570	$520-720	$660-890	$770-1,074
Utilities	●	◎	○	○	◎
Engineering/Costs Average	●	◎	○	○	○

O = Least/Not Favorable ◎ = Neutral/Favorable ● = Most/Very Favorable

The most significant findings of the evaluation process include the following:

- From a public input perspective, all of the new concepts rank very favorably with respect to concept location. The majority of the public opinion favored a crossing location south of the existing crossings, which would support any of the new location crossing concepts. All of the concepts support the public's number one criteria of furthering economic development within the region.
- Concepts 2A, 2B, and 3A rank the most favorable from a traffic perspective. Concept 2B is projected to carry the most traffic in Year 2023 (22,900 vpd) and Concept 3B is projected to carry the least traffic (10,600 vpd).
- All of the new location concepts are projected to improve the Year 2023 level-of-service on the I-55 bridge from a LOS E/F to LOS C/D.
- All of the concepts have approximately the same impact on area vehicle miles of travel (VMT). The concepts on new alignment (2 and 3) are estimated to result in reducing area vehicle hours of travel (VHT).
- Concepts 2 and 3 have the most potential to improve area safety conditions and would also provide improved connectivity to other major highways in the region.
- Concept 3B ranks the most favorable with regard to vehicle operating costs savings, Concept 2B ranks the most favorable for travel time savings, and Concepts 2B, 3A, and 3B rank the most favorable from a crash cost savings standpoint.
- Concept 2B ranks the most favorable from an overall economic perspective. It ranks the highest for total travel efficiency benefits and has the highest benefit/cost ratio. Concepts 2A and 3B have an acceptable benefit/cost ratio as well (where 1.0 or greater is considered financially feasible).
- From a social perspective, Concepts 2A and 3B ranked the most favorably. The most significant contributing factor was that these concepts had the most favorable impact on commercial/residential displacements. However, many of the social impacts would be similar for the concepts on new alignment since the concepts are broad enough at this time that many social disparities could be avoided when determining a defined alignment.
- Concept 1 ranked the most favorably from an environmental and engineering perspective primarily due to the fact that the concept is on existing location.

FUTURE TRAFFIC PROJECTIONS ON EXTENSION OF CONCEPT 2A

During the second series of public meetings, citizens asked what the projected Year 2023 traffic volumes would be if Concept 2A was extended to Future 304 (Future I-69) and also if it was extended to I-55. Extending Concept 2A to Future 304 is estimated to increase Year 2023 daily traffic volumes from 17,800 vpd to 22,900 vpd. Extending Concept 2A to I-55 (following the Tennessee/Mississippi state line) is projected to increase traffic volumes to approximately 21,800 vpd in Year 2023. Extending Concept 2A to Future 304

(Future I-69) and I-55 would increase the construction costs by approximately $100 million for both scenarios.

SUMMARY OF STUDY FINDINGS

Based on existing structural conditions and existing and projected traffic volumes on the existing I-40 and I-55 bridges, as well as projected demographics in the Memphis metropolitan area, there is a need for Mississippi River crossing improvements in the study area. The existing I-55 bridge is over 50 years old with a sufficiency rating of 49 and has not been seismically retrofitted. The bridge is currently operating over capacity at LOS E/F and has heavy commercial vehicle traffic. The I-40 bridge is in the process of being seismically retrofitted and currently operates at a LOS of C/D and is projected to operate at LOS C/D by Year 2023.

Public comments from the first series of public meetings favored a new Mississippi River crossing south of the existing I-40 and I-55 bridges, and the primary criteria for the study should be to further economic development in the region. The majority of the comments received from the second series of public meetings favored either Concept 2A or Concept 3A. The number one criteria, once again, was to further economic development, followed by improving everyday travel, and thirdly, improving safety.

The findings of the study indicate that a new Mississippi River crossing in the study area would:

- Provide potential economic benefits for the Delta Region;
- Reduce existing and projected congestion on the existing bridges;
- Provide better connectivity to area roadways;
- Facilitate the safe and efficient movement of persons and goods by fostering a reduction in incident risk and addressing existing safety concerns;
- Serve intermodal and industrial interests in the region; and,
- Be designed for earthquake resistance.

All of these factors were found to be important corridor-wide goals for the Mississippi River crossing concepts and the Memphis metropolitan area.

PROJECT DEVELOPMENT PROCESS

This study does not recommend a preferred alternative. However, the detailed evaluation results documented in this report should provide a wealth of technical information regarding the impacts and feasibility of alternative Mississippi River crossings that can be used by the State Departments of Transportation in selecting a preferred alternative and identifying other needed improvements. The Departments of Transportation will need to supplement the detailed evaluation results of this study with other statewide policies and issues to determine the preferred alternative.

