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DEPARTMENT OF TRANSPORTATION

Tri-County Regional
Planning Commission
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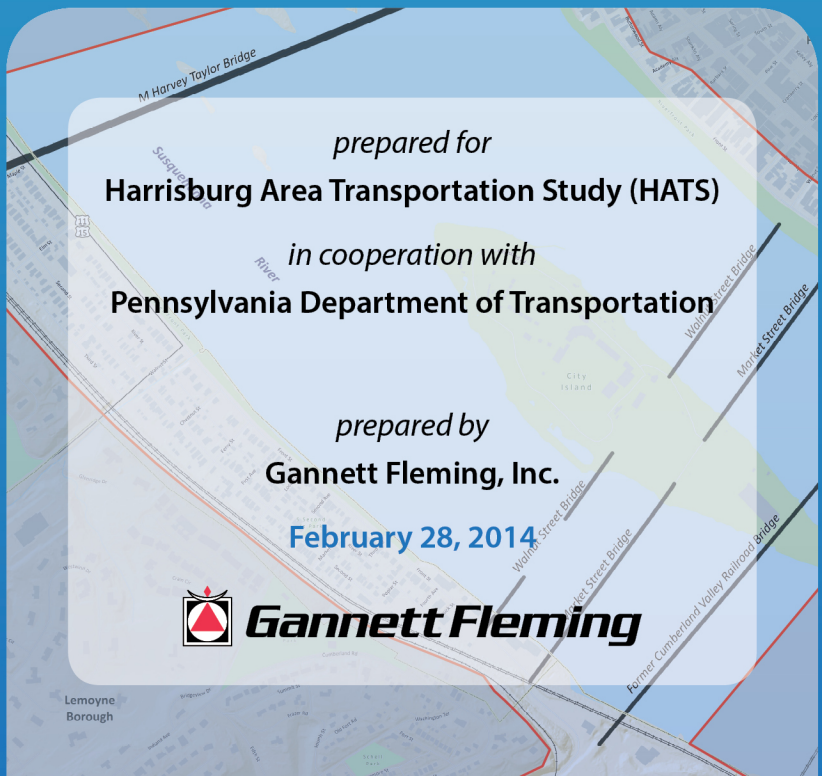
Connections Study
2014



prepared for

Harrisburg Area Transportation Study (HATS)

in cooperation with

Pennsylvania Department of Transportation

prepared by

Gannett Fleming, Inc.

February 28, 2014

Gannett Fleming

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Executive Summary

This study was conducted for the Tri-County Regional Planning Commission through the Harrisburg Area Transportation Study (HATS), in cooperation with PennDOT. The scope involved evaluating four bridges connecting the City of Harrisburg to the municipalities on the West Shore of the Susquehanna River—the M. Harvey Taylor Bridge, Walnut Street Bridge, Market Street Bridge, and the former Cumberland Valley Railroad Bridge (hereafter referred to as the CAT Bridge). The purpose of the study was to evaluate and enhance existing connections between the City of Harrisburg and West Shore communities while improving safety and mobility for all modes of transportation, both currently and in the future.

Existing Conditions Analysis

In order to improve safety and mobility for all modes of transportation, an existing conditions analysis was performed for the study area. As part of the existing conditions analysis, the following data collection activities were conducted to assist in the development of near-, mid-, and long-term improvements and/or alternatives for each bridge:

- Origin/destination survey of users on the Market Street Bridge
- Roadway safety audit of bridges and approaches
- Vehicle/pedestrian counts to analyze operations
- Bridge structural characteristics evaluation
- Environmental conditions analysis

Alternatives Evaluation

Alternatives were developed to enhance safety and multimodal connectivity between the City of Harrisburg and West Shore communities. Existing and future needs were considered when developing alternatives, which were further shaped by agency and public input. Alternatives were developed for the near, mid, and long term to address concerns documented in the existing conditions analysis. A phased approach was considered where possible to manage implementation costs. Near- and mid-term improvements are summarized together; long-term improvements are discussed separately below. The timeframes are defined as near-term being less than 7 years, mid-term 7-14 years, and long-term greater than 14 years.

Near- and Mid-Term Improvements

The following table and maps summarize near- and mid-term improvements/alternatives for each bridge along with the anticipated implementation costs. The location number in the improvement table correlates with the location number of the improvements map.

