Brooke-Hancock-Jefferson Regional Bridge System Study

Phase II Final Report

Prepared for:

Brooke-Hancock-Jefferson Metropolitan Planning Commission

Prepared by:

Edwards AND Kelcey

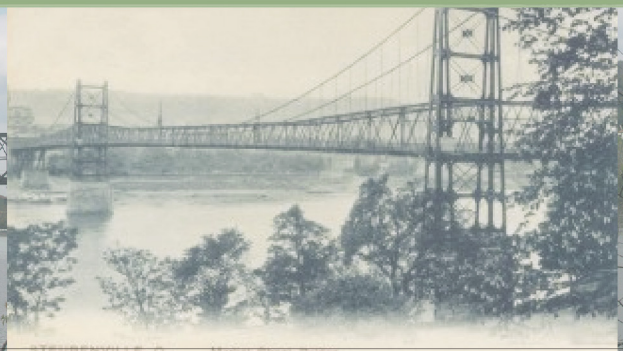
Charleston, West Virginia

Subconsultant:

BURGESS & NIPLE

Columbus, Ohio

September 2003



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September 2003
This project was funded through the cooperative effort of the
U.S. Federal Highway Administration, the Ohio Department of Transportation, and
the West Virginia Department of Transportation.

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Appendix A: Bridge System Study History Prepared by BHJ Staff

Executive Summary

The Brooke-Hancock-Jefferson Metropolitan Planning Commission (BHJ), in both their 2020 and 2025 Regional Transportation Plan, states their #1 priority as "promote a regional Ohio River bridge network that maintains and expands metropolitan activity."

This precedent created funding and this BHJ Regional Bridge System Study. The study, through a rigorous public involvement process and strong quantitative review, provides a best management approach to the region's declining bridge infrastructure (i.e., two of the three bridge crossings in the 18 mile river corridor are near 100 years of age and are rapidly approaching the end of their life cycle).

The following study is Phase II of a two part study. Phase I, submitted in May 2000, initiated answers to the purpose and need for a new river crossing. The Phase I study provided the following facts.

- The Fort Steuben Bridge and Market Street Bridge are past their design life.
- A circumstance in which only one river crossing exists within the metropolitan area would create an unacceptable emergency response time situation.
- Due to inherent design characteristics, neither the Fort Steuben Bridge nor Market Street Bridge can be updated to modern standards.
- Due to weight limits on the Market Street Bridge, the closing of the Fort Steuben Bridge would leave the region with only one crossing capable of carrying commercial truck traffic.
- Access to and from the Veterans Memorial Bridge is vulnerable to accident blockage and deficient intersection design.
- The concentration of all river crossing capacity within a small geographic area constrains the overall flexibility of the regional transportation system.

Phase II, through a publicly-approved quantitative matrix, walked the community through logical constraints and benefits. It concludes with a consensus priority statement for bridge location and access improvements. In May 2003, the priority statement was formally adopted by the Brooke-Hancock-Jefferson Metropolitan Planning Commission, the federally recognized council for regional transportation.

To validate the quantitative decision matrix, key regional goals and objectives were agreed to through public meetings and interviews. General goals include the following items.

- Maintain and enhance transportation capacity.
- Safety and reliability for existing businesses, their employees and all residents.

Evaluation criteria specific to these goals include the following measurable factors.

- Effectiveness in minimizing environmental impacts
- Cost effectiveness
- Effectiveness for improving safety
- Effectiveness in supporting regional economic growth.

To complete this Phase II study, various alternatives for bridge crossings were developed based on preliminary engineering analysis. Locations were identified that could facilitate east-west movements or to serve population and employment centers on each side of the River. These include replacing the existing bridges in their current location as well as two options for a new bridge in the southern portion of the planning area. These options initially formed seven Scenarios including a Baseline, or "no-build," option. Four additional Scenarios were developed using a combination of bridge locations with northern and southern alternatives.

More detailed engineering and environmental studies will be needed in the next Phase to satisfy the National Environmental Policy Act (NEPA). These studies will establish a specific location and configuration for the new bridge.

The preferred Scenario 8, described later in this report, provides the benefits of both the preferred northern and southern Scenarios as well as maintaining a high benefits to cost ratio and the highest reduction of user costs. When Scenario 8 is reviewed in comparison to both the Baseline Scenario and other alternatives, it is found to provide maximum benefit for minimum cost in all categories of mobility, environmental impacts, safety, cost effectiveness and regional economic growth.

The recommendations of the Consultant Team are premised upon the assumption that two of the three bridge crossings (i.e., the Fort Steuben Bridge and Market Street Bridge) will not be in service for the planning year 2025.

After sixteen (16) Bridge Advisory Committee meetings and five (5) public information meetings, the Brooke-Hancock-Jefferson Metropolitan Planning Commission made a three-point priority recommendation. The Phase II study was the guide document for their recommendation. Total cost for these recommendations is estimated at about $102 million in FY 2003 dollars.

Priority #1: Construct roadway and intersection capacity improvements to better access the region's most modern bridge crossing, Veterans Memorial Bridge. These improvements are as follows.

- Realign and improve the Freedom Way and Birch Drive intersection in Weirton.
- Improve the alignment and widen the intersection of Freedom Way and West Virginia Route 2 in Weirton.
- Upgrade and improve the existing three lanes on Freedom Way in Weirton.
- Improve access to Veterans Memorial Bridge at Steubenville through the realignment and widening of adjacent connecting thoroughfares State Route 7 (Dean Martin Boulevard) and University Boulevard.

Priority #2: Construct a new Ohio River bridge crossing south of Wellsburg to connect West Virginia State Route 2 and Ohio State Route 7.

Priority #3: Construct a new Ohio River bridge crossing to connect West Virginia State Route 2 and Ohio State Route 7 in Steubenville at Washington Street.

Bridge Advisory Committee Membership

The Bridge Advisory Committee (BAC) was responsible for overall review and approval of the engineering and planning analysis work in the Study. The BAC met regularly during Phase II. Members of the BAC represent a broad cross section of private and public interest groups. Discussion and review during BAC meetings gave guidance to the Consultant Team. Decisions were based on consensus of the group.

BHJ Commission	Norm Schwertfeger
Brooke County Board of Education	Ron Ujcick
BDC of the Northern Panhandle	John Murry
Brooke County Commission	Paul Phillips
	Bill Schaefer
Brooke-Hancock County Assessors Office	Dan Tassey
Citizen at Large	Russ Irvin
	Helen Mayle
Follansbee, City of	Tony Paesano (Delegate)
	Kevin Diserio (Alternate)
Hancock County Commission	Will Allison
	Chuck Svokas
Jefferson County Commission	Jim Branagan
	Richard Delatore
Mingo Junction, Village of	John Fabian (Delegate)
	Keith Murtland (Alternate)
Ohio Department of Transportation	Greg Gurney (Delegate)
	David Speer (Alternate)
Progress Alliance	Holly Childs
Steel Valley Regional Transit Authority	Frank Bovina
Steubenville, City of	Domenick Mucci (Delegate)
	Dave Snelting (Delegate)
	Fred Hays (Alternate)
Toronto, City of	George Cattrell (Delegate)
	Vacant (Alternate)
Weir Cove Moving & Storage	Romie Castelli
Weirton Steel Corporation	Andy Kowalo
	Virgil Thompson
Weirton Transit Corporation	Curt Hinchee
Wellsburg, City of	Wayne Campbell (Delegate)
	Margaret Metzger (Alternate)
Wheeling-Pittsburgh Steel Corp	Mark Morelli
	John Sneddon
Wintersville, Village of	Bob Laukert (Delegate)
	Gary Folden (Alternate)
Weirton, City of	Joe Cicchirillo
	Bob Riccelli
West Virginia Department of Transportation	Don Bailey (Delegate)
	Richard Warner (Alternate)

Introduction

Purpose of Report

This report summarizes the findings and conclusions drawn from Phase I and Phase II of the Brooke-Hancock-Jefferson Regional Bridge System Study and documents the results of the two phase study. Phase I was directed towards assessing the existing bridge system and establishing the purpose and need for a new river crossing in the BHJ Region between Brooke County, West Virginia and Jefferson County, Ohio. The Phase I Report was completed in May 2000 with the conclusion that an additional Ohio River crossing was warranted based on preliminary analysis. A decision was made by the Brooke-Hancock-Jefferson Metropolitan Planning Commission (BHJ) to obtain funding for a Phase II Study.

The next phase of this study will include a more detailed analysis of issues related to purpose and need as related to Federal funding requirements.

Purpose of Phase II Study

Phase II work began in February 2002. The purpose of the study is to determine the most suitable system of bridges in the study area considering the regional benefits from, and the cost of providing such a system. Forecasts of traffic were based on the year 2025 as a planning horizon. In order to establish a rational evaluation process, eleven alternative Scenarios, including "no-build", were established for review and to ensure mobility of people and goods for the three county BHJ region.

Origin of Study

This study was commissioned by BHJ, as an outgrowth of the BHJ *2020 Regional Transportation Plan* adopted in January of 1998. Funds for this Study have been provided by the Federal Highway Administration (FHWA) and administered by the Ohio Department of Transportation (ODOT) and the West Virginia Department of Transportation (WVDOT).

In addition to the Phase I Report (May 2000), seven technical Memoranda were published describing the analytical process in Phase II. These are:

1. Evaluation Criteria Summary Memorandum;
2. Phase I Travel Demand Results Review Memorandum;
3. Baseline Determination Memorandum;
4. Travel Demand Modeling Process Summary Memorandum;
5. Traffic Operations Analysis Memorandum;
6. Alternatives Definition Memorandum; and
7. Alternatives Evaluation and Ranking Summary Memorandum.

The seven Memoranda were assembled in a single document, dated May 2003. The reader is referred to that document for detailed information.

Need Assessment

One of the primary objectives of this study was to prepare a report that can serve as the basis for FHWA guidelines related to "purpose and need" assessment. The following statements highlight key items and related findings that can be used in the development of the "needs" statement.

The proposed improvements will serve the Ohio River crossing travel desires for the BHJ region over the next 25 years. They prepare the community for the eventual end of the service life for both the Market Street Bridge (constructed in 1904) and the Fort Steuben Bridge (constructed in 1928).

Transportation Demand

During the development of the 2020 Regional Transportation Plan, a new Ohio River crossing was identified as the top priority within the BHJ region. This study and the recommendations have been prepared in response to these concerns. The Market Street Bridge and the Fort Steuben Bridge are well past their design lives. While the investment of funds in added maintenance may extend their useful life, neither bridge can be brought up to modern standards due to inherent design constraints.

The Market Street and Fort Steuben Bridges both serve local traffic that primarily originates within the Weirton, West Virginia and Steubenville, Ohio (BHJ metropolitan area). The Market Street Bridge provides for trips from the Weirton and the Follansbee area to access the central business district of Steubenville. The Fort Steuben Bridge serves the Half-Moon Industrial Park and the City of Weirton and is an important facility for the movement of goods to and from destinations outside of the community. About 17 percent of the daily vehicle traffic is commercial truck traffic.

Due to the nature of commerce in the BHJ region, heavy truck traffic is a normal component of river-crossing traffic. The Market Street Bridge is not capable of supporting commercial truck traffic regardless of the level of maintenance or refurbishment it receives. A 5-ton weight limit is presently in place on the Market Street Bridge. Closure of the Fort Steuben Bridge would leave the region with only one river crossing (Veterans Memorial Bridge) capable of carrying commercial truck traffic.

From a transportation system perspective it should be noted that the closest river crossing points beyond the study area are at Wheeling, 25 miles south of Steubenville and at East Liverpool, Ohio, 25 miles north of Steubenville. The proposed recommendations described in this report will provide for more efficient system-wide travel throughout the region.

Safety Issues

A single river crossing for the region is not acceptable in terms of overall safety needs.

The Veterans Memorial Bridge has ample traffic capacity itself; but access to the bridge is vulnerable to blockage due to accidents. The Bridge is closed once a year for four hours to meet inspection requirements. On these occasions, the two older bridges are not adequate to handle existing or projected future traffic volumes. This highlights the need for redundancy in the system with adequate capacity to provide for the movement of traffic as well as providing access to the region for emergency vehicles.

Additionally, the transportation system in the Ohio River Valley is heavily dependent on the two north/south arterial roadways: WV 2 and SR 7. When either of these is closed due to accidents, flooding, or landslides, as does happen on occasion, few alternative routes are available. By linking these two routes with a new alternative river crossing, a significant increase is realized in the transportation options available in the region for normal transportation purposes as well as the delivery of emergency services. With implementation of the recommendations in this report, analysis shows that a reduction of about 55 accidents per year could be expected.

Economic Development

The concentration of all river-crossing capacity within a small geographic area constrains the overall flexibility of the transportation system in the region. Lengthy work travel times resulting from this lack of flexibility is a significant economic burden and a deterrent to new economic development. A large portion of the area's industrial capacity is located in the Ohio River Valley south of the current crossing locations. There is potential for industrial development in this area of the valley; however, successful development is clearly predicated on adequate transportation access. Given the difficulty that the BHJ region has faced in remaining economically competitive over the last two decades, improving the infrastructure that supports economic development is a priority.

It is a well understood principle that flexibility in the transportation system is important for economic growth.

System Linkage

A major criterion used during the evaluation of alternatives in the study centered on accessibility from selected gateways to selected river and rail ports. Travel times from West Virginia gateways into the planning area to Ohio River and rail ports and from Ohio gateways to West Virginia river and rail ports were analyzed. The time saving created by improving the efficiency of travel throughout the region can equate to a significant monetary saving for the traveling public and industry and can enhance economic development. The study found that by implementing the recommended improvements, travel times for all trips from West Virginia gateways to Ohio River and rail ports could be significantly reduced.

Modal Interrelationships

Within the BHJ region two public transportation agencies serve the area. The Weirton Transit Corporation serves the Weirton area and the Steel Valley Regional Transit Authority serves Mingo Junction and Steubenville. Both of these public transit systems cross the Ohio River and provide for transfers between each other. With the addition of a bridge in the southern portion of the planning area it is assumed that system routes may be modified, thus enhancing accessibility to communities such as Brilliant and Wellsburg and potentially resulting in increased ridership.

Goals and Objectives

The goal of this study was to analyze, from a transportation planning perspective, a series of reasonably viable alternatives at a level of detail sufficient to provide state and local transportation decision makers a basis to identify a preferred Ohio River bridge system for the defined study area. The results of this analysis show a clear need for the preferred system. The purpose of the study is to improve the overall flexibility of the BHJ regional transportation system. Implementation of the recommendations could:

- relieve the economic burden and deterrent to new economic development by reducing the lengthy work travel times and improving access to industry resulting from the lack of alternatives that serve the entire region;
- ensure that at least two Ohio River crossings are available in emergency situations;
- result in a more balanced use of the region's transportation infrastructure; and
- serve both local and regional trips, including business trips, originating within or outside the metropolitan or passing through.

This document sets the stage for further study following the requirements of the NEPA process. The Phase II study recommendations have been selected based on public input, technical analysis, and engineering/environmental feasibility issues.

Description of Study Area

The BHJ region consists of three counties: Brooke and Hancock Counties in West Virginia and Jefferson County in Ohio. The adjoining cities of Steubenville, Ohio, and Weirton, West Virginia, serve as the region's core in terms of population and employment.

The major transportation facilities within the region are Ohio State Route (SR) 7, West Virginia (WV) 2, WV 27 and US 22. SR 7 stretches from Lawrence County in southern Ohio to beyond the northern border of Jefferson County. SR 7 is the main north-south route west of the Ohio River. It connects the region to Wheeling, West Virginia, and to I-70 to the south and I-80/I-76 in Youngstown to the north. WV *2* parallels SR 7 on the east banks. It connects the region with two other large West Virginia cities, Wheeling and Parkersburg. WV 27 connects to WV 2 and provides access to Washington, PA and the Pennsylvania Turnpike. US 22 is the only major east-west thoroughfare in the region because the geographic terrain makes a fluent east-west travel pattern difficult. US 22 is very important because it connects the region to Pittsburgh, Pennsylvania, the closest major metropolitan area. US 22 also connects with I-77 in Ohio, allowing drivers' convenient access to Steubenville/Weirton, East Liverpool/Chester as well as to southern Ohio and the Canton-Akron-Cleveland area, see Figure 1.

There are currently three opportunities to cross the Ohio River within the region. The Fort Steuben Bridge connects Freedom Way in West Virginia to SR 7 and US 22 in Ohio. The bridge is adjacent to the Half Moon Industrial Park and experiences a relatively high amount of truck traffic. The Veterans Memorial Bridge connects the two states via US 22. The Market Street Bridge connects WV 2 with downtown Steubenville. This bridge has a weight restriction of 5 tons, prohibiting large trucks.

The Phase II Study Area is bounded on the north by the Fort Steuben Bridge and extends downstream south of Brilliant near Beach Bottom. See Figure 2.

Existing Bridges

The three existing bridges examined in this study are, from north to south, the Fort Steuben Bridge, the Veterans Memorial Bridge, and the Market Street Bridge. Traffic volumes[1], based on Average Daily Traffic (ADT) counts, on the three bridges are as follows:

	Vehicles	Percent Trucks
• Fort Steuben Bridge	5,500 ADT	17%
• Veterans Memorial Bridge	32,500 ADT	10%
• Market Street Bridge	6,700 ADT	0%

It should be noted that the closest river crossing points beyond the study area are at Wheeling, 25 miles south of Steubenville, and at East Liverpool, Ohio, 25 miles north of Steubenville.

[1] Source: Ohio and West Virginia DOT and BHJ for the year 2002.