This *Highway 79 and Mississippi River Crossing Study* and future selection of a preferred alternative by the participating Departments of Transportation is the first phase in the overall project development and implementation process. The following phases consist of developing environmental documentation in accordance with NEPA regulations to determine the preferred alternative, preliminary and final design, right-of-way acquisition, and finally actual construction of the new Mississippi River crossing.

FINANCIAL FEASIBILITY

The estimated total construction costs for the Mississippi River concepts examined in this study (including roadway costs), range from a low of $310 million to as much as $600 million. A project of this magnitude cannot currently be accomplished through the cooperating states' current funding.

Other innovative financing sources may need to be explored. Issuance of bonds to cover all or portion of the construction costs of new facilities, such as bridges and tunnels is not a new idea, but has not been employed in all areas of the country. Generally these bonds are backed by forecasted revenues from the new facility produced by tolling, or are guaranteed as a general obligation of the state or other issuing entity. Funds are repaid through state and local taxes, usually, fuel and/or vehicle taxes. In addition, Grant Anticipation Revenue Vehicle (GARVEE) bonds are a federal debt financing tool now available. These bonds are backed by the future receipt of federal-aid highway apportionments to a state. While GARVEE bonds may allow a large project to proceed earlier than otherwise, the encumbering of future federal-aid apportionments should be carefully considered.

Another federal innovative financing tool available for large infrastructure projects is the Transportation Infrastructure Finance and Innovation Act (TIFIA). TIFIA can provide direct credit assistance through loans, loan guarantees and lines of credit for no more than 33 % of eligible project costs. This source of financing is generally made available for only large projects that cost over $100 million. The terms of TIFIA loans are negotiated directly with US DOT. TIFIA may provide a useful source of credit for transportation projects, particularly when state or local bonding authority is limited or unavailable.

Finally, state and local governments are exploring the potential for public/private partnerships on projects where benefits may accrue to both public and private sectors. Successful ventures have been limited and generally produced tangible benefits to private interests. However, as high cost infrastructure projects become more difficult to finance, private sector involvement may become a critical component of success.

One or more of the sources of funding described above may play an important role in the financing of a new Mississippi River crossing. The actual financing plan for the crossing should be a product of an overall regional consensus of the states involved and other regional stakeholders.

Appendix A
Study Corridor Photographs

BRIDGE CROSSINGS

Hwy 79 at Arkansas River Crossing

Hwy 79 at the Wabbaseka Bayou Crossing

BRIDGE CROSSINGS

Hwy 79 at the White River Bridge Crossing near Clarendon

Hwy 79 at the St. Francis River

SENSITIVE LAND USES

Cemetery on Hwy 79 in Pine Bluff

Church at Hwy 79 and SH 15

SENSITIVE LAND USES

Church along Hwy 79 near Wabbaseka

Marianna Cemetery along Hwy 79

LIMITED RIGHT-OF-WAY

Hwy 79 in Pine Bluff

Hwy 79 Bypass around Stuttgart

LIMITED RIGHT-OF-WAY

Railroad Paralleling Hwy 79 near Roe

Hwy 79 Intersecting SH 1

LAND USES

Agricultural Land Uses near SH 15

Agricultural Land Uses near Horseshoe Lake

Environmental/Social Issues

Bayou Metro Wildlife Management Area

Very Sparsley Developed Corridor

Appendix B
Memphis MPO's Comments

MEMORANDUM

To: Robert P. Babineaux, Jr., P.E.

From: Carter Gray, Administrator, Department of Regional Services
Memphis Urban Area MPO

Subject: Review of and Comments on the "Highway 79 and Mississippi River Bridge Crossing Study" by Wilbur Smith Associates

Date: August 22, 2003

The study concludes that "Based on existing structural conditions and existing and projected traffic volumes on the existing I-40 and I-55 bridges, as well as projected demographics in the Memphis metropolitan area, there appears to be a need for Mississippi River crossing improvements in the study area." (Page 10-4.) We agree. The I-55 bridge is more than 50 years old, has not been seismically retrofitted, and currently is operating over capacity at LOS (Level of Service) E/F. The I-40 bridge is being seismically retrofitted— however, it now operates at LOS C/D and is projected to operate at that level for the foreseeable future.

The study does not recommend one preferred river crossing solution but rather offers five varying "concepts" (concepts 1, 2A, 2B, 3A, and 3B) for further consideration. We believe the best option is to combine elements of concepts 2A and 2B to create a new concept (called "Modified Concept 2A-2B.")