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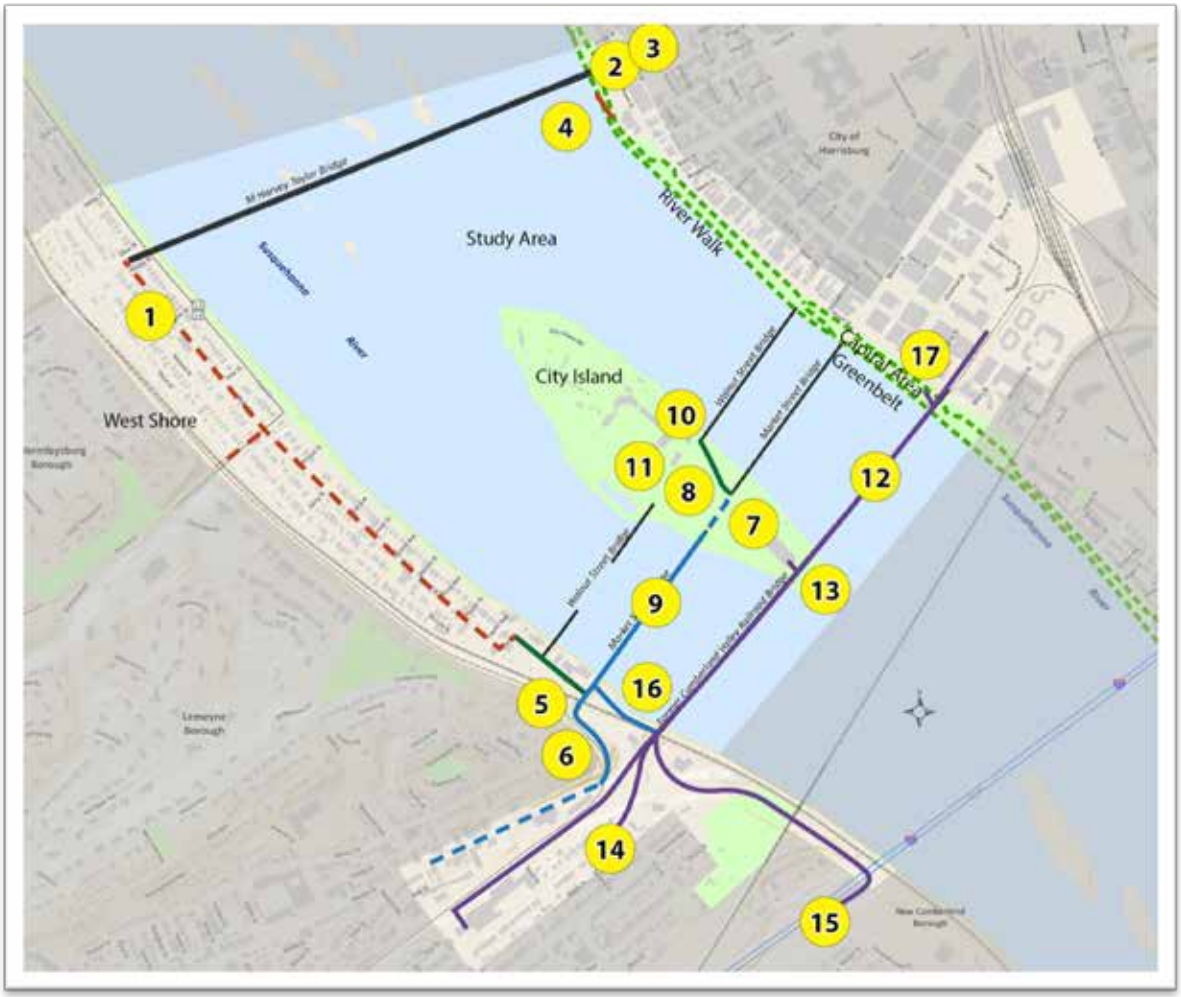
Summary of Near- and Mid-Term Preferred Improvements and Costs