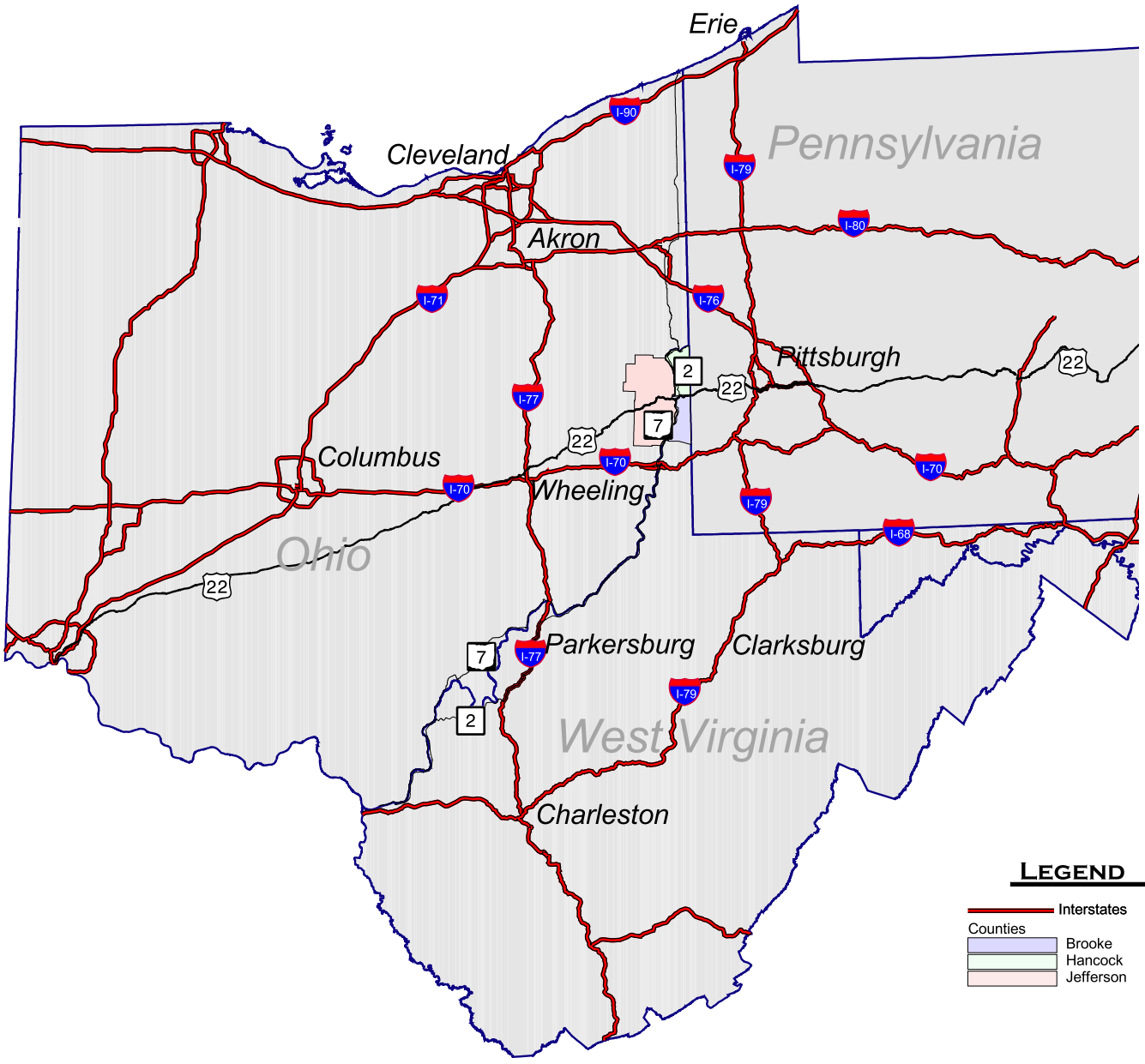

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Figure 1
Regional Location

Edwards and Kelcey

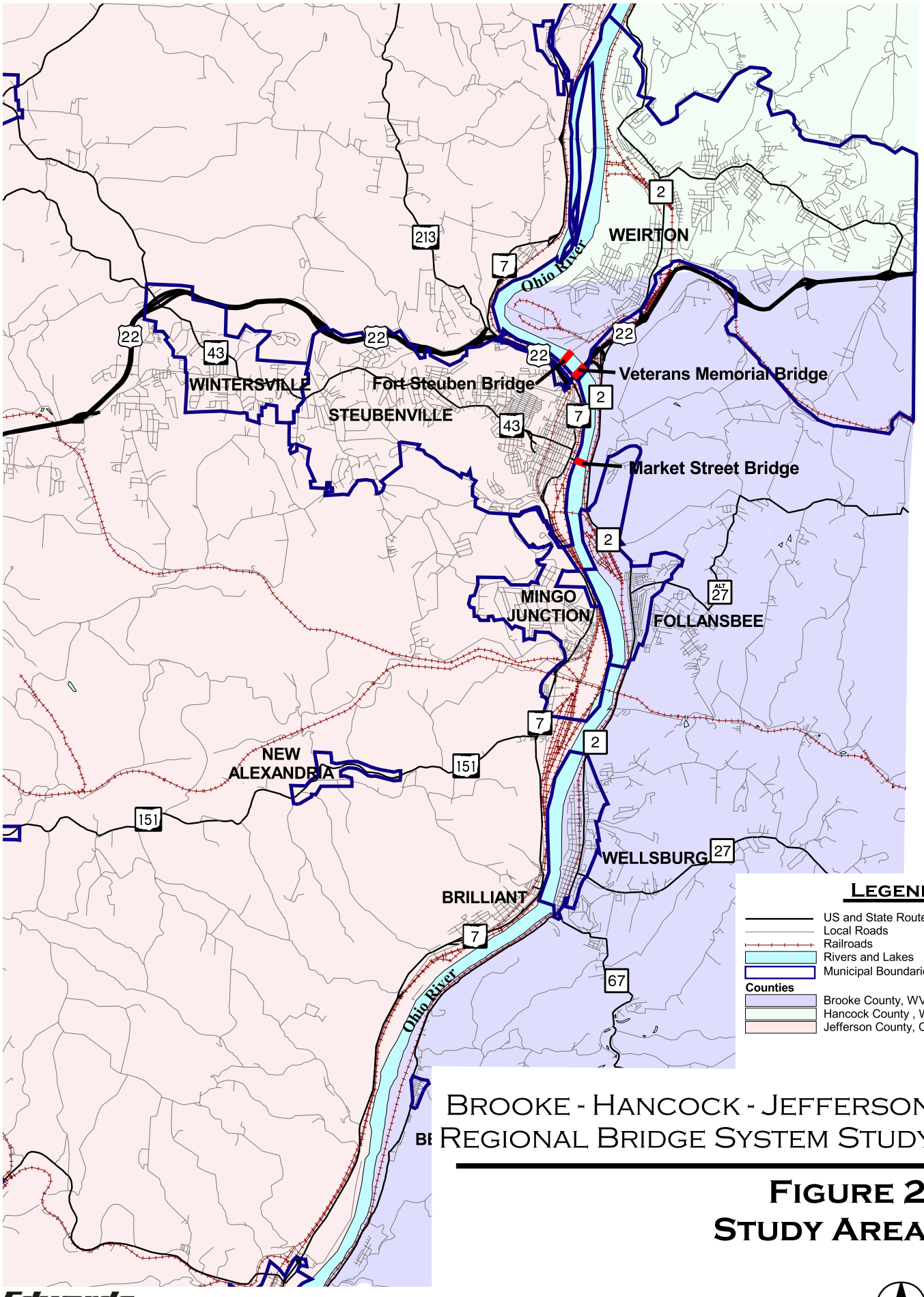

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Figure 2
Study Area

Edwards and Kelcey

Source: BHJ-2020 Transportation Plan January 29,1998

1 0 1 2 3 Miles

Economic Conditions

Over the last thirty years, the BHJ region has been passing through a significant era of change due to national economic trends. For many years, this area has been included as an important part of the nation's industrial heartland. Coal mining, electric power generation, various types of manufacturing, including steel making, formed the core of the area's economy.

Throughout the United States, all of these industries have been experiencing great change. Coal mining declined in northern West Virginia, eastern Ohio, and western Pennsylvania as coalfields were depleted and clean air regulations reduced the market for the high sulfur content coal in the area. Steel making and other types of manufacturing have increasingly faced stiff competition from overseas and have been forced to reduce labor costs to compete in the world market. Power generation, which also had been based on the supply of locally mined coal, has also suffered from changed circumstances due to the passage of clean air legislation.

Consequently, the economic core of the region has eroded over time. Employers, in an effort to remain competitive, have tended to replace labor force with technological improvements designed to increase productivity. Nevertheless, the manufacturing sector remains the heart of the economic base of the BHJ region. Figure 3 shows the generalized distribution of existing major manufacturing employment in the Study Area.

While employment is lower than it once was, these jobs tend to pay high wages and remain a very important piece of the regional economy. Currently, the manufacturing base of the BHJ region is concentrated in the Ohio River Valley in a linear pattern extending south from the Weirton-Steubenville area.

Service and commercial employment in the region has increased, again reflecting the overall trend at the national level. These jobs have different geographic distribution, tending not to be located in the Ohio Valley. Rather they are found in growing retail areas on ridge tops, east of Weirton and west of Steubenville. See Figure 4.

As employment has decreased in basic industries, the population characteristics of the region have changed as well. It is estimated that within the three-county BHJ region, population has declined by more than 30,000 persons since 1970, equivalent to roughly 18 percent of the area's 1970 population. The estimated population of the three-county BHJ region based on the 2000 census was 135,966.

The decline in population in the BHJ region has occurred disproportionately among younger age groups, meaning that over time, the region's population has grown older. While the trend towards an older population is prevalent throughout the United States, it has occurred more rapidly in the BHJ region. For these reasons, there is a very strong and understandable desire in the BHJ region to find ways to counter these trends and restore stability and even growth to the

area's economic and population bases. A prime example of this effort is the planning now underway by the State of West Virginia to improve WV 2, the principal arterial running north/south on the West Virginia side of the Ohio River Valley. This road is now a two-lane highway through much of its length. Currently there are two major construction projects underway to widen sections of this route to four lanes, with plans in the works to widen the remaining sections in the future. The primary reasons for this project are the need to correct safety problems caused by roadway geometrics and landslides as well as the desire to improve the competitive position of towns along the West Virginia side of the Ohio River, including Follansbee, Wellsburg, Beech Bottom and others. This effort to improve WV 2 extends throughout the State.

In addition, the West Virginia Route 2 and I-68 Authority has the responsibility to promote the improvement of the WV 2 corridor from Chester to Parkersburg and the extension of I-68 from Morgantown to Moundsville. The Authority is composed of representatives from ten counties. The mission of the Authority is to "work closely with all those interested and involved to promote the development of those two projects in a manner most beneficial to the region and the State."

Forecasts for future growth in the region's employment are modest. Much will depend on the region's ability to attract the type of jobs that are consistent with the national and global economy and to maintain a competitive and efficient manufacturing base. Many efforts, both public and private, are underway to retain and grow existing jobs as well as to attract new jobs. An excellent transportation system, one that provides connectivity throughout the BHJ region, is essential to economic growth.

Figures 5 through 8 show the expected locations for employment centers in the planning year 2025.

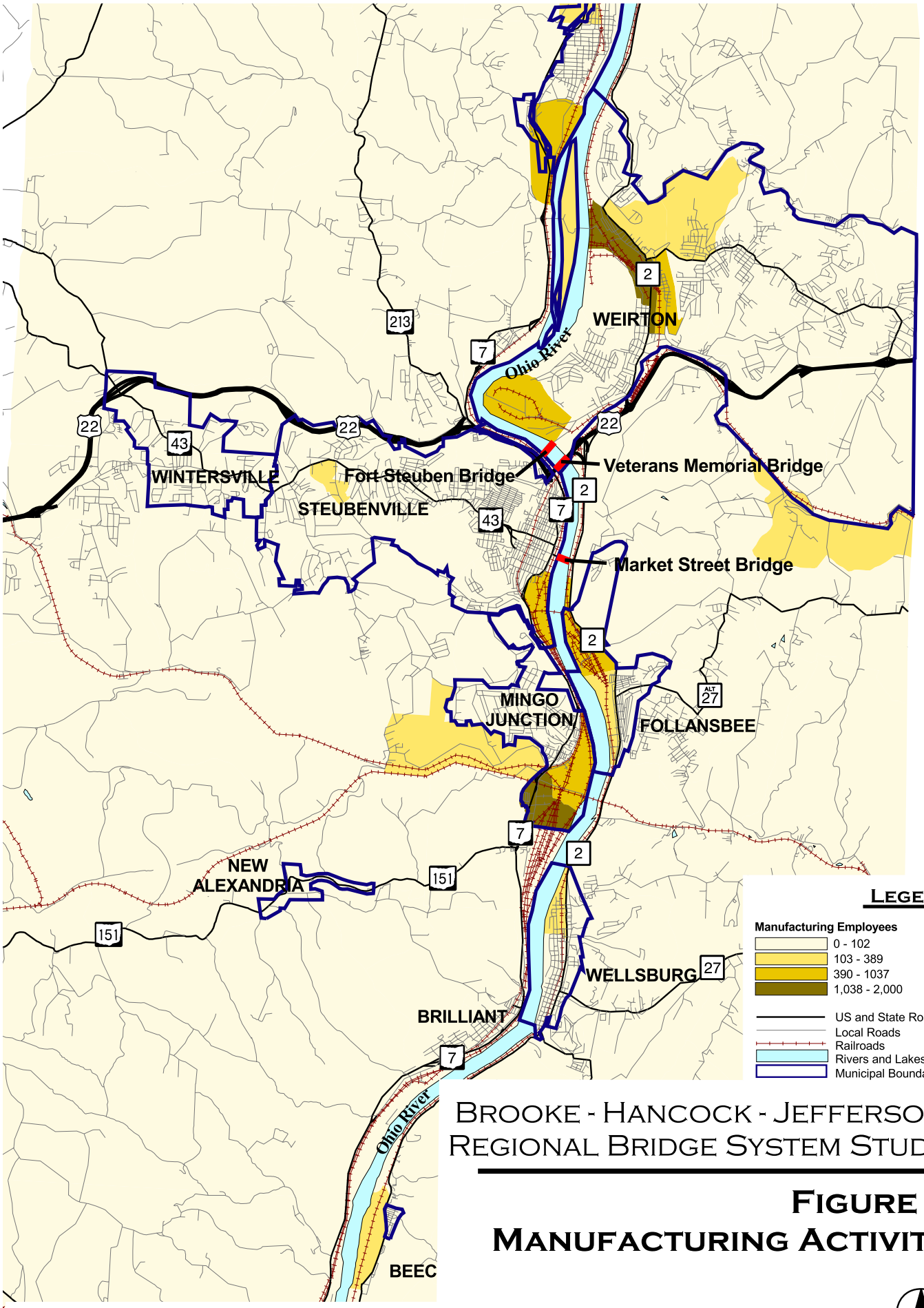

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Figure 3
Manufacturing Activity

Edwards and Kelcey

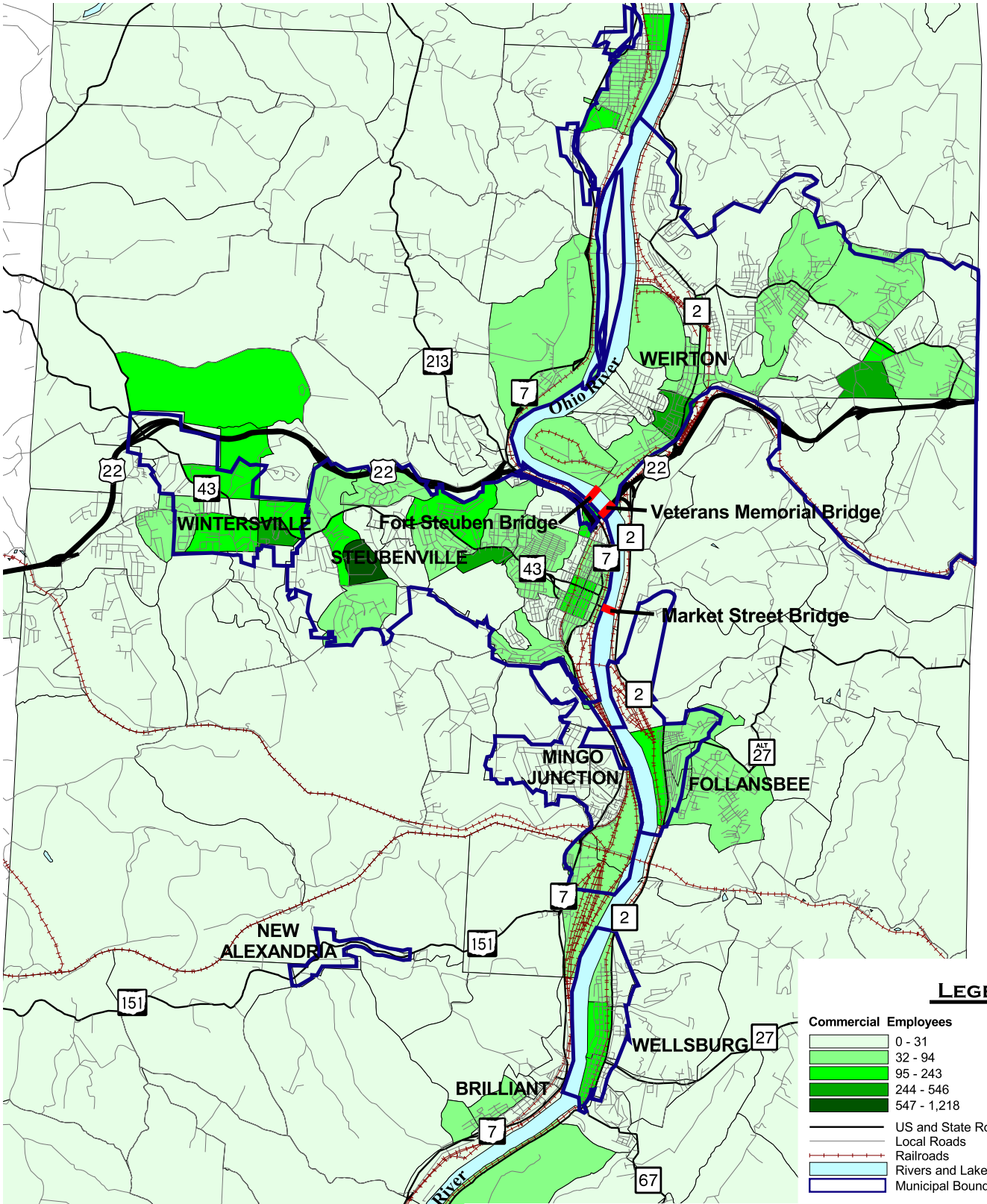

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Figure 4
Commercial Activity