Modified Concept 2A-2B would connect Interstate 40 and U.S. Highway 79 in Crittenden County and proposed Interstate 69 in DeSoto County with an expressway-style roadway via a new Mississippi River Bridge just west of Pidgeon Industrial Park (very near to where the alignment of Concept 2A now is shown crossing the river.) However, rather than following Concept 2A's southeastward alignment connecting Highway 79 with U.S. Highway 61 in Shelby County just north of the Tennessee-Mississippi state line, we believe a better option would be to have Highway 79 follow a more westerly and southerly course in Shelby County. This highway would follow an alignment just west of North Horn Lake and South Horn Lake crossing the Tennessee-Mississippi state line in the vicinity of Mud Lake to connect with I-69 near I-69's proposed interchange with Highway 61 just north of the DeSoto County-Tunica County line (near Concept 2B's proposed junction with Highway 61 and I-69.) This modified alignment therefore would benefit all four counties (Crittenden, Shelby, DeSoto, and Tunica) in the study area.

Modified Concept 2A-2B would:

- Provide a direct, expressway-type connection between I-40 in Crittenden County west of West Memphis with I-69, Highway 61, and I-55 in DeSoto County.

- Reduce truck and other vehicular traffic in congested areas in West Memphis and Memphis by more efficiently moving traffic on I-55 and I-40 around the Memphis metropolitan area via a new river bridge and I-69 connector.

- Reduce congestion on the I-55 (Memphis-Arkansas) bridge, the I-55-Crump Boulevard interchange, and the entire, 12-mile section of I-55 in Tennessee.

- Provide immediate access to the industrial developments proposed for Pidgeon Industrial Park.

- Provide immediate access to the new intermodal Super Terminal at Pidgeon.

- Provide enhanced access to the already developed Port of Memphis on Presidents Island north of Pidgeon.

- Provide enhanced access to recreational and historical sites in the area such as T. O. Fuller State Park and Chucalissa Indian Village in southwestern Shelby County.

Undoubtedly, there will be some negative effects of this proposed alignment— which could include:

- The need to realign and extend railroads in Crittenden, Shelby, and DeSoto counties to connect with the new river bridge— should the new bridge be intermodal.

- Effects on existing recreational uses on North Horn and South Horn lakes— mainly fishing and boating activities.

- Loss of wetlands in Crittenden, Shelby, and DeSoto counties— particularly in the floodplain of the Mississippi River and the wetlands around North Horn, South Horn, Mud, and Cockleburr lakes in southwestern Shelby County and northwestern DeSoto County.

- Effects on wildlife habitats— especially a large bird rookery at the Earth Complex in southwestern Memphis, a significant stopping-point for migrating waterfowl in the Mississippi River Flyway.

As for Concept 1, while there obviously would be benefits to having a new or improved bridge located close to Downtown Memphis, the negatives here seem to outweigh the positives.

- The area is already heavily developed— so land acquisition costs likely would be high. Many of the existing uses in this area are intensive (industrial operations, warehouses, commercial buildings, roadways, railways, etc.) so relocation costs also would be high.

- Improvements to the existing I-55 bridge or the construction of a new bridge in this area would undoubtedly create traffic congestion and delays for motorists— with only one alternate river crossing nearby (the I-40 (Hernando DeSoto) bridge farther north in Memphis.

- Consideration must be given to the effects a new bridge in this area would have on recent residential developments on the bluffs along both sides of Riverside Drive south of Downtown Memphis; the older, stable, minority neighborhood of French Fort just south of Crump Boulevard; recreational uses at Martin Luther King, Jr., Riverside Park and McKellar Lake; the wildlife management area and hunting activities on Presidents Island; National Register of Historic Places properties such as the Memphis-Arkansas Bridge, Chickasaw Heritage Park with its Native American mounds and Civil War fortifications and the U.S. Marine Hospital Complex; and cultural amenities such as the National Ornamental Metal Museum.

While Concept 3A would offer a shorter connection from Highway 79 in Crittenden County to I-69 in DeSoto County, this alignment would be too far removed from Pidgeon, Presidents Island, and major railroads in Memphis to benefit them to any great extent.

While Concept 3B would provide Arkansas residents with speedier access to the gaming and entertainment areas in Tunica County and offer a quicker way for Mississippi residents to access I-40 and I-55 in Arkansas, it is too far south of Memphis to offer much public benefits for the majority of residents in the Memphis metropolitan area.