Identifier (Sponsor)	Bridge	Improvement	Timeframe	2014 Cost
1 (TBD)	Harvey Taylor	West Shore Ped/Bike Routing	Near-Term	$2,000
2 (PennDOT)	Harvey Taylor	Harrisburg Front & Forster Sign/Marking Upgrades	Near-Term	$2,500
3 (PennDOT)	Harvey Taylor	Harrisburg Front & Forster Pedestrian Improvements	Mid-Term	$170,000
4 (TBD)	Harvey Taylor	Harrisburg Riverfront Walk and Greenbelt Connection	Mid-Term	$1.8 M
5 (TBD)	Market Street	Wormleysburg Front Street Restriping/Ped Improvements	Near-Term	$3,500
6 (PennDOT)	Market Street	Wormleysburg-Lemoyne Bottleneck Sidewalk Repair	Near-Term	$10,000-$20,000
7 (PennDOT)	Market Street	City Island Left-Turn Restrictions	Near-Term	$5,000
8 (TBD)	Market Street	City Island Ped/Bike Paths through Parking Area	Near-Term	$20,000
9 (PennDOT)	Market Street	Widen Sidewalk on North Side as part of Necessary Rehab	Mid-Term	$200,000
10 (TBD)	Walnut Street	Ped/Bike Signing for Travel between WSB and MSB	Near-Term	$2,000
11 (TBD)	Walnut Street	City Island Bike Share System	Near-Term	Self Sufficient
12 (CAT)	CAT	Demolish CAT Bridge (Not a preferred option – provided as information only)	-	$10 M
12 (CAT)	CAT	Maintenance of Bridge (Concrete repairs necessary at approximately 5-year intervals whether or not the bridge is put to use)	Mid-Term	$1.5 M
12 (CAT)	CAT	Convert Bridge to Ped/Bike Pathway*	Mid-Term	$3.2 M
13 (CAT)	CAT	Construct Connection to City Island	Mid-Term	$150,000
14 (TBD)	CAT	West Shore Construct At-Grade Bosler Connection to Lemoyne**	Mid-Term	$450,000
15 (TBD)	CAT	West Shore Construct Lowther Connection to New Cumberland**	Mid-Term	$430,000
16 (TBD)	CAT	West Shore Construct Elevated Connection MSB and CAT**	Mid-Term	$1.8 M
17 (TBD)	CAT	East Shore Construct Connection Ramp Greenbelt to CAT**	Mid-Term	$1.7 M

*Previous CAT Bridge inspection performed during 2004. Prior to any detailed design another in-depth inspection should be considered.