1 0 1 2 3 Miles

Edwards and Kelcey

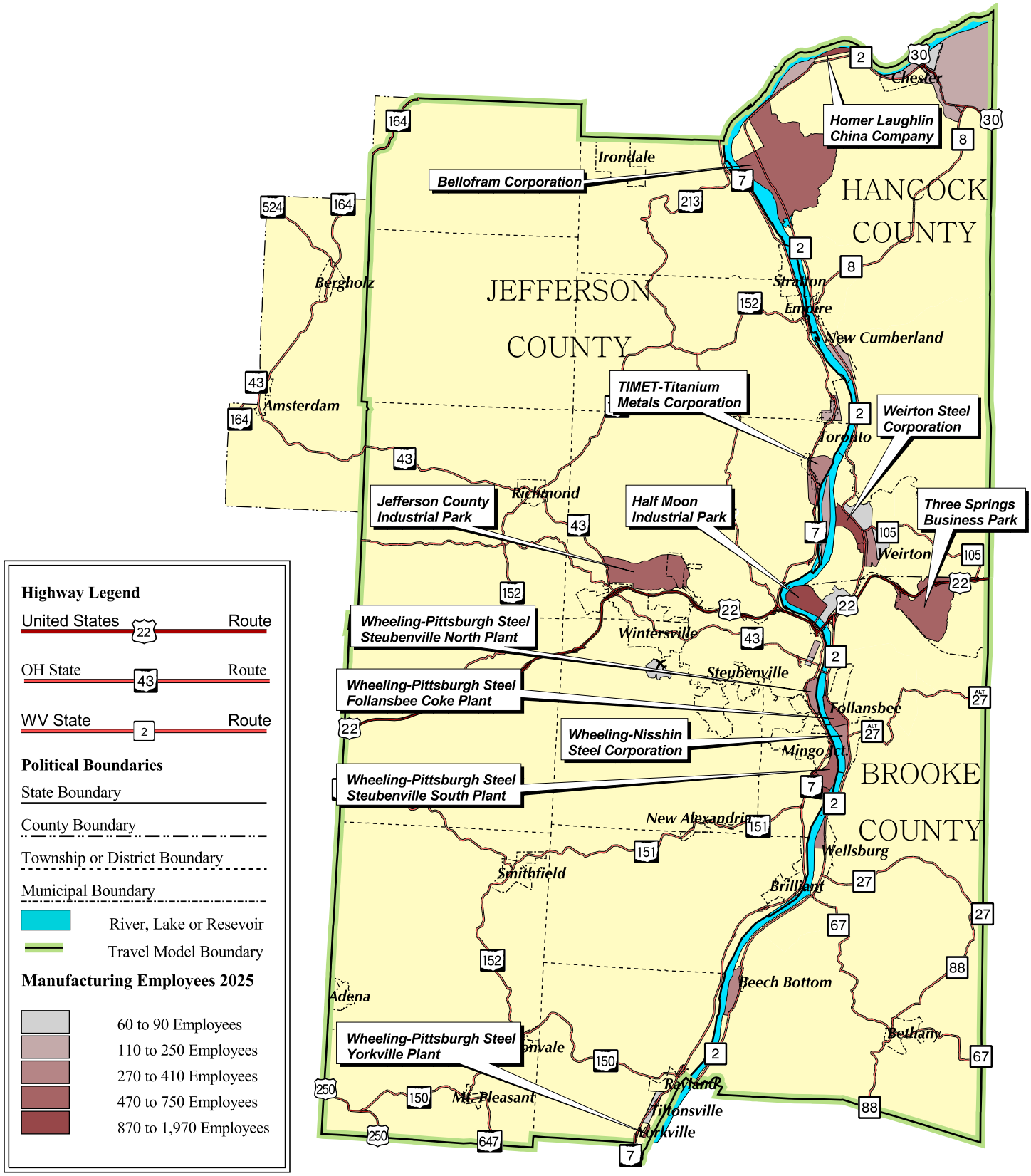

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Figure 5
Manufacturing Employment Centers 2025

Source: BHJ-MPC 2025 Transportation Plan

2 0 2 4 6 Miles

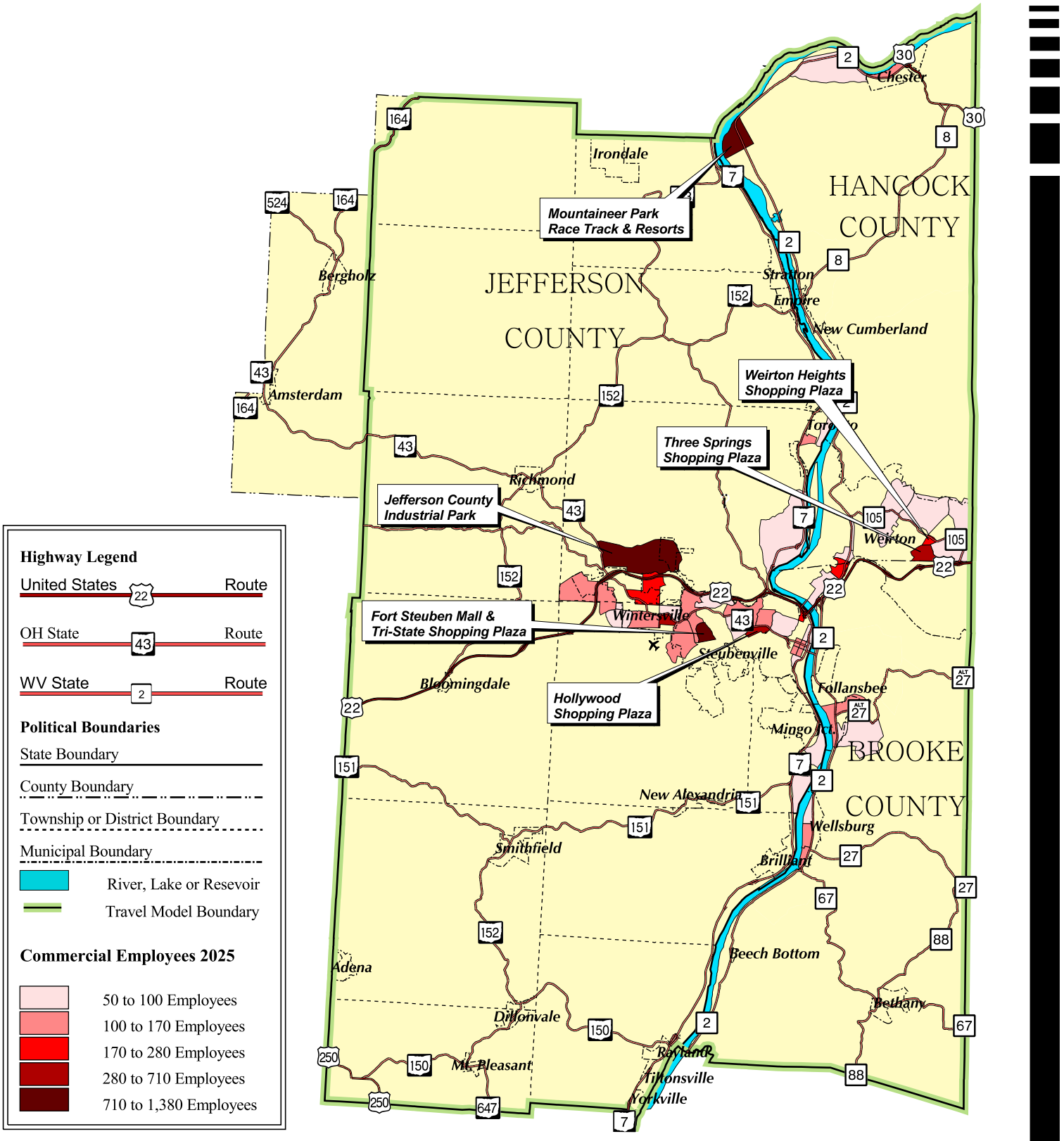

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Figure 6
Commercial Employment Centers 2025

Source: BHJ-MPC 2025 Transportation Plan

2 0 2 4 6 Miles

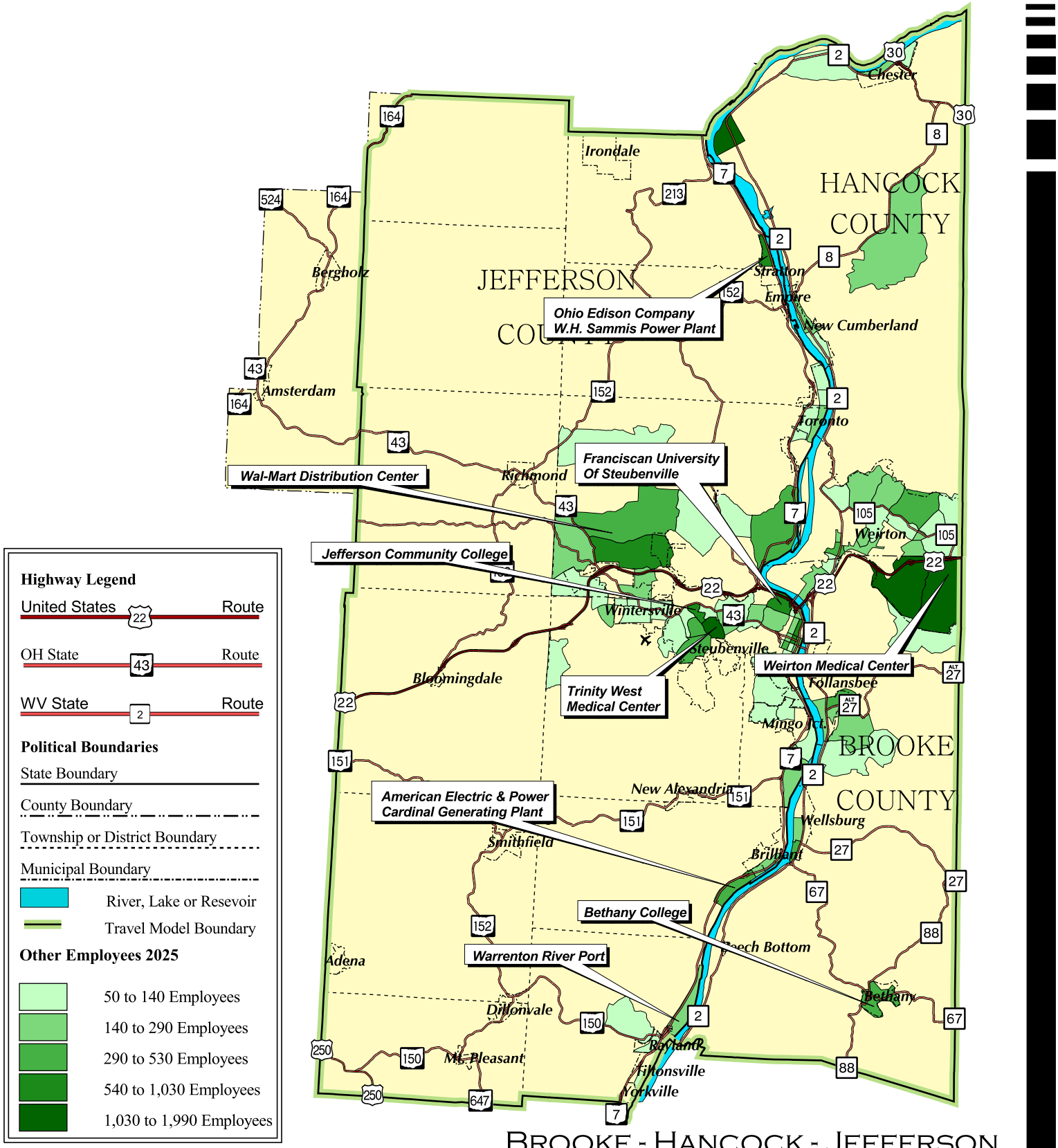

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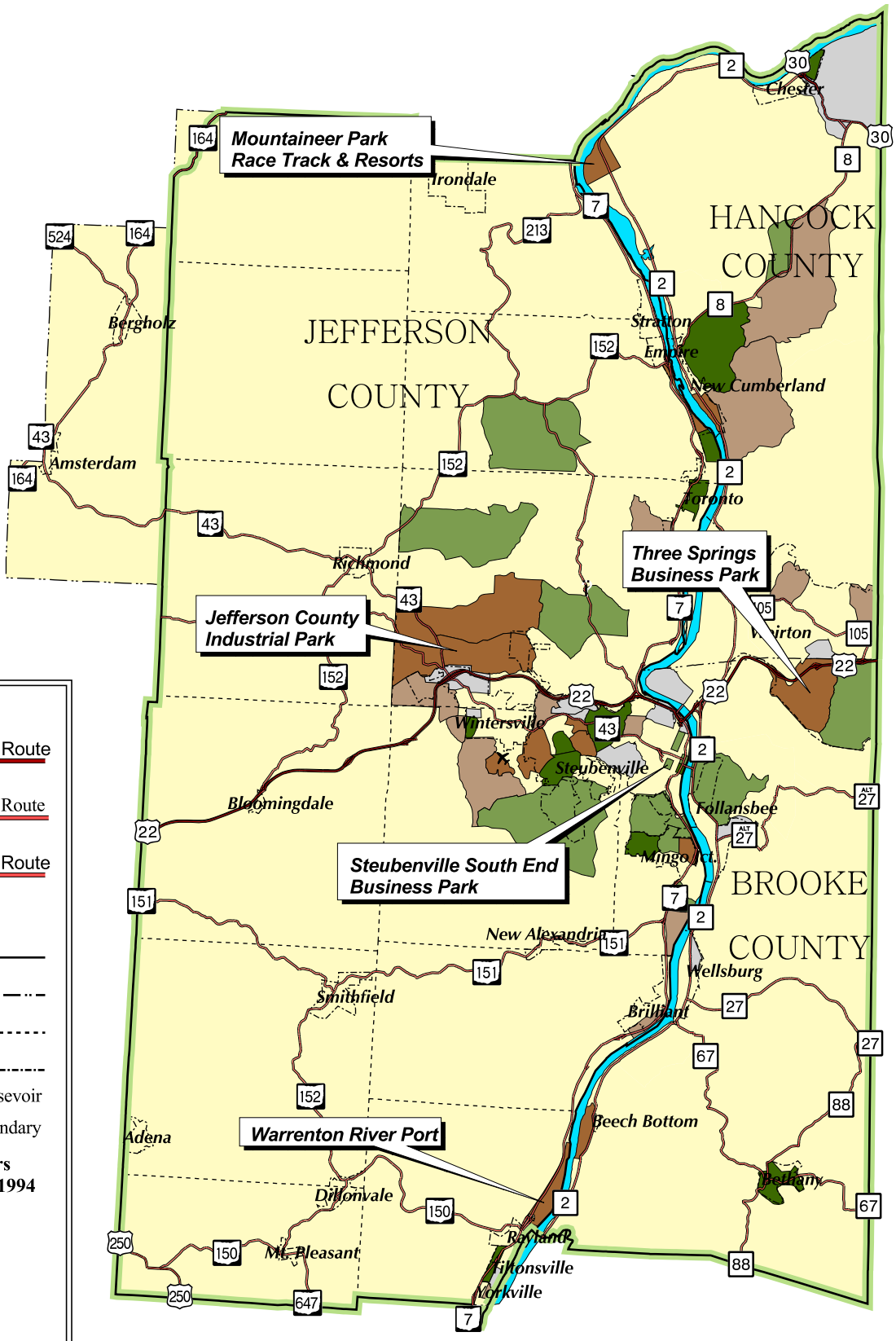
Figure 7
Other Employment Centers 2025

Source: BHJ-MPC 2025 Transportation Plan

2 0 2 4 6 Miles



Highway Legend

United States Route 22

OH State Route 43

WV State Route 2

Political Boundaries

State Boundary

County Boundary

Township or District Boundary

Municipal Boundary

River, Lake or Resevoir

Travel Model Boundary

Employment Growth Centers
Total Emp 2025/Total Emp 1994

- 1.0086 - 1.0667
- 1.0682 - 1.1123
- 1.125 - 1.2
- 1.2022 - 1.6616
- Greater than 1.7406

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Figure 8
Employment Growth Centers 1994 to 2025

Edwards and Kelcey

Source: BHJ-MPC 2025 Transportation Plan

2 0 2 4 6 Miles

Condition Analysis

Listed is a brief description of the study bridges and their existing condition including a general summary of expected service life and anticipated required repairs. A more detailed description and cost estimate for repairs are provided in the Phase I Final Report.

Market Street Bridge

The Market Street Bridge was constructed in 1904. It spans the Ohio River at Steubenville, Ohio, and is approximately 1,800 feet long. The West Virginia Department of Transportation is responsible for maintaining the bridge. It consists of two girder-approach spans (32 feet each), three through-truss spans (112 feet each) and a suspension bridge to span the main river channel. The cross-section includes a two-lane roadway and a pedestrian walkway. The west end of the bridge extends into downtown Steubenville, and serves the business district. It is posted with a 5 ton weight limit.

Given the age of the Market Street Bridge, the remaining service life is nearing its end. Rehabilitation and continuing maintenance will slow its rate of deterioration, but the Bridge will remain deficient in terms of both roadway geometrics and load-carrying capacity. With a structure of this type and age, concerns will continue to exist over the integrity of the main cables, cable anchorages and the supporting piers. Funding for future repairs will not be sufficient to extend its service life for the long-term. West Virginia may have difficulty securing additional repair funds, given the age, condition and structural capacity of the Bridge.

Fort Steuben Bridge

The Fort Steuben Bridge was constructed in 1928. It spans the Ohio River just north of Steubenville, Ohio, and is approximately 1,585 feet long. The Ohio Department of Transportation is responsible for maintenance of the structure. It consists of four-deck girder approach spans (60 to 90 feet in length each) and a suspension bridge that crosses over the main river channel. The bridge provides two traffic lanes. The pedestrian walkway has been closed for safety reasons.

The service life of this Bridge is nearing its end and it is functionally obsolete. Costly repairs will be required in order to extend the Bridge's remaining service life. More importantly, the fact that the structure is a suspension bridge eliminates the possibility of widening the roadway. Given the age of the structure, there will be a continuing concern over the integrity of the main cables, cable anchorages and main piers.

Veterans Memorial Bridge

The Veterans Memorial Bridge was constructed in 1990 and crosses the Ohio River between Weirton, West Virginia and Steubenville, Ohio. The structure is a single tower cable-stayed bridge, with an 820-foot forespan and 688-foot backspan, and a total bridge length, including approach spans, of 1,965 feet. The Ohio and West Virginia Departments of Transportation share ownership and maintenance costs for the structure. The Bridge carries four through-traffic lanes and two acceleration/ deceleration lanes for the ramp structures adjacent to the Bridge.

The Veterans Memorial Bridge provides an efficient river crossing for traffic in the area. It will continue to serve the area for the foreseeable future.

Goals and Objectives

The establishment of regional Goals and Objectives was an important task in Phase I completed by the BAC. The adopted Goals and Objectives formed the basis for later criteria used in the Phase II assessment of alternative bridge systems.

Goal #1 – Maintain and enhance transportation capacity, safety and reliability for existing businesses, their employees, and all residents

Objectives

- Provide alternative and redundant routes for truck traffic
- Alleviate congestion and maintain an acceptable minimum Level of Service (LOS) to enhance shipment of goods and movement of employees
- Accurately measure constraints of roadways and strive to upgrade river crossings and connecting roadways to at least current minimum standards for geometry

Goal #2 – Provide enhanced access for expansion and retention of businesses, and attraction of new businesses to the region

Objectives

- Evaluate transportation improvements and alternatives for their ability to serve existing and potential future development sites
- Evaluate transportation improvements that can better tie together the BHJ region with adjacent economic market areas
- Prioritize improvements in transportation facilities and cross-river travel that can serve targeted economic development objectives for the BHJ region

Goal #3 – Draw more traffic and commerce into the Upper Ohio Valley

Objectives

- Develop transportation system improvements that will provide greater interconnection with surrounding regions, states, municipalities, and marketplaces
- Build an efficient and effective transportation network that will become a regional strength and draw additional traffic and customers into the Steubenville-Weirton marketplace

Goal #4 – Develop linkages to high capacity inter-modal transportation by strengthening the connections to river ports and railroads

Objectives

- Consider access to rail and river port facilities as a locational criterion for transportation improvements and cross-river travel routes

Goal #5 – Enhance Emergency Management Options to Provide Alternative Routes in Case of Flood, Natural Disaster or Accident

Objectives

- Redundancy of the transportation network and cross-river linkages during times of accident, flooding or other natural disaster should be a planning criterion for new major investments in infrastructure
- Roadway design standards for new travel facilities should account for the weight and size of vehicles expected to travel during times of emergency and at all other times

Goal #6 – Improve travel times throughout the region

Objectives

- Establish minimum desirable Levels of Service and adequate standards for roadway and bridge design
- Establish time of travel as a critical planning criterion for prioritizing capital improvements

Goal #7 – Ensure that the cross-river transport network from Wheeling north to Steubenville is sufficiently robust to carry all weights and sizes of commercial vehicles

Objectives

- Establish planning criteria for the larger tri-state region in concert with the states of Ohio, West Virginia, and Pennsylvania to ensure that improvements in the Steubenville-Weirton area help enhance and optimize the larger transportation network for all modes

Public Involvement Process

Public involvement in the study began in Phase I and continued throughout Phase II. It was an important part of the process and provided significant guidance for the BAC, the BHJ staff and the Consultant Team. The majority of public input into the process was generated through frequent meetings with the BAC, two public information meetings, and an interactive Web site hosted by BHJ.