Appendix C
Detailed Cost Estimates

Highway 79 Corridor Study

Preliminary Cost Estimate (Alternative 1) - Low Cost Estimate

(1-Lane Widening Along Outside Existing Freeway)

Date: ________________

Roadway Length for Estimate[1] (miles): 7.75

I-55 Corridor - I-40/I-55 Interchange to Crump Boulevard Interchange

Corridor Length (miles): 22.4

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
GRADING	Clearing and Grubbing	$1,500 /Ac.	61.5	$ 92,250
	Excavation	$4.00 /C.Y.	0	$ -
	Compacting Embankment	$0.50 /C.Y.	100578	$ 50,289
	Borrow	$8.00 /C.Y.	100578	$ 804,624
			Total	**$ 947,163**
DRAINAGE	Major Drainage (Culverts)	8% of Grading & Surfacing		**$ 414,273**
			Total	**$ 414,273**
SURFACING	1-Lane Widening along Outside	$150 /L.F.	55300	$ 8,295,000
	1-Lane Ramp (diamond/directional)	$180 /L.F.	4930	$ 887,400
	2-Lane Ramp (diamond/directional)	$192 /L.F.		$ -
	1-Lane Loop Ramp	$192 /L.F.	1400	$ 268,800
	Outer Roadway 2-Lane with paved shoulders	$125 /L.F.	33850	$ 4,231,250
			Total	**$ 13,682,450**
ROADWAY	(includes grading, drainage and surfacing)		**Subtotal**	**$ 15,043,886**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond existing alignment)	$5.5M /Each	2	$ 11,000,000
	Crump Blvd. Interchange	Lump Sum		$ 11,400,000
	System-to-System Interchange	$6.5M /Each		$ -
	Lighting - Interchange	$150,000 /Each	2	$ 300,000
	Signalization - Interchange(urban areas only)	$187,500 /Each		$ -
	Fencing - Mainline	$10.00 /L.F.	55300	$ 553,000
	Erosion Control	5% of Gr., Dr., & Surf.		$ 752,194
	Removal of Existing Structures	10% of Gr., Dr., & Surf.		$ 1,504,389
	Signing & Paving Markings	2% of Gr., Dr., & Surf.		$ 300,878
	Maintenance of Traffic	8% of Gr., Dr., & Surf.		$ 1,203,511
	Utility Relocation (along existing alignment)	$200,000 /Mile	7.8	$ 1,550,000
			Total	**$ 28,563,972**
TOTAL ROADWAY CONSTRUCTION COST				**$ 43,607,858**
BRIDGES	Mainline - Interchange/RR/Stream/Creek	$80 /S.F.	300000	$ 24,000,000
	Bridge Approaches	$15 /S.F.	38400	$ 576,000
TOTAL STRUCTURES CONSTRUCTION COST				**$ 24,576,000**
			Construction Subtotal	$ 68,183,858
			Contingency @ 15% of Construction	$ 10,227,579
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 12,545,830
TOTAL CONSTRUCTION COST				**$ 90,957,266**
RIGHT-OF-WAY	Right-of-Way	$50,000 /Ac.	62.9	$ 3,145,000
	Residential Acquisition	$100,000 /Each	6	$ 600,000
	Commercial Acquisition	$1,000,000 /Each	26	$ 26,000,000
			ROW Subtotal	$ 29,745,000
TOTAL RIGHT-OF-WAY COST				**$ 29,745,000**
MISSISSIPPI RIVER CROSSING	Removal Existing I-55 Bridge	Lump Sum		$ 5,000,000
	Mainline Mississippi River Crossing	Lump Sum		$ 185,000,000
TOTAL MAINLINE MISSISSIPPI RIVER CROSSING COST				**$ 190,000,000**
GRAND TOTAL				**$ 310,702,266**

1: No improvements I-40/Highway 79 to I-40/I-55 Interchange - 14.65 miles.

Cost per Mile = **$40,090,615**

Highway 79 Corridor Study

Preliminary Cost Estimate (Alternative 1) - High Cost Estimate

(1-Lane Widening Along Outside Existing Freeway)