**Agreements with Norfolk Southern and/or Amtrak would be necessary.

Map of Recommended Near- and Mid-Term Improvements



Long-Term Considerations

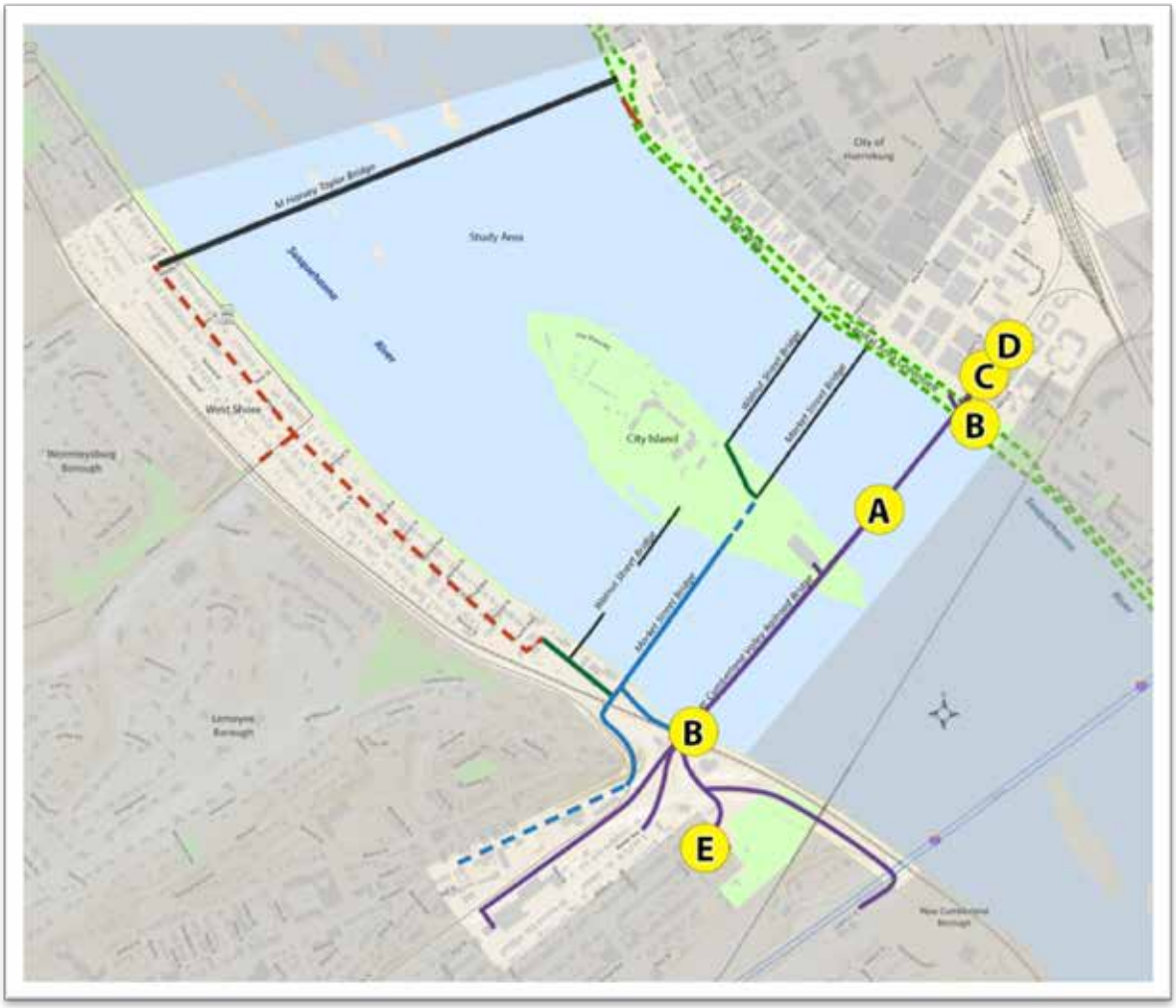
Additional analyses and further discussions with railroad stakeholders will be required for continued consideration of more detailed improvement options and any administration agreements necessary to advance major improvement projects for the CAT Bridge. For this reason and due to the complexity of the numerous alternatives developed for that bridge and its approaches, the improvements were deemed "long term." The majority of the improvements under consideration will require cooperation from the railroads (Norfolk Southern and Amtrak) that own the right-of-way at the bridge termini. It should be noted that the bridge will require a structural rehabilitation in the long term to prolong its life and to prevent significant deterioration of its superstructure.

The long-term considerations are detailed within this report. An improvement table summarizing potential improvements/alternatives on the CAT Bridge is presented below along with associated costs where appropriate. The location identifiers in the improvement table correlate with the letters on the long-term improvements map.

Potential Long-Term Improvements and Costs

Identifier (Primary Owner)	Location	Improvement	Timeframe	2014 Cost
A (CAT)	CAT Bridge	Bridge rehabilitation (Necessary even if the bridge remains unused. Includes waterproof membrane, concrete repairs, and repair of scour holes with grout bags.)	Long-Term	$12-$15 M
A (CAT)	CAT Bridge	Pavement or rail to accommodate potential transit use. Since the limits of any potential transit corridor are uncertain, cost only on bridge itself and not approaches. Does not include gates, signaling, lighting, and other appurtenances.	Long-Term	$300,000 (Pavement) $700,000 (Rail/Track)
B (CAT)	CAT Bridge Approaches	The limits of any potential transit corridor are uncertain; however bus or railway infrastructure would be necessary as well as pavement, track, gates, signaling, lighting, etc.	Long-Term	Unknown
C (Amtrak)	Harrisburg Amtrak Line	Track relocation/modification of Amtrak line would be required to accommodate any potential transit use.	Long-Term	Unknown
D (Amtrak)	2nd Street Overpass	Transit use may require rehabilitation of the Second Street overpass.	Long-Term	Unknown
E (TBD)	Proposed Norfolk Southern Lemoyne Connector	If the Norfolk Southern proposed connector of the Lurgan Branch and Shippensburg Secondary is built, the Bosler pedestrian/bicycle connection would be abandoned and a grade-separated pedestrian/bicycle connection to Lemoyne would be required via Hummel Ave.	Long-Term	$1.6 M