Bridge Advisory Committee (BAC)

The Consultant Team continued to meet with the BAC on a regular basis to discuss key issues related to the study. During Phase II of the Study the BAC was responsible for evaluating the work of the Consultant Team and making a final recommendation to the BHJ Technical Advisory Committee (TAC). A total of eight BAC meetings were held during Phase II of the Study. Meetings were held almost monthly and were at various locations throughout the study area. The meetings were generally well attended by BAC members or their alternate delegates. All meetings included representation from BHJ, WVDOT, ODOT, and the Consultant Team. The following table summarizes the key activities at each of the meetings.

BHJ took the lead in documenting the results of each of the BAC meetings and the Public Workshops. Copies of the meeting minutes were made available to BAC members as well as the general public and were posted on the project Web site. A complete set of minutes for the BAC meetings is in a separate document. The BHJ staff also prepared a media plan for newspaper and TV and coordinated area-wide public service announcements.

Summary of Phase II BAC Meetings

Meeting Number	Date	Location	Purpose of Meeting	Action
1	2/6/02	Holiday Inn – Steubenville, OH	• Initial meeting after Phase I • Update of Phase II Scope of Work • Review of role of BAC in study process • Consultant team approach to Phase II • Review of Evaluation Criteria	Solicitation of comments on evaluation criteria
2	3/13/02	Brooke County Library – Wellsburg, WV	• Explanation of baseline Scenario • Final review and discussion of evaluation criteria • Presentation of draft baseline Scenario traffic counts • Discussion of comparative ranking approach	Revision and adoption of final evaluation criteria
3	4/10/02	Millsop Community Center – Weirton, WV	• Summary of comparative analysis methodology • Presentation of alternative bridge systems to be analyzed • Presentation of traffic operations analysis of bridges and roadways	Approval of comparative analysis methodology

Summary of Phase II BAC Meetings (*Continued*)

Meeting Number	Date	Location	Purpose of Meeting	Action
4	7/9/03	Brooke County Library – Wellsburg, WV	• Update on study process • Review of matrix and comparison of bridge Scenarios • Recommendation of preferred northern and southern alternatives	Review of Scenarios and unanimous vote to confirm consultant recommendations
5	9/3/02	Brooke County Library – Wellsburg, WV	• Explanation of northern alternatives and matrix review	Selection of preferred northern alternative (Option 5)
6	10/22/02	Millsop Center – Weirton, WV	• Explanation of combined bridge Scenarios and review of matrix evaluation	Approval of public information meeting on November 13, 2002
7	1/15/03	Holiday Inn – Steubenville, OH	• Presentation of preliminary recommendations and conclusions • Discussion of study review schedule	Clarification and comments on recommendations
8	3/12/03	Fire Hall – Wellsburg, OH	• Clarification and final discussion of recommendations	Vote to adopt consultant recommendations; move to send letter to ODOT and WVDOT requesting commitment to extend life of Market Street and increase maintenance of Fort Steuben

Newspaper and TV media covered each BAC meeting. Lengthy articles appeared in the newspaper and results were given on evening TV news programs.

Public Workshops

Two public information meeting were held at key stages in the Phase II Study process. The meetings were designed to solicit public input into the study process and to gain feedback from the community about the study methods and final recommendations.

The first public meeting was held on November 13, 2002 from 4:00 to 7:00 p.m. at the Millsop Community Center in Weirton, WV. The first meeting was to present the study evaluation criteria and the alternatives to be analyzed. Approximately 51 members from the community attended the meeting.

The meeting was designed as an open house session where the public could stop by and speak to project representatives and obtain handouts and comment sheets in an informal setting. The Consultant Team supplied a newsletter-style handout for the meeting that contained information about the purpose of the study as well as the various Scenarios that were being considered in the study. A map of the study area showing all of the proposed Scenarios was also provided.

Attendees were asked to complete comment sheets to address the following issues regarding the initial steps of the Phase II Study:

- The Market Street and Fort Steuben Bridge are obsolete. When replaced, should they be replaced in their existing locations?
- If there was only enough funding available to construct one new bridge where would you most like to see it located?
- When traveling across the river in the region (i.e., Weirton, Steubenville, Follansbee, and Wellsburg) do you have trouble finding direct routes to you destinations? If so, where?

Citizens were also given the opportunity to provide any additional questions or comments on their forms.

Approximately 115 completed comment sheets were received by the Consultant Team. According to these responses the majority of citizens preferred not to see the northern bridges replaced in their existing locations and would most like to see a new southern bridge constructed. A complete summary of the handouts, comment sheets, and copies of the received comments are included in a separate document.

The second public information meeting was held on February 5, 2003 also at the Millsop Center in Weirton. The focus of the second public information workshop was to present the study findings and recommendations to the public for review and comment. The workshop was held open-house style and was lead by representatives from BHJ and the Consultant Team. Maps displaying the preferred alternatives were on display and comment sheets were provided to attendees.

Project Web Site

BHJ and the Consultant Team maintained a project website (www.bhjbridge.org), which acted as a repository for information compiled during the study process. Copies of maps and the study matrix were available for viewing and downloading on the site. The website also displayed meeting minutes and handouts. The site was used as a tool for the BAC and the general public to obtain project updates and gain access to study materials. The interactive web site also had a comment function that allowed people to submit questions or concerns about the project.

Planning Process

The following represents the basic tasks that were performed in Phase II:

A. Establishment of Evaluation Criteria and Baseline Scenario;

B. Travel Demand Modeling;

C. Alternative Studies and Environmental Overview;

D. Alternatives Ranking and Identification of Preferred Alternative; and

E. Traffic Operations Analysis.

This section will discuss the process used for each of the above items and the technical results.

A. Establishment of Evaluation Criteria and Baseline Scenarios

Selection of a Baseline

Officials from the West Virginia Department of Transportation (WVDOT) and the Ohio Department of Transportation (ODOT) as well as staff from BHJ and the Consultant Team[2] set out to explore bridge alternatives that would address the region's evolving mobility needs for the public and private sectors. It was determined that a "no-build" Scenario would be the baseline Scenario for the project. This Scenario assumed that the useful life of both the Fort Steuben Bridge and the Market Street Bridge would end within the next 25 years and no action would be taken to replace or build any new bridges across the Ohio River. Additional Scenarios would be tested and compared against this baseline to evaluate their performance. The baseline assumptions for Year 2025 were:

- The Fort Steuben Bridge will no longer be in service;
- The Market Street Bridge will no longer be in service; and
- The Veterans Memorial Bridge, with some operational improvements, as discussed in a later part of this report, will be the only remaining Ohio River bridge structure in the Study Area.

The Baseline and other potential Scenarios were evaluated against each other using both quantitative and qualitative criteria related to mobility, environmental impacts, safety, cost effectiveness, and regional economic growth. The Federal Highway Administration's STEAM (Surface Transportation Efficiency Analysis Model) program and the region's travel demand model, jointly maintained by ODOT and the BHJ staff, provided the quantitative data. Qualitative data was developed from local input and professional experience. The qualitative method of analysis using the travel demand model is discussed later in this report.

[2] Edwards and Kelcey as prime consultant and Burgess & Niple as subconsultant.

Evaluation Criteria

In order to develop measurable criteria that could be used for evaluation, the Goals and Objectives were refined to look at mobility, environmental concerns, safety, cost effectiveness and regional economic growth. The BAC participated in this refinement and approved the application of the criteria. These criteria are listed below by category.

Mobility

1. **Vehicle Hours of Travel (VHT)** Total number of hours traveled by all vehicles within the planning area on a weekday.
2. **Vehicle Miles of Travel (VMT)** - Total vehicle miles of travel within the planning area in a year.
3. **Total Travel Time (Million Person Hours/Yr**.) – Total travel time per year for persons in the planning area.
4. **Average Travel Times, From Selected Gateways to Selected River and Rail Ports** – Travel time between selected gateways into the planning area and selected river and rail ports in both Ohio and West Virginia (see Figure 9 for Gateway Locations):
    - *West Virginia Gateways to Ohio – River and Rail Ports*
        - WV 27 to Wheeling-Pitt South Works River Port
        - US 22 to Wheeling-Pitt South Works River Port
        - WV 2 (south) to Wheeling-Pitt South Works River Port
        - WV 27 to Warrenton River Terminal
        - US 22 to Warrenton River Terminal
        - WV 2 (south) to Warrenton River Terminal
        - WV 27 to Norfolk & southern Railways/Wheeling & Lake Erie Railroad Facility
        - US 22 to Norfolk & southern Railways/Wheeling & Lake Erie Railroad Facility
        - WV 2 (south) to Norfolk & southern Railways/Wheeling & Lake Erie Railroad Facility
    - *Ohio Gateways to West Virginia – River and Rail Ports*
        - US 22 to Weirton Ice and Coal Water Port
        - SR 7 (south) to Weirton Ice and Coal Water Port
        - US 22 to Wheeling-Pitt Coke Plant River Port
        - SR 7 (south) to Wheeling-Pitt Coke Plant River Port
5. **Percent of System at each Level of Service** - This category uses the Highway Capacity Manual's rating system to illustrate what percentage of the overall transportation system functioning at the various Levels of Service (LOS) from A to E.

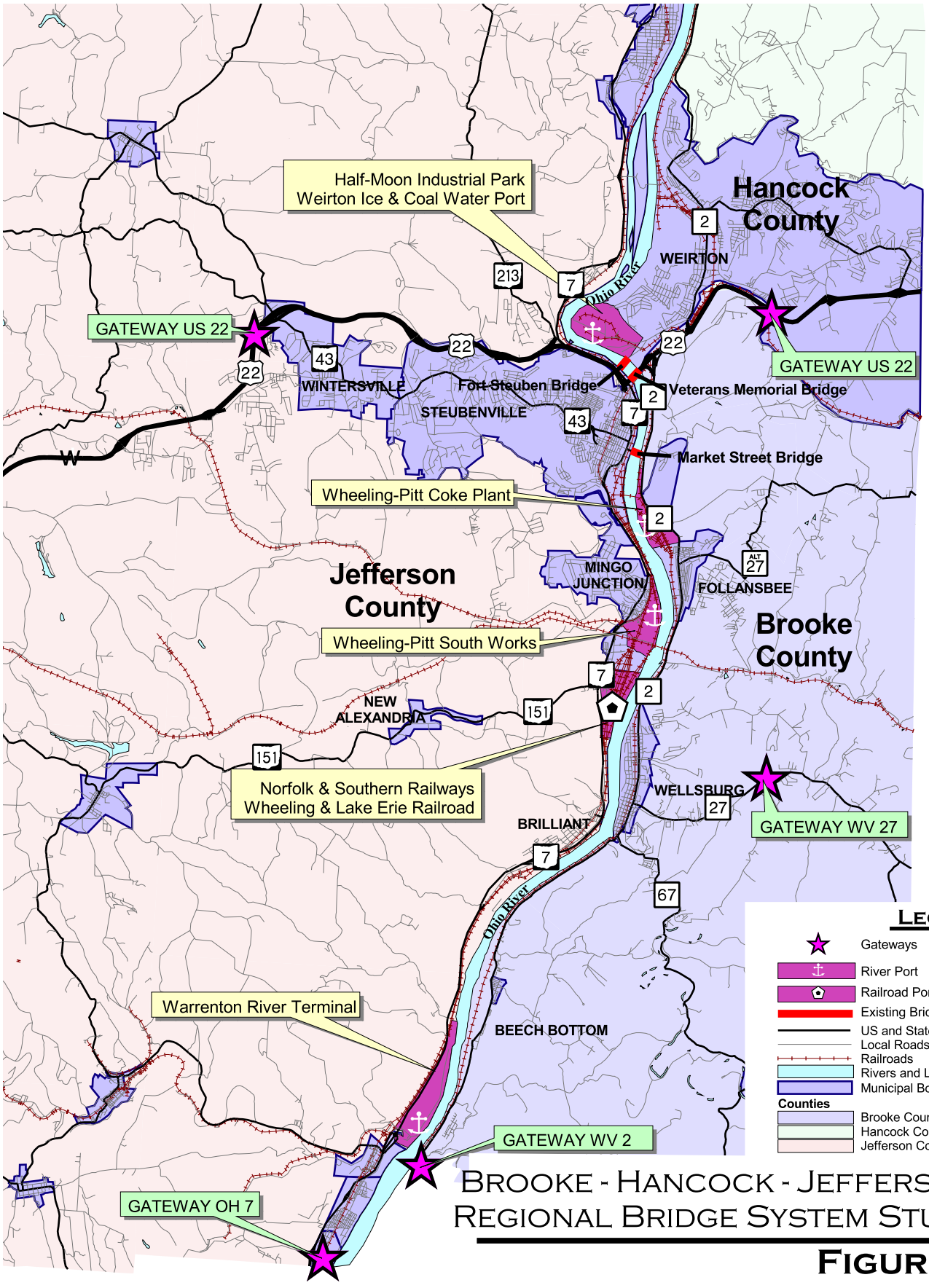

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Figure 9
Selected Gateways to River and Rail Ports

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Environmental

6. **Probability of Minimizing Potential Environmental Impacts** – Subjective determination of environmental impacts based on collected data related to natural environment factors (threatened and endangered species, wetlands, hazardous materials, floodplains) and social impacts (commercial and residential property and environmental justice issues).
7. **Estimated vehicle emissions (tons/yr)** – Calculation based on national averages of pollutants typically caused by automobiles including Hydro-Carbons (HC), Carbon Monoxide (CO), Nitrous Oxide (NOx), and Particulate Matter (PM10).

Safety

8. **Potential Annual Accidents** – Calculation based on accidents per 100 million vehicle miles traveled by roadway functional classification.
9. **Potential for Improved Emergency Response Times** – Developed from a goal to maximize safety. This is a qualitative rating based on improved access throughout the planning area due to the location of various bridge alternatives.
10. **Potential for Alternative River Crossings (Avoidance of Single Service Situations)** – Also developed from a goal to maximize safety. This rating is qualitative and is based on providing duplication in the transportation network and river crossing linkages. The more opportunities to cross the river the higher the rating.

Cost Effectiveness

11. **Capital Cost (Millions)** – Total estimated cost to do the environmental review, design, purchase right-of-way and construct each bridge alternative.
12. **Reduction in Total User Cost ($1000/year)** - Calculation of user cost reduction for the entire network from the base case Scenario. Travel time reduction play a major role in this calculation, national defaults were used in this calculation including a value of $8.90/person-hour for autos and $16.50/person-hour for commercial vehicles.
13. **Benefits and Cost Ratio** – Used to determine the ratio of benefits received from **reduction in total user cost** compared to **capital cost**. If the ratio exceeds 1.0, the overall improvements are generally considered to be financially feasible.
14. **Technical Feasibility** - Developed from the goal to identify and propose implemental solutions. This is a subjective engineering judgment based on the ease of construction (technical feasibility) of the alternative.
15. **Fiscal Likelihood** – Subjective, based on the cost of construction and likely funding available.
16. **Potential Land Use Impacts** – This measure was developed from a general goal to minimize negative impacts on land and associated users. It is an estimate of the total number of acres that may be potentially impacted by construction of a bridge as well as the total number of residential and commercial properties that may be affected.

Regional Economic Growth

17. **Ability to Maximize Accommodations of Heavy and Large Vehicles** - Subjective rating of the system to accommodate Heavy and Large Vehicles both crossing the river and to move about the planning area.
18. **Potential for Improved Access to Existing Industrial Sites** – Measure developed from the goal to improve access throughout the system for existing businesses. This is a subjective rating of each alternative and its ability to provide alternative routes for trucks, alleviate congestion and maintain an acceptable LOS.
19. **Potential for Improved Access to Future Industrial Sites** – Same definition as above with the exception that this is for proposed industrial expansion and new sites.

B. Travel Demand Modeling

Process Overview

BHJ's regional travel demand model was used in Phase II as the primary technical analysis tool. The model forecasts travel demand over the three-county BHJ region that includes Jefferson County in Ohio and Brooke and Hancock Counties in West Virginia. It is calibrated to the 1999 observed travel behavior of the region and validated against highway counts. Its purpose in this Study was to forecast the regional and corridor-level transportation impacts of various alternatives. A large portion of the evaluation criteria (and the corresponding performance measures) required data from two sources: the travel demand model and traffic operations analysis. The travel demand model also provided some of the data needed for traffic operations analysis.

For this part of the Study, the following technical assumptions were made:

1. The horizon year is 2025;
2. The Baseline Scenario was determined by the process described earlier in this report;
3. This study applied a single 2025 land use (i.e., socio-economic) data set. It is identical to the one used in the latest regional Long Range Transportation Plan;
4. The Consultant Team used the regional travel demand model validated by ODOT; and
5. Emissions calculations were computed using the STEAM model.

Baseline and Horizon Year Comparisons

Vehicle Trips

Currently, about 417,000 auto trips occur daily in the BHJ region. This figure is estimated to increase 3 percent by 2025. Almost one-quarter of all vehicle trips have at least one trip end outside the region. These external trips are estimated to grow 8 percent by 2025.

Internal trips begin and end inside the region and comprise 75 percent of all vehicle trips. They are estimated to grow by 1 percent between 1999 and 2025, reflecting the stability of the region.

Vehicle trip growth in the region is modest. Obviously, this reflects the low forecasts for population and employment. Should the demographics and economy of the region improve, then it will be important to revisit the trip forecast so as to better estimate transportation needs.

River Crossings

Trips that cross the Ohio River constitute about 11 percent of all trips in the region. The regional travel demand model estimates 48,300 river crossings in 1999. This is slightly higher than the number of trips (46,000) traveling between West Virginia and Ohio. The assignment models show a double river-crossing movement between the Half Moon Industrial Park area and central and southern Brooke County. This is because, according to the assignment, it is quicker to cross the Fort Steuben Bridge and Veterans Memorial Bridge than to connect with US 22 in West Virginia. This movement is not evident in field observations according to BHJ.