Date: ______________

Roadway Length for Estimate[1] (miles): 7.75

I-55 Corridor - I-40/I-55 Interchange to Crump Boulevard Interchange

Corridor Length (miles): 22.4

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
GRADING	Clearing and Grubbing	$1,500 /Ac.	62.9	$ 94,350
	Excavation	$4.00 /C.Y.	0	$ -
	Compacting Embankment	$0.50 /C.Y.	102244	$ 51,122
	Borrow	$8.00 /C.Y.	102244	$ 817,952
			Total	**$ 963,424**
DRAINAGE	Major Drainage (Culverts)	8% of Grading & Surfacing		**$ 427,574**
			Total	**$ 427,574**
SURFACING	1-Lane Widening along Outside	$150 /L.F.	55300	$ 8,295,000
	1-Lane Ramp (diamond/directional)	$180 /L.F.	8580	$ 1,544,400
	2-Lane Ramp (diamond/directional)	$192 /L.F.		$ -
	1-Lane Loop Ramp	$192 /L.F.		$ -
	Outer Roadway 2-Lane with paved shoulders	$125 /L.F.	35050	$ 4,381,250
			Total	**$ 14,220,650**
ROADWAY	(includes grading, drainage and surfacing)		**Subtotal**	**$ 15,611,648**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond existing alignment)	$5.5M /Each	3	$ 16,500,000
	Crump Blvd. Interchange	Lump Sum		$ 13,300,000
	System-to-System Interchange	$6.5M /Each		$ -
	Lighting - Interchange	$150,000 /Each	3	$ 450,000
	Signalization - Interchange(urban areas only)	$187,500 /Each		$ -
	Fencing - Mainline	$10.00 /L.F.	55300	$ 553,000
	Erosion Control	5% of Gr., Dr., & Surf.		$ 780,582
	Removal of Existing Structures	10% of Gr., Dr., & Surf.		$ 1,561,165
	Signing & Paving Markings	2% of Gr., Dr., & Surf.		$ 312,233
	Maintenance of Traffic	8% of Gr., Dr., & Surf.		$ 1,248,932
	Utility Relocation (along existing alignment)	$200,000 /Mile	7.8	$ 1,550,000
			Total	**$ 36,255,912**
TOTAL ROADWAY CONSTRUCTION COST				**$ 51,867,560**
BRIDGES	Mainline - Interchange/RR/Stream/Creek	$80 /S.F.	790920	$ 63,273,600
	Bridge Approaches	$15 /S.F.	102800	$ 1,542,000
TOTAL STRUCTURES CONSTRUCTION COST				**$ 64,815,600**
			Construction Subtotal	$ 116,683,160
			Contingency @ 15% of Construction	$ 17,502,474
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 21,469,701
TOTAL CONSTRUCTION COST				**$ 155,655,335**
RIGHT-OF-WAY	Right-of-Way	$50,000 /Ac.	62.9	$ 3,145,000
	Residential Acquisition	$100,000 /Each	16	$ 1,600,000
	Commercial Acquisition	$1,000,000 /Each	26	$ 26,000,000
			ROW Subtotal	$ 30,745,000
TOTAL RIGHT-OF-WAY COST				**$ 30,745,000**
MISSISSIPPI RIVER CROSSING	Removal Existing I-55 Bridge	Lump Sum		$ 5,000,000
	Mainline Mississippi River Crossing	Lump Sum		$ 185,000,000
TOTAL MAINLINE MISSISSIPPI RIVER CROSSING COST				**$ 190,000,000**
GRAND TOTAL				**$ 376,400,335**

1: No improvements I-40/Highway 79 to I-40/I-55 Interchange - 14.65 miles.

Cost per Mile = **$48,567,785**

Highway 79 Corridor Study

Preliminary Cost Estimate (Alternate 2A) - Low Estimate

(Four-Lane Divided Freeway on New Alignment)

Date: 3/11/2003

Roadway Length (miles): 12.0
Corridor Length (miles): 14.9

US 79 Corridor - I-40 to US 61

ITEM	SUB-ITEMS	UNIT COST		QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**				
	Floodplain Terrain	$6.5M	/mile	1.2	$ 7,775,871
	Rolling Terrain	$8.6M	/mile	0.6	$ 5,144,038
	Flat Terrain	$5.5M	/mile	10.2	$ 55,926,458
				Roadway Subtotal	**$ 68,846,367**
MISCELLANEOUS ITEMS					
	Local Service Interchange (diamond/folded-diamond)	$4.5M	/Each	0	$ -
	System-to-System Interchange	$6.5M	/Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000	/Each	2	$ 400,000
				Misc. Items Subtotal	**$ 13,400,000**
TOTAL ROADWAY CONSTRUCTION COST					**$ 82,246,367**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70	/S.F.	224,000	$ 15,680,000
	Bridge Approaches	$15	/S.F.	81,760	$ 1,226,400
TOTAL STRUCTURES CONSTRUCTION COST					**$ 16,906,400**
				Construction Subtotal	$ 99,152,767
				Contingency @ 15% of Construction	$ 14,872,915
				Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 18,244,109
TOTAL CONSTRUCTION COST					**$ 132,269,792**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (250')**	$5,000	/acre	420	$ 2,100,092
TOTAL RIGHT-OF-WAY COST					**$ 2,100,092**
MAINLINE MISSISSIPPI RIVER CROSSING					**$ 253,867,500**
GRAND TOTAL					**$ 388,237,384**

Cost per Mile = **$32,453,508**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):
Railroads= 250 ft.
Minor State Hwy= 180 ft
Major State Hwy= 350 ft.
Stream/Creek= 180 ft
Rivers= 1000 ft.
Approaches= 36.5 ft.