Map of Potential Long-Term Improvements



Next Steps

The improvements presented in this report were developed with a phased approach to include near-, mid-, and long-term projects. Project implementation will require the establishment of a project sponsor and following the regional project development process through the Harrisburg Area Transportation Study (HATS) MPO in cooperation with PennDOT. All projects utilizing federal funding are required to be placed on the Regional Transportation Plan and included on the Transportation Improvement Program (TIP) in order to receive funding. The HATS Project Development Process, including the RTP and TIP requirements, can be accessed on the HATS website at http://www.tcrpc-pa.org/HATS/Pages/Project-Development.aspx. Some mid-term and long-term projects may require additional detailed study and analysis in order to better define all aspects of the improvements including specific project engineering design, environmental constraints, refined cost estimates, project sponsors, project funding, agency agreements, etc.

Background

This Connections Study was conducted for the Tri-County Regional Planning Commission through the Harrisburg Area Transportation Study (HATS), in cooperation with PennDOT. The scope involved evaluating four bridges connecting the City of Harrisburg to the municipalities on the West Shore of the Susquehanna River—the M. Harvey Taylor Bridge, Walnut Street Bridge, Market Street Bridge, and Cumberland Valley Railroad Bridge (hereafter referred to as the CAT Bridge). In addition to the bridges themselves, the adjacent intersections and approaches to each bridge were examined.

Study Purpose

The purpose of the study was to evaluate and enhance existing connections between the City of Harrisburg and West Shore communities while improving safety and mobility for all modes of transportation, both currently and in the future.

Study Objectives

Specific study objectives included:

- Examine existing bridge utilization (multimodal or exclusive uses)
- Document existing conditions and performance of each bridge
- Assess current and anticipated future needs
- Obtain public and agency preferred utilization and improvements
- Develop improvements/alternatives for the near, mid, and long term to enhance current connections to align with and/or leverage regional and local initiatives
- Provide benefit-cost analysis for improvements/alternatives
- Document available and potential funding sources

Needs

This report documents needs relative to cross-river mobility. The needs are outlined in the Existing Conditions section. The primary areas of need are:

1. Delay – Intersection delays at bridge termini are documented for periods in which traffic count data was collected; however, improvements to capacity are limited due to the urban nature of these areas, which leaves little room for expansion. A travel time and delay study was performed through the Market Street bottleneck connecting Wormleysburg and Lemoyne, to document the travel delay that could be alleviated by transit options.
2. Economic viability – Cost estimates are provided for the various improvement alternatives and are ranked based on their feasibility from a cost perspective.
3. Safety – A safety audit was conducted to identify areas in the study area where safety deficiencies exist. These deficiencies relate to vehicular, bicycle, and pedestrian travel.

4. American with Disabilities Act (ADA) deficiencies – As part of the safety audit, deficiencies related to ADA accessibility non-conformance were identified.
5. Pedestrian/bicycle needs – Traffic data that was collected included pedestrian counts on each river bridge. The counts demonstrate where the need is greatest. The safety audit performed included deficiencies related to pedestrian/bicycle travel.