Table 1 – Daily Volumes on Ohio River Bridges

Bridge	1999 Base*	2025 Horizon Year	2025 Baseline
Fort Steuben	9,100	9,500	--
Veterans Memorial	28,100	31,300	49,200
Market Street	11,100	12,900	--
Total Ohio River Crossings	**48,300**	**53,700**	**49,200**

Source: BHJ Regional Travel Demand Model

Table 2 – Daily Volumes by Direction on Ohio River Bridges

Bridge	1999 Base*	2025 Horizon Year	2025 Baseline
Fort Steuben (Westbound)	4,500	4,400	0
Fort Steuben (Eastbound)	4,600	5,100	0
Veterans Memorial (Westbound)	14,100	16,000	24,600
Veterans Memorial (Eastbound)	14,000	15,300	24,600
Market Street (Westbound)	5,600	6,500	0
Market Street (Eastbound)	5,500	6,400	0
Total (Westbound)	**24,200**	**26,900**	**24,600**
Total (Eastbound)	**24,100**	**26,800**	**24,600**

Source: BHJ Regional Travel Demand Model. *These volumes are assigned by the demand model and are approximate when compared to actual traffic counts.

The model estimates river crossings to increase to 53,600 in 2025. Again, this is slightly higher than the number of trips (51,000) traveling between West Virginia and Ohio. The assignment model shows the same double river-crossing movement occurring in the 1999 model. The Veterans Memorial Bridge receives more than 50 percent of all river crossings. It has the largest vehicle capacity of the three bridges. Demand for Fort Steuben Bridge and Market Street Bridge is estimated to rise between 2000 and 2025. Demand for all bridges is equally distributed between westbound and eastbound movements.

Over 75 percent of the trips that cross the Ohio River originate in and return to West Virginia. This is because of the high number of external trips entering the region in West Virginia and traveling to (or through) Ohio. The remaining 20-25 percent originates and returns to the Ohio side of the river.

Table 3 – Vehicle Trip River Crossings

Trip Type	1999 Base	2025 Horizon Year	2025 Baseline
Internal-Internal Trips	23,900	25,700	24,000
External-Internal Trips	18,500	21,100	21,000
External-External Trips	3,500	4,200	4,200
Total Ohio River Crossings	**46,000**	**51,000**	**49,200**

Source: BHJ Regional Travel Demand Model

About 50 percent of vehicle trips between Ohio and West Virginia are internal-internal trips. These trips have both trip ends inside the BHJ region. They are the most sensitive to transportation alternatives in the region. Approximately 40 percent are external-internal trips. These trips have one trip end outside the region. External-external trips constitute about 8 percent of Ohio River Crossings. These trips have both their origin and destination outside the BHJ region. They are typically less sensitive to local transportation alternatives and probably would not alter their trip patterns significantly if the region's bridge system were modified.

Alternatives Analysis Using the Model

The alternatives studied in Phase II and listed later in this report were used to evaluate the effects of a combination of bridges (except the baseline case). The alternatives were studied to evaluate the effect of the bridge(s) on the following criteria: user benefits, LOS, regional traffic and accident criteria, and emissions. The team analyzed the results from the 2025 model runs under varying bridge conditions. The following section outlines the alternatives that were studied and provides the technical results of both the quantitative analysis completed using the model as well as the qualitative analysis completed.

C. Alternative Studies and Environmental Overview

A series of reasonable alternatives for new crossing locations within the Study Area were initially identified and reviewed with the BAC. A public meeting was also held to present the alternatives that were identified for review and comment. Listed below, and shown in Figure 10, is the final list of alternatives that were evaluated as well as the alternatives matrix that illustrates the model runs required to test this range of alternatives.

- **Veterans Memorial Bridge Only (Baseline).** The baseline alternative where only the Veterans Memorial Bridge is assumed to exist. (Alternative 1). This bridge connects SR 7 with WV 2 and is situated just south of Fort Steuben Bridge.
- **New Southern Bridge (south of Wellsburg) added to Baseline.** A new Southern Bridge south of Wellsburg is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge. (Alternative 2)
- **New Southern Bridge (between Follansbee and Wellsburg) added to Baseline.** A new Southern Bridge located between Follansbee and Wellsburg is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge. (Alternative 3)
- **New Market Street Bridge (in existing location) added to Baseline.** A new Market Street Bridge in its existing location is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge (Alternative 4). This bridge would connect WV 2 with Market Street in Steubenville (Ohio side.).
- **New Market Street Bridge (with connection to SR 7) added to Baseline.** A new Market Street Bridge in its existing location with a high capacity connection to SR 7 is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge (Alternative 4A). This bridge would provide high capacity connections between WV 2 and SR 7.
- **New Washington Street Bridge added to Baseline.** A new Washington Street Bridge connecting Washington Street with WV 2 is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge. (Alternative 5)
- **New Fort Steuben Bridge (in existing location) added to Baseline.** A new Fort Steuben Bridge in its existing location with improved connections to the SR 7 and WV 2 is assumed to be open and operational in 2025 in addition to the Veterans Memorial Bridge (Alternative 6). This is the northernmost bridge.
- **2025 All Bridges.** This alternative assumes that all four bridges – Veterans Memorial Bridge, New Southern Bridge at preferred location, New Washington Street Bridge, and New Fort Steuben Bridge at existing location. (Alternative 7)
- **2025 Existing Fort Steuben Bridge Not Included.** This alternative assumes that Veterans Memorial Bridge, the New Southern Bridge and New Washington Street Bridge are open and fully operational in 2025. The existing Fort Steuben Bridge is closed to traffic. (Alternative 8)

- **2025 New Market Street Bridge Not Included.** This alternative assumes that Veterans Memorial Bridge, New Southern Bridge and New Fort Steuben Bridge are open and fully operational in 2025. (Alternative 9)
- **2025 New Southern Bridge Not Included.** This alternative assumes that only the Veterans Memorial Bridge, the New Washington Street Bridge and the new Fort Steuben Bridge are open and fully operational in 2025. (Alternative 10)

The Veterans Memorial Bridge was built in 1990 and is always assumed to be fully operable in 2025.

Table 4: Alternative Scenarios

Scenario	Veterans Memorial Bridge	New Southern Bridge	Market Street Bridge	Fort Steuben Bridge
Baseline 1	✔			
2	✔	✔ (South of Wellsburg)		
3	✔	✔ (Between Follansbee and Wellsburg)		
4	✔		✔ (New in existing location)	
4A	✔		✔ (New with connection to SR 7)	
5	✔		✔ (New connects Washington Street with WV 2)	
6	✔			✔ (New with improved connections to SR 7 and WV 2)
7	✔	✔ (South of Wellsburg)	✔ (New connects Washington Street with WV 2)	✔ (New with improved connections to SR 7 and WV 2)
8	✔	✔ (South of Wellsburg)	✔ (New connects Washington Street with WV 2)	
9	✔	✔ (South of Wellsburg)		✔ (New with improved connections to SR 7 and WV 2)
10	✔		✔ (New connects Washington Street with WV 2)	✔ (New with improved connections to SR 7 and WV 2)

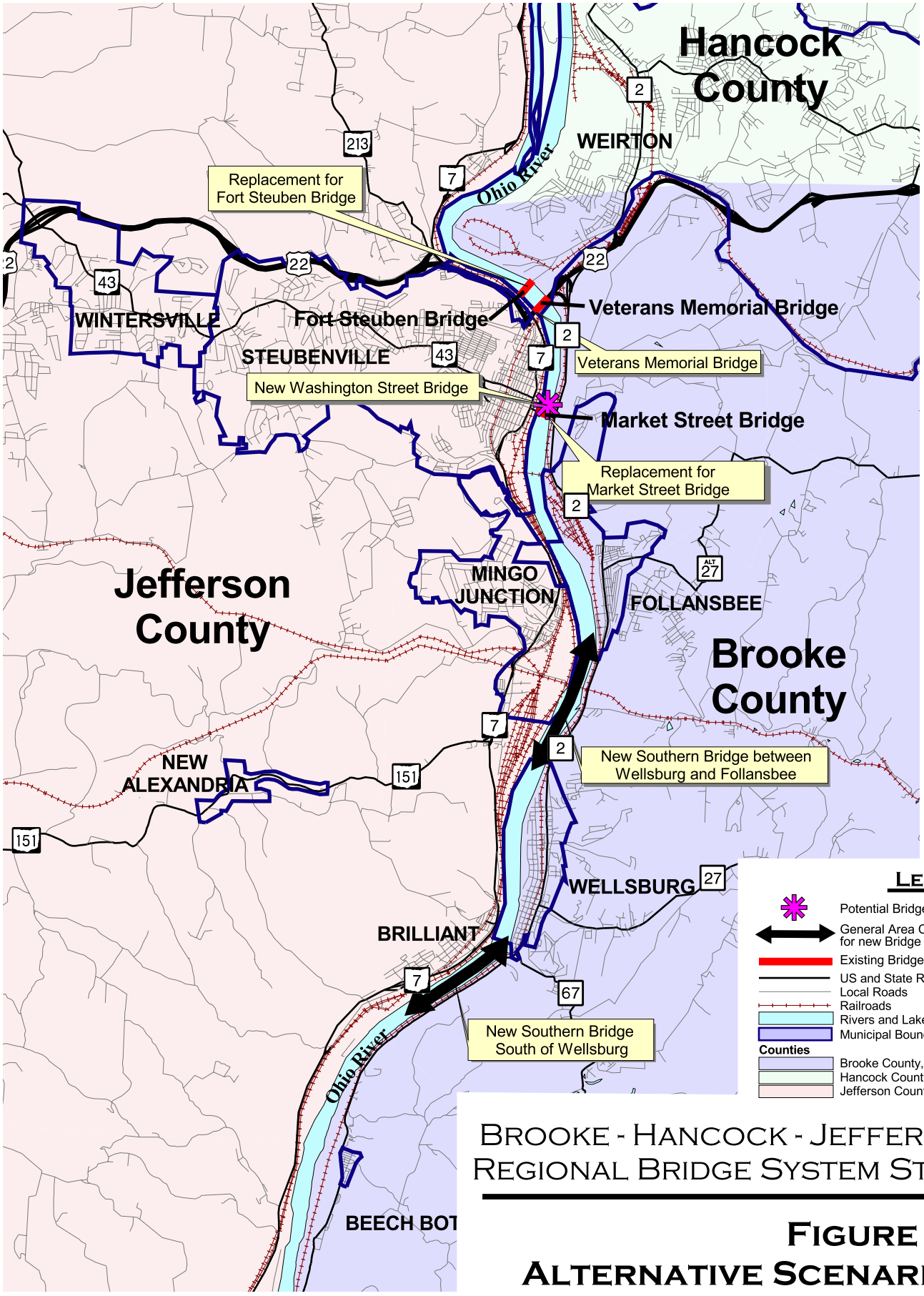

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Figure 10
Alternative Scenarios

Edwards and Kelcey

D. Alternative Ranking and Identification of Preferred Alternative

Evaluation of Alternatives

The evaluation criteria outlined earlier in this report with the above alternatives were used in the evaluation process to conduct a "trade-off" analysis, which pulls together the key differences among the Scenarios. The trade-off analysis is designed to take the broadest view possible of the key differences among the Scenarios and highlight their differences to aid in decision-making. The information gathered to conduct the "trade-off" analysis was summarized and documented in a matrix and are discussed below. This helped to frame the decision on a preferred alternative in terms of the advantages and disadvantages of choosing one alternative versus another.

The evaluation consisted of both quantitative and qualitative components. The quantitative analysis used data from the travel demand model previously described. This included travel characteristics, traffic volumes and operating levels of service as well as "existing conditions" data on highway system capacities. The qualitative analysis used evaluation criteria related to the bridges that were drawn from the DOT's, the Bridge Advisory Committee, the MPO and the public. Specific measurable criteria (objectives) and are listed as follows:

Quantitative

- Number of Anticipated potential accidents and/or fatalities (annual)
- Percent of system at each Level of Service (LOS)
- Vehicle hours of Travel (VHT)
- Total travel time
- Vehicle miles of travel (VMT)
- Reduction in Total User Costs
- Average travel time, selected external gateways to selected internal sites
- Estimated vehicle emissions
- Potential land use impacts
- Benefits Cost Ratio

Qualitative

- Potential for improved emergency response times
- Potential for alternative river crossings
- Potential for improved access to existing industrial sites
- Potential for improved access to future industrial sites
- Technical Feasibility
- Fiscal Likelihood
- Probability to Minimize Potential Environmental Impacts

The first seven Scenarios included the Baseline and individual bridges combined with the Baseline. Scenarios 7 through 10 were combinations of bridges using the preferred northern and southern alternatives derived from the analysis of Scenarios 2 through 6.

Method of Analysis

The focus of the evaluation was on the long-term value of various river-crossing locations. Scenarios were compared to the 2025 baseline condition for this study, which assumes Veterans Memorial Bridge is the only operational Ohio River bridge. A multi step approach was developed by the project team to analyze the various Scenarios.

The Baseline Scenario established travel parameters with "no build" system characteristics. The next step involved analysis of alternatives related to establishing an optimum location in the southern portion of the Study Area (Scenarios 2 and 3). Then, a similar analysis was conducted for alternative locations in the northern portion (Scenarios 4, 4A, 5, and 6). Results of the analysis established a preferred location for a southern bridge (south of Wellsburg) and a preferred location for a northern bridge (a new bridge at Washington Street in Steubenville).

Using the preferred southern and northern locations, the combined Scenarios 7, 8, 9, and 10 were analyzed. The evaluation criteria were grouped into categories, which include effectiveness in improving mobility, effectiveness in minimizing environmental impacts, cost effectiveness, potential for improving safety, and effectiveness in supporting regional economic growth. The findings of the evaluation are discussed by category below and shown in Table 5:

Mobility

The southern Scenarios (2 and 3) both rate high in improving travel time throughout the region as well as lowering VMT and VHT. Both alternatives reduce by half the amount of travel time from WV Gateways to Ohio River and rail ports due to the central or southern location of many of the Ohio rail and river facilities. The improvements from Ohio Gateways to WV rail and river port are not as dramatic. This is due to most WV facilities being located either in the central planning area or in the northern portion of the planning area.

VHT system wide in a twenty-four hour period was reduced by 3,000 hours with Scenario two and 2,800 hours for Scenario three. VMT was reduced by 25,000 miles traveled over the baseline for Scenario 2 a 17,000 mile reduction for Scenario 3. Total travel is reduced by 870,000 hours per year hours for Scenario 2 versus 680,000 hours for Scenario 3.

It can be seen under the mobility ratings shown in Table 5 that Scenario 2 exceeds the performance of Scenario 3.

The northern Scenarios do not improve travel time, VMT and VHT as dramatically as the addition of a southern bridge, but when compared to the Baseline Scenario there are still noticeable improvements. A comparison of Scenarios shows that the three variations for replacing the Market Street Bridge (4, 4A, 5) improve travel times by several minutes to both WV and Ohio rail and river ports from selected gateways. Selected ports measured better travel times under Scenarios 4A and 5 due to their direct connection to SR 7. Scenario 6, the replacement of the Fort Steuben Bridge, provides no improvement in travel time to the rail and river ports over the Baseline Scenario.

The largest reduction in VHT over the Baseline is Scenario 5 (Washington Street). VHT for this Scenario is reduced by 700 hours per day over the Baseline. VHT for the Scenarios 4, 4A, and 6 are reduced by 100, 400, and 100 hours per day respectively. The largest reduction for VMT over the Baseline is 21,000 miles per day for both Scenarios 4A and 5, followed by Scenario 4 at 18,000 miles per day and Scenario 6 at 4,000 miles per day. The largest reduction of total travel time over the Baseline Scenario was Scenario 5, which resulted in a reduction of 230,000 person hours per year.

The mobility rating shown in Table 5 shows that, when looking at the northern Scenarios, Scenario 5 exceeds the performance of Scenarios 4, 4A, and 6.

For the combined Scenarios, Scenario 7 showed the greatest improvements in mobility. This Scenario included the existing Veterans Memorial Bridge as well as the construction of three additional bridges. Scenario 8 (Veterans Memorial Bridge, southern bridge near Wellsburg and a new bridge at Washington Street) also showed similar improvements in overall mobility.

Scenarios 7, 8, and 9 show the greatest improvement in gateway travel times. Scenario 10, only slightly improves travel time over the Baseline. For the remaining mobility criteria, (VHT, VMT, and total travel time) Scenario 7 has a significant advantage over the Baseline with reductions of 2,884 hours in VHT, 35,000 miles in VMT, and almost 1 minute in total travel time. This was followed closely by Scenario 8. Improvements in these measurements dropped off considerably with Scenarios 9 and 10.

Environmental Impacts

The Scenarios were reviewed to identify the relative potential impacts on the environment. This preliminary evaluation was generally qualitative. Data was reviewed related to the location of the 100-year floodplain, presence of threatened and endangered species, hazardous materials sites, historic sites, public facilities and wetlands. This data was used to develop a qualitative rating of the probability to minimize environmental impacts. Ratings ranged from 5 ✓'s being most desirable to 1 ✓ being the least desirable. Additionally, Surface Transportation Efficiency Analysis Model (STEAM) developed by FHWA was used to develop a quantitative number for emissions based on national averages.

Based on the qualitative ratings for environmental impacts the Baseline Scenario and the Scenarios that replaced bridges in their existing locations for Market Street and Fort Steuben ranked high.

The lowest rated Scenario to minimize potential environmental impacts for the southern Scenario was Scenario 3 due to its crossing an industrial area and the potential for hazardous waste impacts. For the northern alternatives, both Scenarios 4 and 6 rated equally high due to the lack of disruption associated with placing a structure on a new location. Scenarios 4A and 5 were slightly downgraded due to impacts associated with construction on new locations.

Estimated vehicle emissions (tons/yr) were calculated for each Scenario. For the southern Scenarios (2 and 3) a large reduction was seen for both Hydro-Carbons (HC) and Carbon Monoxide (CO) over the Baseline with Scenario 2 having largest reduction. The northern Scenarios didn't see the same amount of reduction in vehicle emissions as the southern. The largest reduction for northern Scenarios was Scenario 5.

The combined Scenario options do not fare as well as some of the other alternatives in this category due to the disruption of the physical environment resulting from the construction of three bridges. Scenario 7 does show reductions in vehicle emissions and improvements in air quality.

Overall, Scenario 2 was the most effective in terms of reducing environmental impacts for the southern area. For the northern Scenarios, both Scenarios 4 and 6 tied for least natural environmental concerns and Scenario 5 was the most effective for reduction in vehicle emissions. For the combined Scenarios, Scenarios 7 and 8 were the best performers for reductions in vehicle emissions (see Table 5).

Safety

To measure safety improvement, potential annual accidents, potential for improved emergency response times and potential for alternate river crossings (avoidance of single service situations) were evaluated. The potential for annual accidents was determined from the STEAM model. Emergency response times and alternate river crossings used a qualitative weighting.