Highway 79 Corridor Study

Date: 3/11/2003

Preliminary Cost Estimate (Alternate 2A) - High Estimate

(Four-Lane Divided Freeway on New Alignment)

Roadway Length (miles): 11.3

Corridor Length (miles): 14.9

US 79 Corridor - I-40 to US 61

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**			
	Floodplain Terrain	$6.5M /mile	1.1	$ 7,320,379
	Rolling Terrain	$8.6M /mile	0.6	$ 4,842,712
	Flat Terrain	$5.5M /mile	9.6	$ 52,650,417
			Roadway Subtotal	**$ 64,813,508**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond)	$4.5M /Each	0	$ -
	System-to-System Interchange	$6.5M /Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000 /Each	2	$ 400,000
			Misc. Items Subtotal	**$ 13,400,000**
TOTAL ROADWAY CONSTRUCTION COST				**$ 78,213,508**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70 /S.F.	224,000	$ 15,680,000
	Bridge Approaches	$15 /S.F.	81,760	$ 1,226,400
TOTAL STRUCTURES CONSTRUCTION COST				**$ 16,906,400**
			Construction Subtotal	$ 95,119,908
			Contingency @ 15% of Construction	$ 14,267,986
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 17,502,063
TOTAL CONSTRUCTION COST				**$ 126,889,957**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (350')**	$5,000 /acre	567	$ 2,833,666
TOTAL RIGHT-OF-WAY COST				**$ 2,833,666**
MAINLINE MISSISSIPPI RIVER CROSSING				**$ 356,636,250**
GRAND TOTAL				**$ 486,359,873**

Cost per Mile = **$43,185,459**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):

- Railroads= 250 ft.
- Minor State Hwy= 180 ft
- Major State Hwy= 350 ft.
- Stream/Creek= 180 ft
- Rivers= 1000 ft.
- Approaches= 36.5 ft.

Highway 79 Corridor Study

Date: 3/11/2003

Preliminary Cost Estimate (Alternate 2B) - Low Estimate

(Four-Lane Divided Freeway on New Alignment)

Roadway Length (miles): 14.5

Corridor Length (miles): 18.7

US 79 Corridor - I-40 to US 61

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**			
	Floodplain Terrain	$6.5M /mile	2.2	$ 14,090,966
	Rolling Terrain	$8.6M /mile	0.0	$ -
	Flat Terrain	$5.5M /mile	12.3	$ 67,564,375
			Roadway Subtotal	**$ 81,655,341**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond)	$4.5M /Each	0	$ -
	System-to-System Interchange	$6.5M /Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000 /Each	4	$ 800,000
			Misc. Items Subtotal	**$ 13,800,000**
TOTAL ROADWAY CONSTRUCTION COST				**$ 95,455,341**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70 /S.F.	204,000	$ 14,280,000
	Bridge Approaches	$15 /S.F.	75,920	$ 1,138,800
TOTAL STRUCTURES CONSTRUCTION COST				**$ 15,418,800**
			Construction Subtotal	$ 110,874,141
			Contingency @ 15% of Construction	$ 16,631,121
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 20,400,842
TOTAL CONSTRUCTION COST				**$ 147,906,104**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (250')**	$5,000 /acre	517	$ 2,584,883
TOTAL RIGHT-OF-WAY COST				**$ 2,584,883**
MAINLINE MISSISSIPPI RIVER CROSSING				**$ 395,898,750**
GRAND TOTAL				**$ 546,389,737**

Cost per Mile = **$37,806,492**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):
- Railroads= 250 ft.
- Minor State Hwy= 180 ft
- Major State Hwy= 350 ft.
- Stream/Creek= 180 ft
- Rivers= 1000 ft.
- Approaches= 36.5 ft.

Highway 79 Corridor Study

Preliminary Cost Estimate (Alternate 2B) - High Estimate

(Four-Lane Divided Freeway on New Alignment)

Date: 3/11/2003

US 79 Corridor - I-40 to US 61

Roadway Length (miles): 14.6

Corridor Length (miles): 18.7

ITEM	SUB-ITEMS	UNIT COST		QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**				
	Floodplain Terrain	$6.5M	/mile	2.2	$ 14,275,625
	Rolling Terrain	$8.6M	/mile	0.0	$ -
	Flat Terrain	$5.5M	/mile	12.4	$ 68,449,792
				Roadway Subtotal	**$ 82,725,417**
MISCELLANEOUS ITEMS					
	Local Service Interchange (diamond/folded-diamond)	$4.5M	/Each	0	$ -
	System-to-System Interchange	$6.5M	/Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000	/Each	4	$ 800,000
				Misc. Items Subtotal	**$ 13,800,000**
TOTAL ROADWAY CONSTRUCTION COST					**$ 96,525,417**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70	/S.F.	204,000	$ 14,280,000
	Bridge Approaches	$15	/S.F.	75,920	$ 1,138,800
TOTAL STRUCTURES CONSTRUCTION COST					**$ 15,418,800**
				Construction Subtotal	$ 111,944,217
				Contingency @ 15% of Construction	$ 16,791,633
				Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 20,597,736
TOTAL CONSTRUCTION COST					**$ 149,333,585**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (350')**	$5,000	/acre	723	$ 3,614,819
TOTAL RIGHT-OF-WAY COST					**$ 3,614,819**
MAINLINE MISSISSIPPI RIVER CROSSING					**$ 396,236,250**
GRAND TOTAL					**$ 549,184,654**