Introduction

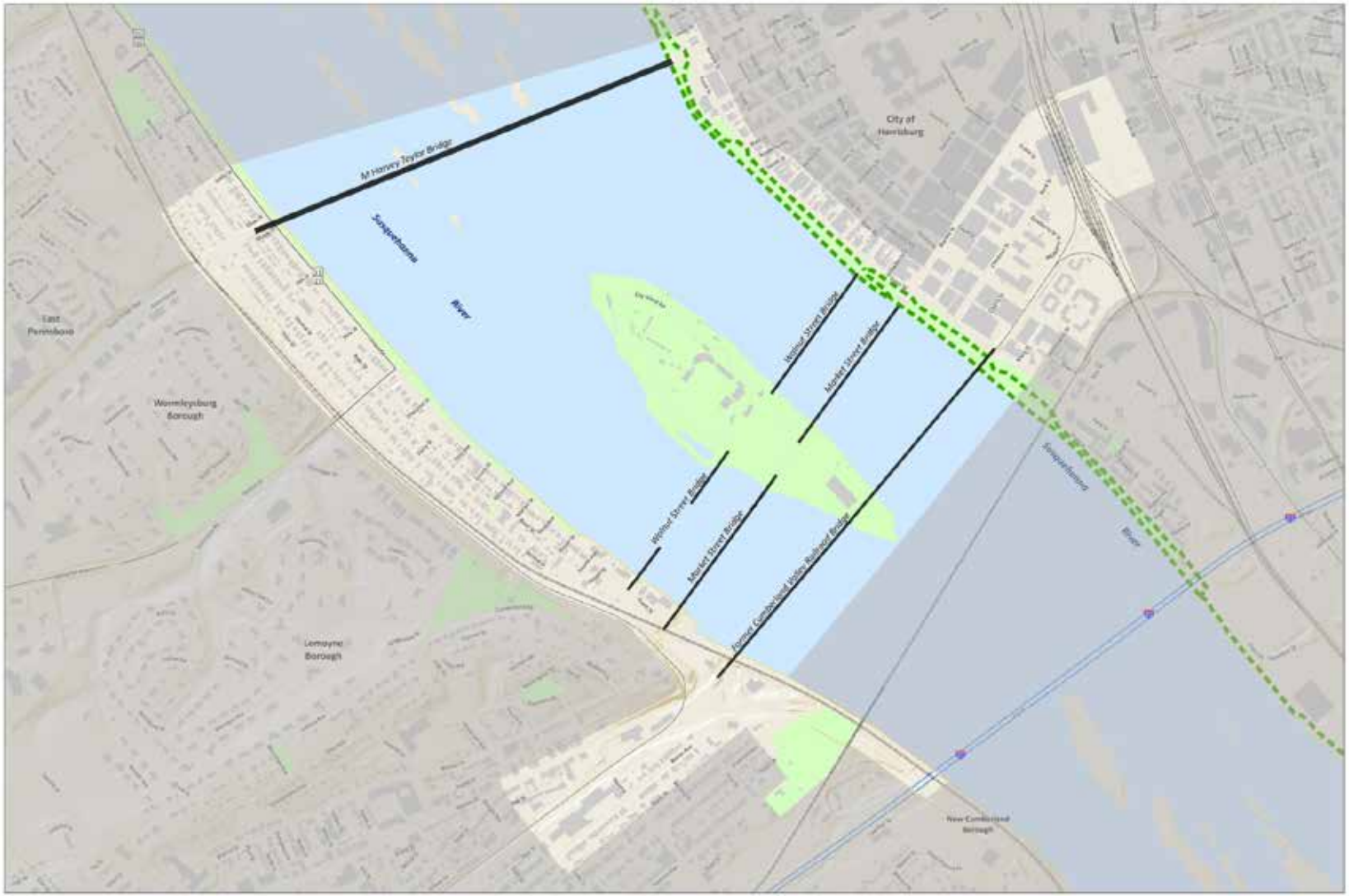
The Greater Harrisburg region is situated within the Great Valley Section of the state. This broad, physiographic province is bisected locally by the Susquehanna River, which separates the region into the East and West Shores. The presence of the river was instrumental in Harrisburg's early emergence as a center for trade and transportation, yet since colonial times it has posed a challenge for regional mobility. Early settlers established ferries long before bridges were constructed. Bridges were built to meet specific needs, and by the modern era there was actually a surplus of bridges to provide connectivity between the East and the West Shore.

The Walnut Street Bridge—the oldest bridge in the study area—was built in response to a toll monopoly held by the Harrisburg Bridge Company, which owned the bridge that preceded the modern-day Market Street Bridge. By the mid-twentieth century, the region had three Interstate-grade bridges spanning the river (I-76, I-81, and I-83), and another controlled access facility (the Harvey Taylor Bridge).

The Connections Study examined only the structures that primarily serve local trips between the City of Harrisburg and the West Shore. These are the Harvey Taylor Bridge and the Market Street Bridge. The study included two additional bridges due to their unique role and history, and potential for providing future mobility. These are the Walnut Street Bridge and the former Cumberland Valley Railroad Bridge, which has been owned and maintained by Capital Area Transit (CAT) since 1995 and is now referred to as the CAT Bridge.

The four bridges are diverse in terms of their construction, carrying capacity, and the types of traffic they were designed to carry. They are shown on Figure 1 and an overview of each bridge (from north to south) follows.