For the southern Scenarios it was found that the biggest reduction, over the baseline Scenario for potential annual accidents, was with Scenario 2. It was also determined that qualitatively Scenario 2 outranked Scenario 3 for emergency response times and alternate river crossings. The reason for this was due to improved access to the southern portion of the planning area. Both southern Scenarios exceeded the ratings for the northern Scenarios due to redundancy caused by being located closer to the Baseline Scenario.

For the northern Scenarios, Scenario 4 showed the largest reduction of accidents followed closely by Scenarios 4A and 5. Scenario 6 showed no improvement over the Baseline in reduction of accidents. When reviewing improvements for emergency response times and alternate river crossings, each northern Scenario preformed equally well with no clear winner due to the close physical proximity to the Baseline Scenario.

Scenario 7 provided the greatest safety improvements of the combined Scenarios by having the largest reduction of annual accidents and emergency response times over the Baseline, as well as improving overall mobility in the region.

Cost Effectiveness

For cost effectiveness, capital cost, reduction in total user cost, and the benefits to cost ratio were evaluated. Capital cost included the replacement of the existing bridge or a bridge on new location, the required bridge approach work, right-of-way cost, and planning and design

cost was also included in the estimates. The reduction in user cost was determined from the STEAM model on a system wide basis. Travel time reductions play a major role in this calculation; national defaults were used in this calculation including a value of $8.90/person-hours for autos and $16.50/person-hours for commercial vehicles.

The southern Scenarios both have major reductions in user cost but, when compared to all Scenarios, have a higher capital cost. Scenario 2 has a user cost reduction of $12.7 million dollars per year as compared to $9.2 million for Scenario 3. Capital cost is also lower for Scenario 2 with the estimated cost being $43.8 million for a two-lane structure and $51.5 million for a four-lane structure. Scenario 3 capital costs are $59.7 million and $71.4 million respectively. The benefits to cost ratio for both Scenarios 2 and 3 are very high. Scenario 2 ratio is 4.43 for a two lane facility versus 2.35 for Scenario 3.

For the northern Scenarios the reductions in user cost is not as dramatic with Scenario 5 having the greatest user cost reduction of $3.9 million per year. The Scenario with the least reduction in user cost is 6 with a reduction of $0.6 million per year. Conversely, the lowest capital cost is associated with Scenario 6, which has a cost of $31 million for a two-lane structure and $37 million for a four-lane structure. The highest capital cost is for Scenario 4A at $47.8 million for two-lanes and $54.6 million for a four-lane structure. The higher cost is due to potential impacts to adjacent land uses. The northern Scenario having the greatest benefits to cost ratio is Scenario 5 followed closely by Scenario 4. Scenario 6 had the lowest benefit to cost ratio.

For the combined Scenarios the greatest capital cost savings was associated with Scenario 10. The construction of three new bridges proposed in Scenario 7 is the most costly followed by 8 and 9 respectively. The reduction in total user cost was just the opposite with Scenario 7 having the largest reduction in total user cost of $13.9 million, followed by Scenario 8 at $13.7 million. Scenario 10 had a reduction of $3.5 million. To determine the preferred combined Scenario the benefits to cost ratio was calculated for the combined Scenarios with 8 giving the biggest return on investment.

Regional Economic Growth

This category looked at how additional river crossings and their location could improve regional economic growth. Items reviewed to determine this included the potential to improve access to existing industrial sites, potential to improve access to future industrial sites and the ability to maximize accommodations of heavy and large vehicles.

The analysis of southern Scenarios rated Scenario 2 slightly higher than 3 due to its location and functional ability to better accommodate heavy and/or large vehicles. Scenario 2 was rated higher because the more southern proximity enhanced the potential ability to serve the planning area more effectively. Scenarios 2 and 3 rated equally well on serving both existing and future industrial sites.

For the northern Scenarios, number 6 was rated highest. It serves future industrial sites slightly better than others. Scenarios 4 and 4A are downgraded due to pavement truck weight restrictions on Market Street in Steubenville.

Finally, for the combined Scenarios it was found that Scenario 7, construction of three bridges provided the largest economic benefit to the region when accommodating heavy and large vehicles and its ability to serve the planning area effectively. Very close behind was Scenario 8, which includes the construction of the preferred southern and northern alternatives.

Conclusions

Table 5 shows a listing of the 19 evaluation criteria used for the 10 alternative Scenarios. Comparison of each "cell" within the matrix provides a useful basis for selection of a preferred Scenario.

The evaluation of the alternative Scenarios suggests that no single solution is best in all measured categories for addressing all the transportation needs of the BHJ area. However, the results suggest that some of the Scenarios or combinations of Scenarios could be very effective and satisfy many of the critical needs of the region.

Based on the criteria used for evaluation in this Study, the best performers for each general category (not necessarily by priority) are:

- Southern Scenario 2 – new southern bridge located in Wellsburg or an area south of Wellsburg;
- Northern Scenario 5 – new Washington Street Bridge with high capacity connection to SR 7; and
- Scenario 8 – Veterans Memorial Bridge, with preferred southern and preferred northern alternatives.

Scenario 8 is the preferred alternative. It provides the advantages of both the preferred northern and southern Scenarios as well as maintaining a high benefits to cost ratio and the highest reduction of user costs. When Scenario 8 is reviewed in comparison to both the Baseline and other alternatives it is found to provide maximum benefit for minimum cost in all categories mobility, environmental impacts, safety, cost effectiveness and regional economic growth.

The preliminary estimated cost for construction of two new bridges with roadway approaches, as provided in Scenario 8, is approximately $98,310,000. Additional costs related to environmental issues, permitting, navigation, and preliminary engineering studies will likely increase the total cost to well over $100,000,000. Detailed engineering and location studies will be required in order to obtain a better construction cost estimate.

It is noted that strong efforts should be made to extend the life of the existing Market Street Bridge as long as possible, thus delaying the need for a new bridge at Washington Street.

Table 5
BHJ Alternatives Evaluation Matrix
12/10/2002 (revised 5/31/03)

	MEASURES	Base Scenario	Southern Scenarios		Northern Scenarios				Combined Scenarios			
		Vets only	Vets, New South of Wellsburg	Vets, New Between Follansbee and Wellsburg	Vets, New Market in Exist. Location	Vets, Market St c/w SR 7	Vets, Washington St.	Vets, new Ft. Steuben	All 4 Bridges	Vets, New Southern Bridge, Washington	Vets, New Southern Bridge, New Ft. Steuben	Vets, Washington, New Ft. Steuben
		Baseline	#2	#3	#4	#4A	#5	#6	#7	#8	#9	#10
	Mobility											
1	**Vehicle hours of travel (VHT)**	90,900	87,900	88,100	90,800	90,500	90,200	90,800	88016	88100	88800	90300
2	**Vehicle miles of travel (VMT)**	2,799,000	2,774,000	2,782,000	2,781,000	2,778,000	2,778,000	2,795,000	2,764,000	2,770,000	2,775,000	2,774,000
3	**Total Travel Time (Million Person Hours/Yr)**	36.05	35.18	35.37	35.90	35.86	35.82	36.00	35.11	35.15	35.33	35.84
4	**Average Travel Time, Selected Gateways to Selected River and Rail Ports.**											
	WV Gateways to OH River and Rail Ports											
	WV27 to WP S Works River Port	36	17	16	32	31	31	36	17	17	17	32
	US22 to WP S Works River Port	17	17	16	16	16	16	17	17	17	17	17
	WV2 (south) to WP S Works River Port	41	17	18	38	36	36	41	17	17	17	37
	WV27 to Warrenton River Term	51	25	29	47	46	46	51	25	25	25	47
	US22 to Warrenton River Term	32	32	32	32	32	32	32	32	32	33	32
	WV2 (south) to Warrenton River Term	56	24	31	53	51	51	56	24	24	24	52
	WV27 to NS/W&LE RR Facility	37	16	14	33	32	32	37	16	16	16	33
	US22 to NS/W&LE RR Facility	18	18	18	18	17	17	18	18	18	19	18
	WV2 (south) to NS/W&LE RR Facility	42	15	16	39	37	37	42	15	15	15	38
	OH Gateways to WV River and Rail Ports											
	US22 to Weirton I&C Water Port	25	25	25	25	25	25	21	21	25	21	21
	SR 7 (south) to Weirton I&C Water Port	29	29	29	29	28	28	24	25	28	25	25
	US22 to WP Coke Plant River Port	24	24	24	24	24	24	24	24	24	24	24
	SR 7 (south) to WP Coke Plant River Port	28	22	23	23	23	23	28	23	23	23	23
5	**Percent of System at each Level of Service.**											
	LOS "A"	83%	83%	83%	83%	84%	83%	83%	83%	83%	83%	83%
	LOS "B"	8%	9%	9%	9%	8%	9%	8%	9%	9%	9%	9%
	LOS "C"	3%	4%	4%	3%	4%	3%	3%	4%	4%	4%	4%
	LOS "D"	4%	3%	3%	3%	3%	3%	4%	3%	3%	3%	3%
	LOS "E"	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	LOS "F"	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
	Environmental Impacts											
6	**Probability to Minimize Potential Environmental Impacts**	✓✓✓✓	✓✓✓	✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
7	**Estimated vehicle emissions (ton/yr)**											
	Hydro-Carbons (HC)	846	833	836	843	842	842	845	831	832	835	841
	Carbon Monoxide (CO)	14,559	14,272	14,343	14,521	14,513	14,499	14,542	14,264	14,276	14,325	14,514
	Nitrous Oxide (NOx)	1,443	1,428	1,433	1,435	1,433	1,433	1,440	1,422	1,426	1,427	1,430
	PM10	57	56	57	57	57	57	57	56	56	56	56
	Safety											
8	**Potential Annual Accidents**	3,951	3,902	3,922	3,922	3,924	3,923	3,950	3,892	3,897	3,907	3,923
9	**Potential for Improved Emergency Response Times**	✓	✓✓✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓	✓✓
10	**Potential for Alternate River Crossings (Avoidance of Single Service Situations)**	✓	✓✓✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓	✓✓
	Cost Effectiveness											
11	**Capital costs (Millions) 2ln/4ln**	0	$43.8 $51.5	$59.70 $71.38	$31.92 $38.86	$47.75 $54.55	$40.03 $46.83	$31.0 $37.0	$114.81 $130.33	$83.83 $98.31	$74.78 $83.50	$71.01 $78.85
12	**Reduction in Total User Costs (1000$/yr)**	0	12,655	9,172	2,934	3,368	3,855	627	13,968	13,714	10,822	3,577
13	**Year 2025 Benefits Cost Ratio 2 ln / 4 ln**	0	4.43 3.77	2.35 1.97	1.41 1.16	1.08 0.95	1.48 1.26	0.31 0.26	1.86 1.64	2.51 2.14	2.22 1.99	0.77 0.70
14	**Technical Feasibility**	✓✓✓✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓
15	**Fiscal Likelihood**	✓✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓
16	**Potential Land Use Impacts**		**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**	**Ohio WV**
	Total Number of Acres	0	3.01 3.31	17.65 3.87	3.60 0.00	4.00 0	4.50 4.10	0.00 0.00	7.51 7.41	7.51 7.41	3.01 3.31	4.50 4.10
	Residential Units	0	10 3	16 0	0 0	0 0	0 0	0 0	10 3	10 3	10 3	0 0
	Commercial Units	0	4 1	8 0	3 0	1 0	3 0	0 0	7 1	7 1	4 1	3 0
	Regional Economic Growth											
17	**Ability to Maximize Accommodation of Heavy and Large Vehicles**	✓✓✓	✓✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓
18	**Potential for Improved Access to Existing Industrial Sites**	✓✓	✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓✓✓	✓✓✓✓✓	✓✓✓✓	✓✓✓
19	**Potential for Improved Access to Future Industrial Sites**	✓✓	✓✓✓✓	✓✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓✓✓	✓✓✓✓	✓✓	✓✓

Notes: 1 - Qualitative rating with 5 ✓✓✓✓✓ being most desirable to 1✓ being the least desirable
2 - **STEAM** output is generated by using a fixed trip table (from BASE case)

E. Traffic Operations Analysis

With the adoption of a preferred alternative, the next step was to perform a traffic operations analysis to aid in project prioritization. The analysis determined the traffic impact improvements of the preferred Scenario 8 could be implemented prior to construction of any proposed Scenarios to improve traffic circulation and access.

Traffic volume counts, turning-movement counts, field observations and measurements were included in the work tasks. The traffic operations analysis is based on the following:

1) Bridge Advisory Committee Meetings;

2) Study area reconnaissance, traffic counts and field observations;

3) Reference to the Ohio Department of Transportation (ODOT) Location and Design Manual, the ODOT State Highway Access Management Manual, the West Virginia Department of Transportation Design Directives, and the Manual of Uniform Traffic Control Devices;

4) The Highway Capacity Software (HCS 2000) for signalized and unsignalized intersections (Release 4.1a); and

5) The application of accepted and normal traffic safety and engineering standards.

All traffic counts, capacity analyses, and accident data used for operations analysis are summarized in the Memorandum 5 Traffic Operations Analysis Final Report, dated February 2003, developed as part of the overall study. In some cases assumptions as to probable traffic distribution were made in order to analyze the impact of bridge closures on roadways and intersections. All these assumptions were made based on knowledge of the study area, field observations, and common traffic engineering practices. The reader is referred to Technical Memorandum 5 for details related to the traffic operations analysis.

Existing Traffic Conditions

The primary roadways included in the operations study area are SR 7, US 22, WV 2 and various streets in Steubenville adjacent to the bridge crossings. See Figure 11. For the purpose of this operational study, the Upper Ohio Valley Bridge System is defined as the three existing bridges currently located in the area, the access ramps and streets connecting to those bridges, and the principal arterial highways that are tied to the existing bridges.

The Market Street Bridge has a year 2002 average daily traffic (ADT) of 6,700 vehicles. The Fort Steuben Bridge has an average daily traffic of 5,500 vehicles and the Veterans Memorial Bridge has an ADT of 32,500 vehicles.

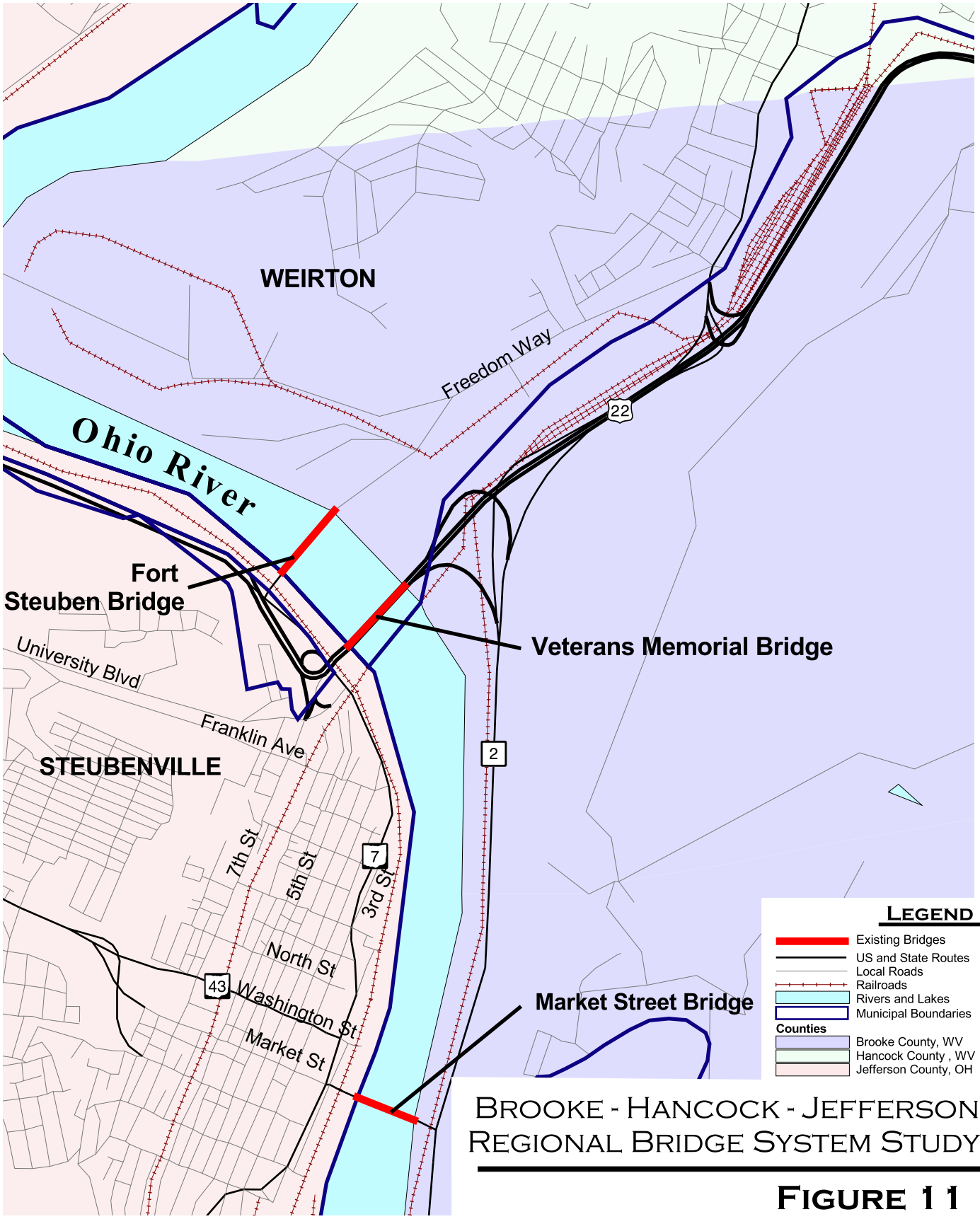

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Figure 11
Traffic Operations Study Area

Edwards and Kelcey

1000 0 1000 2000 3000 Feet

Manual turning movement counts were taken on December 3, 2002 through December 5, 2002, during the PM peak hour, at seventeen intersections within the study area. These traffic counts were performed in the downtown Steubenville grid system and at the intersection of Freedom Way/US 22/WV 2.

Washington Street Area Improvements

In order to determine if locating a proposed bridge at Washington Street was a feasible alternative, the sixteen intersections in Steubenville were analyzed under future traffic conditions (see Figure 12). The analysis was completed by manually reassigning traffic on the Market Street Bridge to the proposed bridge on Washington Street. This information was consistent with the travel demand model. Replacement of this bridge changes traffic flow patterns primarily in the eastern portion of Steubenville.

The capacity analyses resulted in satisfactory levels of service at all surveyed locations. However, the signal system will require an adjustment in signal timing. Certain intersections may require new turn phases to accommodate additional vehicle turning movements.