Cost per Mile = **$37,508,343**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):

Railroads= 250 ft.

Minor State Hwy= 180 ft

Major State Hwy= 350 ft.

Stream/Creek= 180 ft

Rivers= 1000 ft.

Approaches= 36.5 ft.

Highway 79 Corridor Study

Date: 3/11/2003

Preliminary Cost Estimate (Alternate 3A) - Low Estimate

(Four-Lane Divided Freeway on New Alignment)

Roadway Length (miles): 20.7

Corridor Length (miles): 23.5

US 79 Corridor - I-40 to US 61

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**			
	Floodplain Terrain	$6.5M /mile	1.0	$ 6,719,129
	Rolling Terrain	$8.6M /mile	0.0	$ -
	Flat Terrain	$5.5M /mile	19.6	$ 108,022,917
			Roadway Subtotal	**$ 114,742,045**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond)	$4.5M /Each	2	$ 9,000,000
	System-to-System Interchange	$6.5M /Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000 /Each	4	$ 800,000
			Misc. Items Subtotal	**$ 22,800,000**
TOTAL ROADWAY CONSTRUCTION COST				**$ 137,542,045**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70 /S.F.	212,800	$ 14,896,000
	Bridge Approaches	$15 /S.F.	81,760	$ 1,226,400
TOTAL STRUCTURES CONSTRUCTION COST				**$ 16,122,400**
			Construction Subtotal	$ 153,664,445
			Contingency @ 15% of Construction	$ 23,049,667
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 28,274,258
TOTAL CONSTRUCTION COST				**$ 204,988,370**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (250')**	$5,000 /acre	655	$ 3,273,646
TOTAL RIGHT-OF-WAY COST				**$ 3,273,646**
MAINLINE MISSISSIPPI RIVER CROSSING				**$ 247,680,000**
GRAND TOTAL				**$ 455,942,016**

Cost per Mile = **$22,053,626**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):

Railroads= 250 ft.
Minor State Hwy= 180 ft
Major State Hwy= 350 ft.
Stream/Creek= 180 ft
Rivers= 1000 ft.
Approaches= 36.5 ft.

Highway 79 Corridor Study

Preliminary Cost Estimate (Alternate 3A) - High Estimate

(Four-Lane Divided Freeway on New Alignment)

Date: 3/11/2003

Roadway Length (miles): 20.1
Corridor Length (miles): 23.5

US 79 Corridor - I-40 to US 61

ITEM	SUB-ITEMS	UNIT COST		QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**				
	Floodplain Terrain	$6.5M	/mile	1.0	$ 6,528,314
	Rolling Terrain	$8.6M	/mile	0.0	$ -
	Flat Terrain	$5.5M	/mile	19.1	$ 104,955,208
				Roadway Subtotal	**$ 111,483,523**
MISCELLANEOUS ITEMS					
	Local Service Interchange (diamond/folded-diamond)	$4.5M	/Each	2	$ 9,000,000
	System-to-System Interchange	$6.5M	/Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000	/Each	4	$ 800,000
				Misc. Items Subtotal	**$ 22,800,000**
TOTAL ROADWAY CONSTRUCTION COST					**$ 134,283,523**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70	/S.F.	212,800	$ 14,896,000
	Bridge Approaches	$15	/S.F.	81,760	$ 1,226,400
TOTAL STRUCTURES CONSTRUCTION COST					**$ 16,122,400**
				Construction Subtotal	$ 150,405,923
				Contingency @ 15% of Construction	$ 22,560,888
				Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 27,674,690
TOTAL CONSTRUCTION COST					**$ 200,641,501**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (350')**	$5,000	/acre	892	$ 4,458,563
TOTAL RIGHT-OF-WAY COST					**$ 4,458,563**
MAINLINE MISSISSIPPI RIVER CROSSING					**$ 392,298,750**
GRAND TOTAL					**$ 597,398,814**

Cost per Mile = **$29,740,390**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):
Railroads= 250 ft.
Minor State Hwy= 180 ft
Major State Hwy= 350 ft.
Stream/Creek= 180 ft
Rivers= 1000 ft.
Approaches= 36.5 ft.