Figure 1: Study Area Map



Harvey Taylor Bridge

Of the four study area bridges, the Harvey Taylor is the newest and thus features the most modern design. Built in 1951, the bridge is a "controlled access facility"—a divided four-lane highway. In 2001, PennDOT improved the bridge by adding cantilevered lanes on both sides to better serve bicycle and pedestrian travel. The bridge links mid-town traffic with the Camp Hill Bypass—a roadway that cuts through the West Shore neighborhoods of Wormleysburg and Camp Hill, providing a vital connection between downtown Harrisburg and US 11/15, PA 581, and points south and west. PennDOT has classified the Harvey Taylor Bridge as being "functionally obsolete," meaning it is still structurally sound, yet its approaches have deficiencies that limit the bridge's full potential use. A functionally obsolete bridge typically has older design features and, while not unsafe for all vehicles, may not adequately accommodate current traffic volumes, vehicle sizes, and weights. Of the four study area bridges, the Harvey Taylor is the most expansive, with 310,096 square feet of bridge deck area.

Walnut Street Bridge

The Walnut Street Bridge was built in 1890, making it the oldest bridge in the study area. Throughout its existence, the bridge has served many functions, including facilitating trolley service between downtown Harrisburg and the West Shore between 1894 and 1936. The Commonwealth of Pennsylvania acquired the bridge in 1954, and by June 1972 it was placed on the National Register of Historic Places. That same month, tropical storm Agnes damaged the bridge and it had to be closed to vehicular traffic. It remained open to bicyclists and pedestrians. A storm in January 1996 severely damaged the bridge, this time completely destroying three of the western spans between City Island and the West Shore and damaging the eastern spans enough to warrant temporarily closing them to pedestrian traffic. PennDOT made $7 million in repairs to the eastern spans the following year before reopening the spans to pedestrian and bicycle traffic that December. The western spans have been the subject of several studies aimed at identifying what the future of that half of the bridge should be. These studies are highlighted elsewhere in this report.

The bridge currently serves as an important bicycle and pedestrian link between City Island and downtown Harrisburg, connecting the city and the Capital Area Greenbelt to special events on City Island.

Market Street Bridge

The Market Street Bridge was built in 1928, replacing its predecessor, the Camelback Bridge, which had served area travelers since its opening in 1816. The Market Street Bridge parallels the Walnut Street Bridge and is located just 500 feet to the southeast. The Market Street Bridge actually comprises three structures—the river crossings on either side of City Island, and a bridge spanning a service road on City Island.

The eastern end of the Market Street Bridge carries traffic into downtown Harrisburg, including Market Square. The western end touches down in Wormleysburg, where traffic empties into a geographic area known locally as "the Lemoyne Bottleneck." The bottleneck is at the junction of Front Street in Wormleysburg with Market Street in Lemoyne Borough. Market Street features a reverse curve as it

winds its way from the Market Street Bridge around a ridge and into Lemoyne Borough. Norfolk Southern also makes three grade-separated rail crossings of the bottleneck, limiting sight distance for the roadway users below.

PennDOT has included Harrisburg's Front Street and the Market Street Bridge as part of "BicyclePA Route J." This designation makes Market Street in Harrisburg and Lemoyne part of a statewide network of cross-state bicycle routes. Like the Harvey Taylor Bridge, PennDOT has classified the western span of the Market Street Bridge as being functionally obsolete.

CAT Bridge

The CAT Bridge is the southernmost bridge in the study area. The bridge was constructed by the Cumberland Valley Railroad in 1915 and served train traffic for various rail freight carriers until 1980. In 1995, the bridge was acquired by Capital Area Transit, which envisioned the bridge as the centerpiece of its plan to introduce regional rail service. CAT owns the right-of-way on the bridge to the riparian boundary on each side of the Susquehanna River. The bridge's former owner, Conrail, abandoned its trackage on the eastern portion of the bridge. Part of this track is currently used by Amtrak as one leg of a wye it uses to reverse train direction. Adjacent to the bridge's western approach, Class I carrier Norfolk Southern operates several lines, including the Port Road Branch which parallels the Susquehanna River southeast to Perryville, MD; the Lurgan Branch which runs southwest to Hagerstown, MD; and the Shippensburg Secondary. In addition to the river, the bridge traverses the southern tip of City Island, and is located within 75 feet of a City Island parking garage that was built in 2005.