SR 7 and Washington Street will no longer intersect if the proposed Washington Street Bridge is installed. In order to provide a safe and efficient connection for motorists that have crossed the new Washington Street Bridge and desire to travel along SR 7, two options were evaluated. The first option is to provide a connection from Washington Street to SR 7 with a ramp that would be located approximately 100' east of the existing Washington Street/Third Street intersection. Advantages of the ramp would include a fast and efficient connection to SR 7 for vehicles making a right turn from Washington Street. The ability to make a right turn immediately after crossing the bridge would reduce delay time and fuel consumption for some vehicles that need to use SR 7. A disadvantage of this ramp connection would be the location of it in proximity to the Washington Street/Third Street intersection. Left and right turns to/from the ramp may be difficult at peak hours with signalization.

The second option for a connection to SR 7 is the installation of a westbound right turn lane on Washington Street at the intersection of Washington Street and Third Street. A connection to SR 7 from the Third Street and North Street intersection would also be needed. Third Street at North Street is a four-way intersection. However, the east side of North Street does not currently intersect SR 7. Under this option North Street could be extended to allow a connection to SR 7.

An advantage to this option would be that it provides access to SR 7 without adding a new access point on Washington Street or Third Street. Another advantage would be that the number of vehicle conflicting movements is less than the ramp option, which should result in fewer accidents. A disadvantage to this option would be that motorists would have to travel a longer distance to get to SR 7. Additional right-of - way would also be required. Signage directing motorists to SR 7 would be installed on Washington Street, Third Street and North Street (see Figure 12).

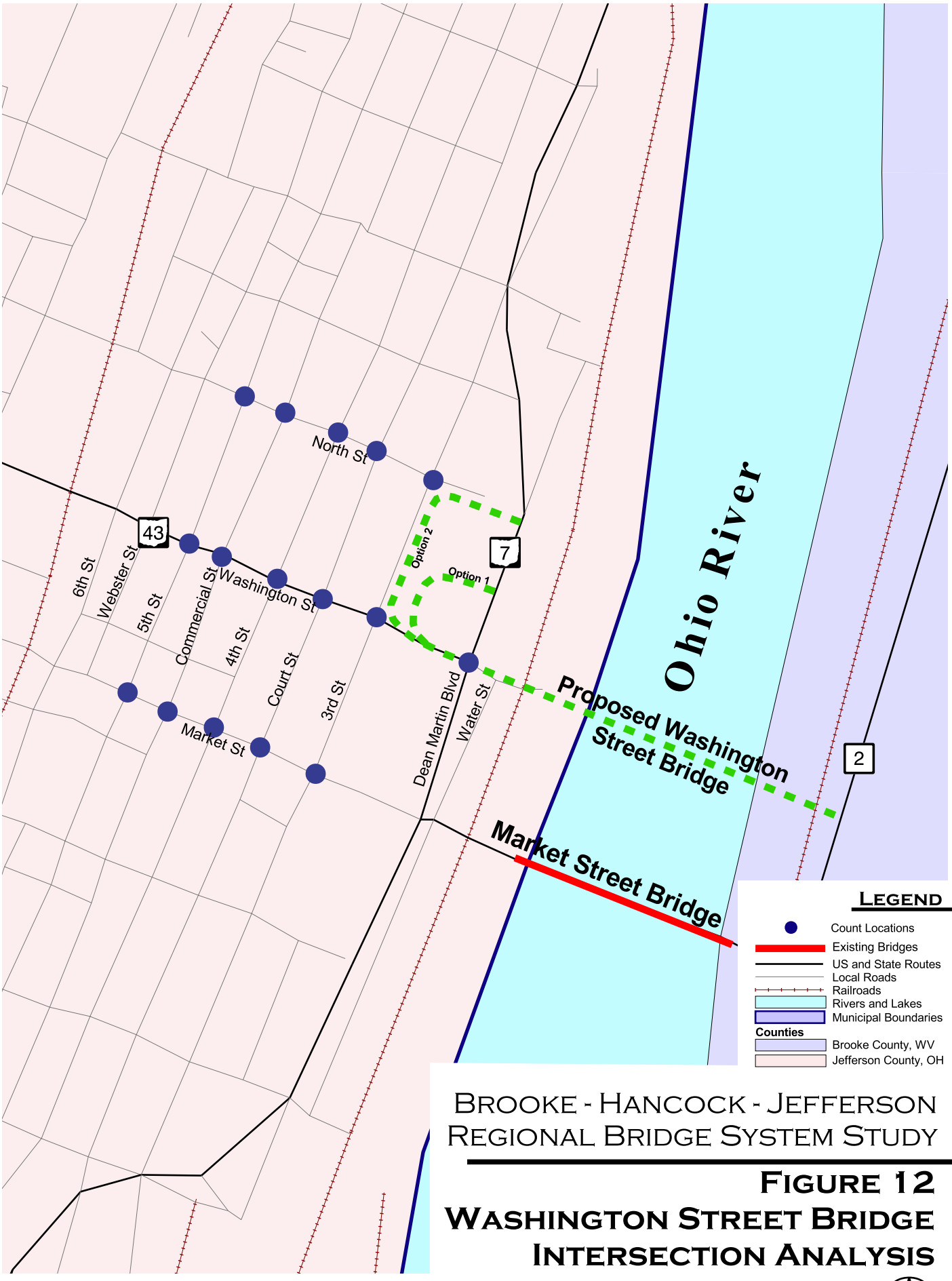

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Figure 12
Washington Street Bridge Intersection Analysis

Edwards and Kelcey

University Boulevard Improvements

SR 7/University Boulevard

The intersection of SR 7 and University Boulevard had the highest number of accidents at a single location, with 51 crashes in the three-year period. This translates to an accident rate of 1.6 accidents per million entering vehicles. Of these crashes, ten were angle type accidents, mostly involving northbound left-turning vehicles and southbound through vehicles. There were also seven rear-end type accidents at this location. Bad weather or slippery pavement was a factor in 42 percent of the crashes. There were a total of six injuries from two of these crashes. No fatalities occurred from accidents at this location.

University Boulevard/7th Street/US 22 Ramps

The intersection of University Boulevard and 7th Street/US 22 ramps was the site of thirteen accidents during the analysis period, with 85 percent of them occurring on dry pavement during clear weather. Nine (69 percent) of these accidents were angle type, seven of which were caused by eastbound vehicles turning left into the path of westbound traffic. There were no fatalities resulting from accidents at this intersection, but there were nine injuries from five of the crashes. The intersection of University Boulevard and 7th Street/US 22 ramps currently operates at LOS "B" with a delay of 12.5 seconds per vehicle. The University Boulevard intersections appear to be operating satisfactory.

These two intersections are interdependent; however, a LOS analysis alone does not adequately address the traffic operation issues. An important conflict of movements occurs between the southbound through traffic and the northbound left-turn traffic at University Boulevard/SR 7. The majority of northbound left-turn traffic onto University proceeds to the US 22 ramp across the Veterans Memorial Bridge. In addition, the northbound SR 7 left-turn queue to University Boulevard exceeds the storage length of the left-turn lane and often blocks the northbound through lane. The combination of the traffic flow path, high percentage of trucks, and short distances make this an awkward area, causing significant backups during peak traffic flow.

Westbound US 22 Ramps

The ramp from westbound Veterans Memorial Bridge to SR 7 experienced three overturned semi-trailers in the three-year period from 1996-1998. While this is a small percentage of the total accidents, due to the location and nature of the accidents there is the possibility of great impact on the surrounding area. These accidents can cause the Veterans Memorial Bridge to close, forcing all traffic to use either the Fort Steuben Bridge or the Market Street Bridge. Other accidents on this ramp include five one-vehicle accidents involving crashing into the concrete barrier and five rear-end type accidents near the merge with SR 7. A total of 23 accidents occurred during a three-year period along the ramp sections, for a rate of 0.77 accidents per million vehicles using the ramps. One of these accidents produced two injuries. There were no fatalities.

Truck accidents occur frequently at these types of interchanges, particularly on curved exit ramps. In fact, trucks overturning on exit ramps at interchanges account for five out of every 100 fatal truck accidents (Source: FHWA). Truck roll-over accidents can be very costly, in urban or rural areas, because these accidents usually result in fatalities and injuries, vehicle and roadway damage, and significant traffic delays. Losses are even greater when trucks carrying combustible or hazardous cargo ae involved. One way to prevent or at least reduce truck roll-over accidents on curved ramps would be to install an automatic warning system on these ramps to help truck drivers take preventive action. The system warns drivers when the truck, based on its load conditions and speed, would roll over if its speed were not reduced. In addition to this warning system, rumble strips could be used.

US 22 & WV 2/Freedom Way Improvements

These alternatives were evaluated in order to provide a solution to the permanent closure of the Fort Steuben Bridge. The Fort Steuben Bridge provides convenient access for vehicles that travel to and from Steubenville, Ohio and Weirton, West Virginia. Trucks account for about seventeen percent (17 percent) of the total traffic across this bridge each day. Many of the trucks travel to and from the nearby Half Moon Industrial Park in West Virginia. In order to prepare for this possible closure, alternatives were analyzed which would mitigate the impact of the Bridge closure.

The several alternatives, described below, were evaluated in detail. For example, the analysis of constructing a new full interchange included the preparation of preliminary engineering drawings showing ramp locations and profiles. Level of Service calculations were also made for peak hour conditions with emphasis on turning movements and lane capacity. The reader is referred to Technical Memorandum 5 for more information.

The first alternative included the construction of a new full interchange from Freedom Way to US 22 and WV 2. Five additional new ramps were included that would allow all movements between Freedom Way and US 22/WV 2. All ramps would meet present highway design standards.

The second alternative is similar to the first with an exception that a direct connection between Freedom Way and the east leg of US 22/WV 2 would not be provided. This was evaluated since the future demand for this movement may not justify the cost of construction of these ramps.

The third alternative evaluated improvements of the existing intersection. Included were additional turn lanes, pavement widening and signalization modifications. For example, operational changes in the existing signal, the construction of a dual eastbound left-turn lane on US 22, and the construction of a new continuous right-turn lane on Freedom Way were considered. Each component was evaluated separately and then they were considered together as an overall improvement. Detailed traffic flow capacity calculations were made in order to evaluate the effectiveness of these improvements.

The fourth alternative evaluated improvements to Freedom Way, between WV 2 and Birch Drive, and the intersection of Freedom Way/Birch Drive. Included were geometric changes at Birch Drive, upgrade and/or widening of the existing three lanes on Freedom Way, possible drainage improvements, and traffic operational changes at Birch Drive.

Figure 13 shows the recommended improvements.

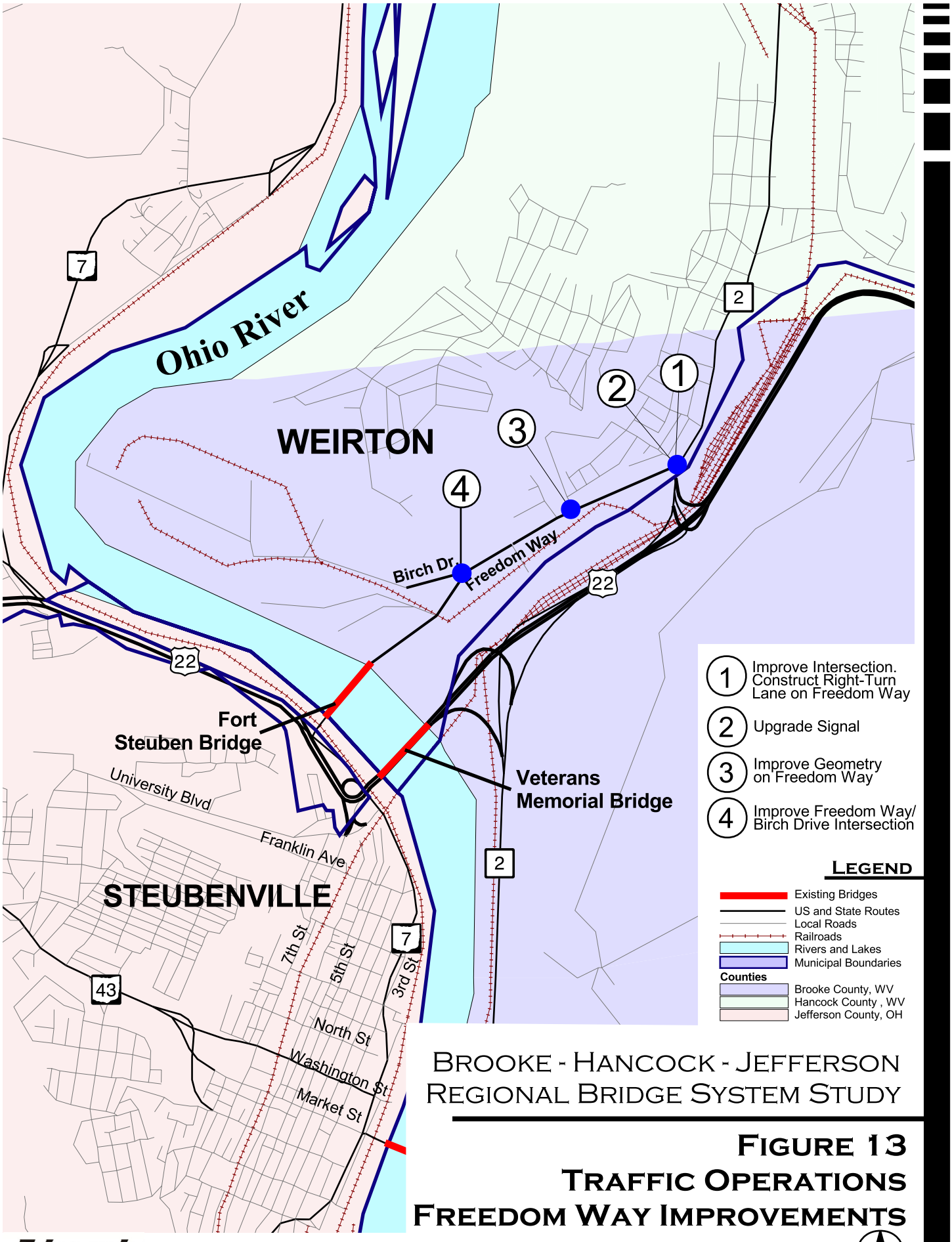

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Figure 13
Traffic Operations
Freedom Way Improvements

Edwards AND Kelcey

Conclusions

Recommended traffic operations improvements are:

Washington Street Improvements

Improvements assume the construction of a new 4-lane bridge over the Ohio River at Washington Street and connecting to WV 2.

1. Improve the Washington Street/Third Street intersection by adding a right-turn lane on the northbound approach to the intersection to accommodate vehicles that need access to SR 7 after crossing the new Washington Street Bridge.
2. Add a right-turn lane on Third Street at its intersection with North Street.
3. Extend North Street to provide a connection to SR 7. A traffic signal at the intersection of North Street/SR 7 may be necessary and should be installed if warranted.
4. Construct a new intersection at the new Bridge and WV 2 to provide motorists crossing the new Washington Street Bridge with a connection to WV 2. The intersection will need a northbound left-turn lane and a southbound right-turn lane on WV 2. An eastbound left-turn lane and a right-turn lane will be needed exiting the new Washington Street Bridge.
5. Install a new traffic signal at the intersection of the new Washington Street Bridge/WV 2 if warranted.
6. Adjust signal timing and phasing as outlined in the capacity analyses on Washington Street.
7. Install fiber optic cable, master controller and all other necessary equipment to allow for a closed loop signal system for the nineteen intersections in the Steubenville Downtown grid system.

It should be noted that the improvements described below recommended for the University Boulevard and Freedom Way area are directly related to the anticipated closing of the Fort Steuben Bridge. Since the date of the closing cannot be known, it is important that engineering design begin as soon as possible so that construction of the improvements will be completed before closing of the Bridge.

University Boulevard/US 22 Ramp Improvements/SR 7

1. Review signal timing of the interconnected system at the intersection of SR 7/University Boulevard to allow for additional green time on the northbound left turn movement in order to provide for better traffic flow and a possible reduction in angle type accidents. Provide additional left-turn lane capacity to minimize queue length, if practical, recognizing the existing physical constraints.

2. Resolve safety concerns related to truck overturning on existing ramps with signing, or advance warning devices. An Automated Truck Warning System to prevent truck rollovers on the ramps should be considered.

3. Improve or widen SR 7 at its intersection with University to faciltate truck turning movements.

US 22 and WV 2/Freedom Way Improvements

1. Improve the intersection of Freedom Way/US 22 and WV 2 to better accommodate the additional traffic, expected with the closure of the Fort Steuben Bridge. Construct a right-turn lane or continuous right-turn lane from Freedom Way to southbound WV 2, due to existing and anticipated traffic volumes and to better facilitate truck traffic out of the Half Moon Industrial Park. Construct a dual left-turn lane for eastbound traffic on US 22.

2. Consider adjusting signal phasing from split phase to concurrent side street movements so that Freedom Way and Walnut Street move at the same time. Signal upgrade or modification will be required as part of the roadway improvements at Freedom Way/US 22 and WV 2.

3. Improve Freedom Way to accommodate additional truck traffic. An additional lane is needed on Freedom Way for approximately 1,000', starting at its intersection with US 22 and WV 2 to receive the dual left turns from eastbound US 22.

4. Realign or improve the Freedom Way/Birch Drive intersection. When the Fort Steuben Bridge is closed, then southbound Freedom Way to Birch Drive could be a continuous movement, with a stop sign added on the northbound approach to the Freedom Way Birch Drive intersection.

Construction Costs

Preliminary construction cost estimates are shown in Table 6. Note that detailed engineering analysis will be required in order to establish an accurate cost estimate and to determine the feasibility of construction of the recommended improvements. Of particular concern are the restraints related to the location of the railroad bridge piers, south of University Boulevard. In addition, widening of SR 7 will impact access to existing businesses adjacent to SR 7.

Table 6
Cost Estimate for Traffic Operations Improvements

	Description	Cost
	Washington Street Improvements	
1	Right-Turn Lane Northbound at Washington Street/Third Street	$205,000
2	Right-Turn Lane Eastbound at Third Street/North Street	$205,000
3	North Street Extension to SR 7 and Related Intersection Improvements	$615,000
4	New Intersection of Washington Street/WV 2	$615,000
5	New Traffic Signal at Washington Street/WV 2	$80,000
6	Signal Timing Adjustments	$10,000
7	Fiber Optic Cable, Cameras, Master Controller for Closed Loop Signal System in Downtown Steubenville, Ohio	$400,000
	Subtotal	**$2,130,000**
	University Boulevard/US 22 Ramp Improvements/SR 7	
1	Signal Timing Adjustments/Extend Northbound Left-Turn Lane*	$147,000
2	Automated Truck Warning System	$160,000
3	Widen SR 7 at University Boulevard*	$300,000
	Subtotal	**$607,000**
	US 22 and SR 2/Freedom Way Improvements	
1	Improve Freedom Way/US 22 Intersection by Constructing Two Additional Turn Lanes	$305,000
2	Signal Upgrade/Modification due to Intersection Improvements. Signal Phasing and Timing Adjustments.	$80,000
3	Improve Freedom Way by Adding a lane 1,000' in Length	$410,000
4	Realign or improve Freedom Way/Birch Drive Intersection	$410,000
	Subtotal	**$1,205,000**
	Grand Total of All Traffic Improvements	**$3,942,000**

*Does not include potential cost associated with constraints of railroad bridge piers and impact on existing businesses along SR 7.