Highway 79 Corridor Study

Date: 3/11/2003

Preliminary Cost Estimate (Alternate 3B) - Low Estimate

(Four-Lane Divided Freeway on New Alignment)

Roadway Length (miles): 22.6

US 79 Corridor - I-40 to US 61

Corridor Length (miles): 25.7

ITEM	SUB-ITEMS	UNIT COST		QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**				
	Floodplain Terrain	$6.5M	/mile	1.1	$ 7,348,693
	Rolling Terrain	$8.6M	/mile	0.0	$ -
	Flat Terrain	$5.5M	/mile	21.5	$ 118,144,375
				Roadway Subtotal	**$ 125,493,068**
MISCELLANEOUS ITEMS					
	Local Service Interchange (diamond/folded-diamond)	$4.5M	/Each	3	$ 13,500,000
	System-to-System Interchange	$6.5M	/Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000	/Each	2	$ 400,000
				Misc. Items Subtotal	**$ 26,900,000**
TOTAL ROADWAY CONSTRUCTION COST					**$ 152,393,068**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70	/S.F.	227,200	$ 15,904,000
	Bridge Approaches	$15	/S.F.	87,600	$ 1,314,000
TOTAL STRUCTURES CONSTRUCTION COST					**$ 17,218,000**
				Construction Subtotal	$ 169,611,068
				Contingency @ 15% of Construction	$ 25,441,660
				Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 31,208,437
TOTAL CONSTRUCTION COST					**$ 226,261,165**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (250')**	$5,000	/acre	767	$ 3,836,318
TOTAL RIGHT-OF-WAY COST					**$ 3,836,318**
MAINLINE MISSISSIPPI RIVER CROSSING					**$ 269,167,500**
GRAND TOTAL					**$ 499,264,983**

Cost per Mile = **$22,080,269**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):
- Railroads= 250 ft.
- Minor State Hwy= 180 ft
- Major State Hwy= 350 ft.
- Stream/Creek= 180 ft
- Rivers= 1000 ft.
- Approaches= 36.5 ft.

Highway 79 Corridor Study

Date: 3/11/2003

Preliminary Cost Estimate (Alternate 3B) -High Estimate

(Four-Lane Divided Freeway on New Alignment)

Roadway Length (miles): 22.2

US 79 Corridor - I-40 to US 61

Corridor Length (miles): 25.7

ITEM	SUB-ITEMS	UNIT COST	QUANTITY	TOTAL COST
ROADWAY (includes: grading, drainage, paving)	**4-Lane Divided Freeway**			
	Floodplain Terrain	$6.5M /mile	1.1	$ 7,225,587
	Rolling Terrain	$8.6M /mile	0.0	$ -
	Flat Terrain	$5.5M /mile	21.1	$ 116,165,208
			Roadway Subtotal	**$ 123,390,795**
MISCELLANEOUS ITEMS				
	Local Service Interchange (diamond/folded-diamond)	$4.5M /Each	3	$ 13,500,000
	System-to-System Interchange	$6.5M /Each	2	$ 13,000,000
	Utility Relocation (Major Crossing)	$200,000 /Each	2	$ 400,000
			Misc. Items Subtotal	**$ 26,900,000**
TOTAL ROADWAY CONSTRUCTION COST				**$ 150,290,795**
BRIDGES	**Mainline** - Interchange/RR/Stream/Creek	$70 /S.F.	227,200	$ 15,904,000
	Bridge Approaches	$15 /S.F.	87,600	$ 1,314,000
TOTAL STRUCTURES CONSTRUCTION COST				**$ 17,218,000**
			Construction Subtotal	$ 167,508,795
			Contingency @ 15% of Construction	$ 25,126,319
			Planning, Design and Construction Administration @ 16% of Construction + Contingency	$ 30,821,618
TOTAL CONSTRUCTION COST				**$ 223,456,733**
RIGHT-OF-WAY	**Right-of-Way Roadway + Structures (350')**	$5,000 /acre	1,074	$ 5,370,845
TOTAL RIGHT-OF-WAY COST				**$ 5,370,845**
MAINLINE MISSISSIPPI RIVER CROSSING				**$ 372,273,750**
GRAND TOTAL				**$ 601,101,328**

Cost per Mile = **$27,036,963**

General Notes:

Bridge Deck Width (mainline) = 40 ft. x 2 bridge decks

Bridge Lengths (mainline over):
Railroads= 250 ft.
Minor State Hwy= 180 ft
Major State Hwy= 350 ft.
Stream/Creek= 180 ft
Rivers= 1000 ft.
Approaches= 36.5 ft.