Note: This estimate does not include Right-of-Way or Utility Relocation Costs.

Final Recommendations and Project Priority

The following recommendations are based on the detailed analysis outlined in this Report and other supporting documents. They are also based on travel-related characteristics in the BHJ region, discussions with various groups and individuals, and public input.

The following issues are relevant to the final decisions made by the BAC, the BHJ Technical Advisory Committee, and the BHJ Transportation Policy Board:

1. It is assumed that the Fort Steuben and Market Street Bridges will not be in service for the planning year 2025.
2. The construction of a new bridge in the 18-mile corridor between the Fort Steuben Bridge and the Ohio County line is BHJ's #1 regional transportation priority. This was established in the Regional Transportation Plan.
3. The formal system Study review and consideration of regional needs has been under consideration since 1999.
4. The thirty-one (31) member Bridge Advisory Committee had oversight for the preparation and completion of this study.
5. The seventy-two (72) member BHJ Transportation Policy Board is the federally-recognized adoption board for this transportation recommendation and priority.
6. Region-wide consensus for the final recommendations and priority is essential. Without BHJ Transportation Policy Board adoption and public consensus, it will be difficult to leverage federal, state and local funds for this high cost transportation system investment.

The BAC thoroughly reviewed the findings and conclusions of the BHJ staff and the Consultant Team. Based on a roll call vote at its final meeting, the BAC forwarded a recommendation for approval of the projects described below. The Transportation Policy Board received the recommendation, and then adopted the proposed improvements.

It should be noted that the first project priority in this Regional Bridge System Study recognizes the critical need to provide specific roadway improvements in the vicinity of the Fort Steuben Bridge. Those improvements are required in order to mitigate the effect of the anticipated closing of the Fort Steuben Bridge.

First Priority

Construct roadway and intersection capacity improvements

- Realign and improve Freedom Way/Birch Intersection.
- Improve alignment and widen the intersection of Freedom Way/WV 2 and related West Virginia approaches.
- Improvement of Freedom Way including upgrade and/or widening of the existing three lanes.
- Improve and widen University/SR 7 intersection and related Ohio approaches.
- Provide safety improvements on Veterans Memorial Bridge ramps in Ohio.

Second Priority

Construct a new Ohio River Bridge, south of Wellsburg

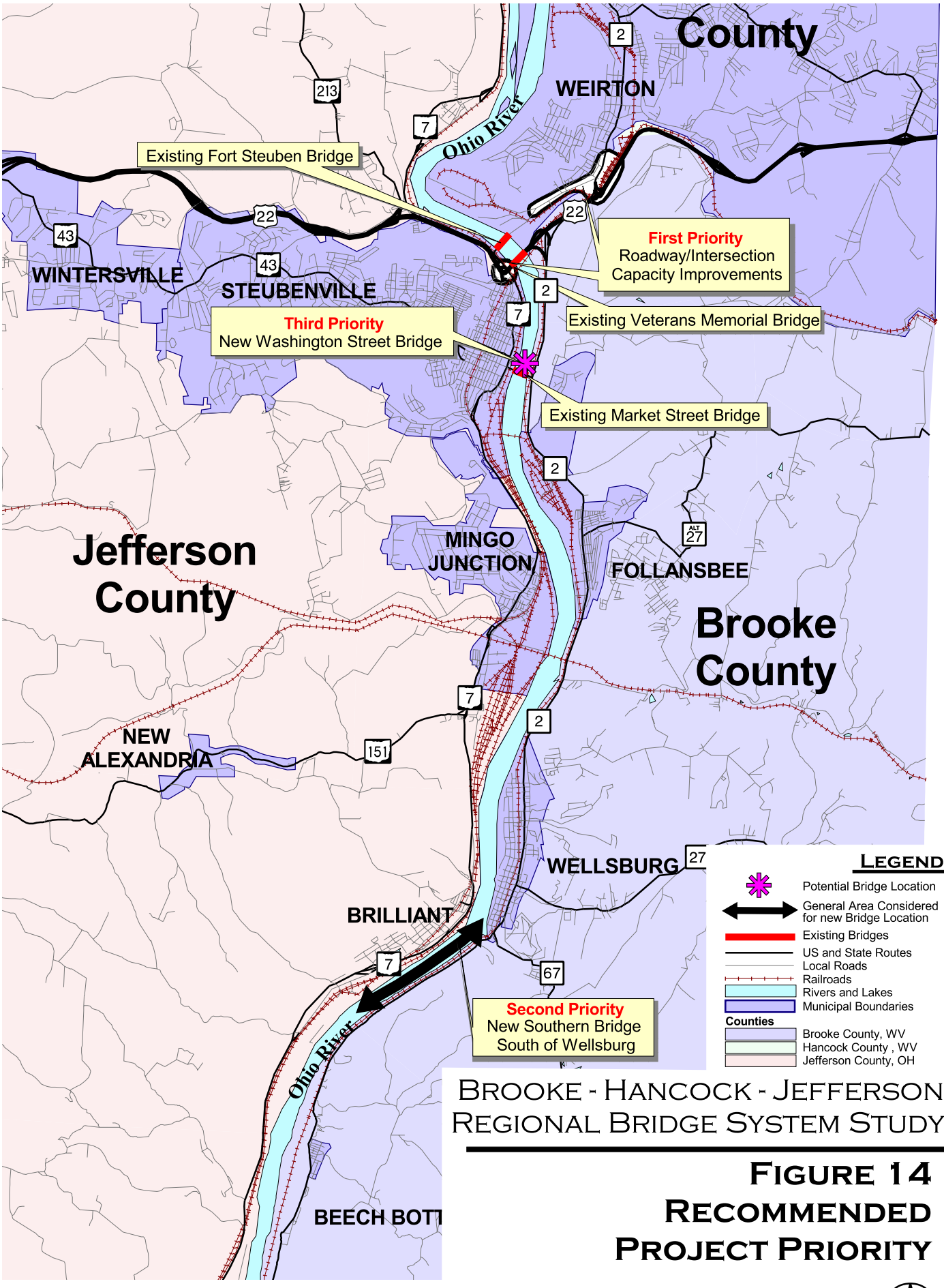
- Prepare engineering and environmental studies to establish a specific location for the new Bridge and configuration of roadway connections to WV 2 and SR 7.

Third Priority

Construct a new Ohio River Bridge to connect WV 2 with Steubenville at Washington Street

- Prepare engineering and environmental studies to establish a specific alignment location and impact on WV 2, SR 7, and the existing street system in the Steubenville Central Business District.

The recommended projects are shown in Figure 14.



Brooke - Hancock - Jefferson Regional Bridge System Study

Figure 14 Recommended Project Priority

Edwards and Kelcey

Appendix A

Bridge System Study History

Prepared by BHJ Staff

May 21, 2003	Brooke-Hancock-Jefferson Metropolitan Planning Commission, BHJ Office. Upon a 14 yes and 1 no vote, the consultant's recommendations were accepted.
March 19, 2003	The BHJ Technical Advisory Committee (TAC), BHJ Office. Upon a 12 yes and 0 no vote, the consultant's recommendations were accepted.
March 12, 2003	Meeting #8 at the Wellsburg Fire Hall. Bridge Advisory Committee (BAC) considers the consultant's recommendation through an advisory vote. Upon a 22 yes and 0 no vote, the consultant's recommendations were accepted.
January 15, 2003	Meeting #7 at the Steubenville Holiday Inn. BAC hears the consultant's recommended bridge scenario.
November 18, 2003	DOT's bridge consultant and BHJ meet to review project status, expectations, predictable outcomes and next steps at Marietta, Ohio.
November 13, 2002	Public Information Meeting for general public to review and provide comment upon project preliminary review at the Millsop Center, Weirton.
October 22, 2002	Meeting #6 at the Millsop Center, Weirton. BAC evaluates the preliminary analysis for combined bridge alternatives.
September 3, 2002	Meeting #5 at the Brooke County Library. BAC determines a northern bridge option and evaluates next steps.
July 9, 2002	Meeting #4 at the Steubenville Holiday Inn. BAC discusses the results of the comparative analysis of bridge scenarios.
July 1, 2002	Study Consultant, Pflum, Klausmeier & Gehrum (PKG) is merged with Edwards and Kelcey, Inc. (EK). No change in individuals on study staff.
May 29, 2002	DOT', bridge consultant and BHJ meet to review preliminary bridge scenarios at Marietta, Ohio.
April 10, 2002	Meeting #3 at the Millsop Center, Weirton. BAC reviews and discusses the proposed methodology for comparative analysis.
March 13, 2002	Meeting #2 of Phase 2 BAC reviews and discusses evaluation criteria at the Brooke County Library.
February 6, 2002	Phase 2 kick-off meeting held with the Bridge Advisory Committee at the Steubenville Holiday Inn.

January 10, 2002 Consultant coordination meeting prior to Phase 2 kick-off held in Marietta, Ohio.

August 1, 2001 PKG submits revised scope of work for Phase II.

July 11, 2001 Twelve (12) attendees representative of BHJ, ODOT and WVDOT met in Marietta, Ohio to complete a final review of the Phase II scope of work. "It was agreed by July 27th the consultant would provide the final scope of services, a suggested amended consultant agreement and statement of cost."

November 15, 2000 A preliminary "Prospectus" (Revised Scope of Work), as reviewed by both state DOT's is faxed to BHJ by WVDOT.

August 25, 2000 Nino Brunello (ODOT) e-mails BHJ and states "… I've finished the validation process and handed the model over to Burgess and Niple (Bridge modeling consultant)."

August 18, 2000 Elected Officials Meeting in Steubenville to review Phase 1 Study. BHJ Staff prepares and presents a 30 point question-answer document. Forty-seven (47) persons attend.

August 11, 2000 Nino Brunello (ODOT) e-mails BHJ and indicates "the internal-external model and the updated external-external trip table for the base year are complete. I should be finished by the 25th."

July 31, 2000 ` BHJ forwards final draft Scope of Services to state DOT's. Requests comment within five days.

June 6, 2000 Letter from BHJ to PKG states "you are formally notified to commence work on Part 2 of the two-part study called the Ohio River Bridge System Needs and Location Study."

June 6, 2000 With ODOT representation (Greg Gurney), WVDOT representation (Don Bailey and Richard Warner), BHJ representation (John Brown, Lisa Kush, Mike Paprocki and Shawn Price), and PKG representation (Jack Pflum), a formal Notice to Proceed statement and letter for Phase 2 was provided to PKG Consultants."

May, 2000 Phase I Final Report. Upper Ohio Valley Bridge System Study forwarded to BHJ and funding agencies.

May 25, 2000 BHJ Commission adopts Phase I Report.

May 3, 2000 BHJ Bridge Advisory Committee recommends Draft Phase I Report.

September 22, 1999 Pflum, Klausmeier & Gehrum Consultants, Inc. and the BHJ execute an agreement to complete Phase I Needs Analysis for the Upper Ohio River Needs and Location Study.

August 24, 1999 WVDOT, ODOT and BHJ select a preferred consultant to complete the regional bridge study.

July 20, 1999 Project review meeting #3 in Charleston to determine consultant short-list.

June 17, 1999 Project review meeting #2 in Steubenville to solidify project financing.

June 14 and 21, 1999 Legal advertisement in Charleston Daily Mail and Columbus Dispatch. Individualized mailings sent to 37 consultants.

April 29, 1999 Project review meeting #1 in Charleston.

April 28, 1999 WVDOT submits Project Prospectus.

March 2, 1999 BHJ submitted consultant scope of work and advertising statements to the West Virginia Department of Transportation (WVDOT).

February 9, 1999 BHJ met with Richard Warner, WVDOT Director of Urban Studies, to review bridge study history and needs to finalize a contract.

December 30, 1998 BHJ met with the Suzann Gad, ODOT Planning Administrator. A list of consultants was provided. Technical service costs were estimated. Advertising requirements were evaluated.

December 3, 1998 John Brown met with WVDOT staff in Charleston to overview proposed Bridge Study.

September 16, 1998 BHJ Commission directed staff (1) to finalize a scope of study (2) to prepare a request for proposal and (3) to determine funding source(s) for a "Bridge System Needs and Location Analysis for the Steubenville-Weirton Metropolitan Statistical Area."

June 18, 1998 BHJ Commission postponed "Bridge System Needs" discussion until a new Executive Director was in place. Mr. Schwertfeger asked Brooke County be kept apprized of progress.

March 19, 1998 The BHJ Technical Advisory Committee recommended BHJ staff pursue discretionary funds with WVDOT and ODOT for a consultant study for a regional bridge study.

February 18, 1998 Funding/RFP preparation meeting for a Bridge System Study held in Charleston, WV. WVDOT, ODOT and BHJ representatives were in

attendance. It was concluded the Study would be prepared by a consultants.

February, 1998 BHJ staff prepared a Scope of Study Outline to be discussed with WVDOT. The narrative to the outlined stated "BHJ staff does not have the financial nor technical resources to adequately address all issues. It is anticipated the proposed study will be designed to meet the requirements of a Major Investment Study (MIS) and will serve as the proposed Corridor Study referenced in BHJ's Overall Work Program."

February 6, 1998 Preliminary draft letter from Samuel Beverage (Commissioner/Ohio Department of Transportation) stated, "Our verbal commitment to assist in this effort was given during BHJ's meetings on September 18, 1997. The approach discussed for the location study has been to pick up where the new plan leaves off, and take the proposal to the next level. This would complete the planning phase and would provide for an easy transition to project development when we are able to direct financial resources to the project."

January 29, 1998 BHJ 2020 Regional Transportation Plan adopted. Plan stated, "It is recommended BHJ continue to pursue the implementation of this project in several ways. First, a study should be implemented which will identify the best location and a more accurate cost of the proposed structure. This study should be conducted jointly with both Ohio and West Virginia Departments of Transportation. Along with the study, it is recommended that BHJ staff work closely with the local elected officials to pursue a dedicated source of funding and funding options such as a bridge toll for this structure."

October 29, 1997 The Ohio Department of Transportation held a public meeting with BHJ and representatives of Steubenville, Weirton, and Jefferson County to explain the current condition and future plans for the Ft. Steuben Bridge.

September 1997 BHJ staff prepared "Preliminary Report on the Impact of Closing the Fort Steuben Bridge." Staff concluded "the information provided by the travel demand model has indicated that the closure of the Fort Steuben Bridge will result in increased congestion, more restricted traffic flows, and therefore have negative impact on regional transportation flow and air quality."

September 24, 1997 The Wells Township Civic League (Brilliant, Ohio) submitted a letter to BHJ in support of the proposed bridge study.

September 18, 1997 At a regular meeting of the BHJ Policy Committee, a motion was passed requesting WVDOT initiate a "Bridge Location Study." The study

purpose was "to identify a site for the proposed new Ohio River crossing somewhere near Wellsburg, WV."

September 5, 1997 Brooke County Commissioners submitted a request to be placed on the BHJ Policy Committee agenda to support a resolution for a "Bridge Location Study."

August 29, 1997 The West Virginia Division of Highways Commissioner, Fred VanKirk, submitted a letter to Brooke County Commissioners and stated "…the proposed bridge has been included in BHJ's long-range transportation plan for your area since 1994. The Department of Transportation and the Division of Highways cooperated with BHJ in the development of the plan, and we concur with its contents. Both offices will assist BHJ in revising the plan, in fact, that effort is already underway. I would suggest that you ask the BHJ staff to include your proposal on the agenda for the next meeting."

August 11, 1997 BHJ submitted a letter to the West Virginia Division of Highways Commissioner, Fred VanKirk, outlining the history of the proposed bridge and reaffirming BHJ's support for such a project.

July 17, 1997 At the last BHJ public hearing for the Year 2020 Transportation Plan, officials from Follansbee and Mingo Junction lent their support to the possible construction of a bridge linking Mingo to an area of Brooke County between Follansbee and Wellsburg.

July 3, 1997 Governor Underwood acknowledged receipt of the Brooke County Commissioner letter and the forwarding of his request to the West Virginia Division of Highways, Fred VanKirk.

June 23, 1997 Brooke County Commissioners submitted a letter to West Virginia Governor Underwood and requested consideration of a new bridge in the Northern Panhandle to connect at either Cross Creek or Buffalo Creek. The letter was forwarded to the Commissioner of the Division of Highways, Fred VanKirk.

July 28, 1995 WVDOT rated the Market Street Bridge in "poor" condition and the Veterans Bridge in "good" condition. ODOT rated the Fort Steuben Bridge in "fair" condition. "When something is to poor condition, according to the state rating system, it is still doing the job, but only barely. Structures in poor condition are not in imminent danger of collapsing, but they should be repaired." (Herald-Star July 28, 1995, Page 1B).

May 31, 1994 The BHJ Year 2015 Transportation Plan was adopted. The Plan identified the construction OF A NEW Ohio River Bridge crossing between

Follansbee and Wellsburg as a primary project. "It would serve to alleviate much of the congestion currently realized on State Route 2 through Follansbee and Wellsburg."

June 3, 1993 The West Virginia Division of Highways lowered the weight limit on the Market Street Bridge from 13 tons to 5 tons after reviewing the results of an inspection by Burgess & Niple Ltd. of Parkersburg.

July, 1993 Community resolutions in support of retaining the Market Street Bridge were passed by the communities of Steubenville and Wintersville.

December 22, 1993 A press release from the office of U.S. Representative Douglas Applegate of Steubenville indicated Governor Gaston Caperton has assured Mr. Applegate there is no effort being made to close the bridge linking Steubenville and West Virginia, between Follansbee and Weirton. (Herald-Star). Mr. Applegate said, "Plans for the construction of a new bridge to link Brilliant with Wellsburg would not be affected by plans to keep the Market Street Bridge open." Dennis Carpenter, Administrative Assistant to the District Six Engineer of the Division of Highways said, "We have announced we are interested in building a new bridge and that we will make such plans, but that is just about the only thing that is definite at this point. The Market Street Bridge can last for many, many years. It's a very sound bridge." (Dec. 22, 1993, Page 1).

July 22, 1993 Fred VanKirk (Commissioner/WV State Highway Engineer) in response to Mark Baldwin (City Manager/City of Wellsburg), stated in letter form, "The existing bridge is safe for its posted load limits. For future travel needs, however, we are preparing to perform a study which will include consideration of major renovation of the existing structure, replacement at the existing site or construction of a new bridge at another location. A major consideration in our study will be a new bridge near Cross Creek."

January 19, 1993 Fred VanKirk (Acting Commissioner/WV State Highway Engineer) in response to Robert Sandercox (V.P. Bethany College) stated in letter form, "… such a bridge would also help alleviate the congestion on WV 88 as you have mentioned. We will consider the possibility of a new transriver crossing at Wellsburg, as well as other sites, during our study of West Virginia Route 2."