Given its unique history as a former railroad bridge and lynchpin of CAT's concept for introducing transit to the region, the CAT Bridge will be the subject of more detailed analysis to determine a potential multimodal transportation role for the structure.

Policy Context—Review of Plans and Previous Studies

The four bridges being considered have been the subject of numerous studies, as well as the object of regional, county, and local policy plans. This section outlines previous plans and reports for background context. These include:

- HATS' 2035 Regional Transportation Plan (December 2010)
- Walnut Street Bridge Span Replacement Options (February 2010)
- Walnut Street Bridge Evaluation Study (June 1999)
- CORRIDOR*one* Planning Studies
- Cumberland County Comprehensive Plan (2011 Update)
- Dauphin County Comprehensive Plan (2008)
- Imagine West Shore Joint Comprehensive Plan (Nov 2010)

HATS 2035 Regional Transportation Plan

The Harrisburg Area Transportation Study (HATS) is the federally-designated Metropolitan Planning Organization (MPO) for Cumberland, Dauphin, and Perry counties. One of the primary functions of an MPO is to develop and regularly update a long-range transportation plan. The Regional Transportation Plan (RTP) establishes the region's transportation goals and policy toward transportation investment. HATS most recently formally adopted an updated RTP in December 2010.

The issue of connectivity between the City of Harrisburg and the West Shore has traditionally been a major focus of the region's planning efforts, especially in the RTP. The plan outlines both "regionally significant" bicycle and pedestrian facilities, and several broad directions—or pedestrian/bicycle focus areas, which intersect with the goals of the Connections Study. These include:

- **BicyclePA Route J** – PennDOT established the BicyclePA network of cross-state bicycle routes in 2000. Their purpose was to facilitate cross-state bicycle trips. One of the BicyclePA Routes—Route J—uses the Capital Area Greenbelt as it makes its way south from US 22/322, across the Market Street Bridge, and through the Lemoyne Bottleneck into Cumberland County. Route J is one of nine such routes identified across Pennsylvania.
- **Capital Area Greenbelt** – This facility has been billed as a 20-mile-long "emerald necklace" of both roadway and non-roadway based bicycle and pedestrian facilities that encircle the City of Harrisburg. The Greenbelt is the subject of a concurrent study that will address several barriers and safety concerns. The portion of the Greenbelt outside of Riverfront Park, which is owned and maintained by the City of Harrisburg, is maintained by the volunteer Capital Area Greenbelt Association. Within the study area, the Greenbelt runs parallel to Front Street in Harrisburg, essentially connecting the bridges at their eastern approaches. As such, it is a critically important pedestrian/bicycle facility for both recreation and transportation.

Several of the applicable priority categories from the RTP have implications for the Connections Study as they relate to bicycle and pedestrian travel within the study area, including:

- **Improved Access to Harrisburg** – This was originally identified in HATS' pedestrian/bicycle transportation plan in 1997. Specific projects identified as part of the RTP update included:
  - Improve the Lemoyne Bottleneck.
  - Improve bicycle and pedestrian access to the Harvey Taylor Bridge in Wormleysburg.
  - Reconstruct the western span of the Walnut Street Bridge.
- **Complete/Expand Existing and Proposed Trails** – Of the list, one potential project included completing "Imagine Wormleysburg" pedestrian walkways.
- **Improve bicycle and pedestrian movement on the West Shore** – Several initiatives were highlighted here, including:
  - Create bicycle and pedestrian access across barriers such as US 11/15, limited access highways, and across railroad right-of-way.
  - Improve bicycle and pedestrian safety on US 11/15 in Lemoyne to Enola; explore the possibility of a West Shore river trail.

Walnut Street Bridge Span Replacement Options

A February 2010 study by the Cumberland County Redevelopment Authority assessed the feasibility of and alternatives for replacing three spans of the Walnut Street Bridge that were destroyed during a 1996 flood, with the goal of reopening the full crossing for use by bicyclists and pedestrians. The report highlights advantages of restoring the spans, including:

- Re-establishing a pedestrian link between the river's east and west shores.
- Re-establishing a missing link to access recreational opportunities on City Island.
- Connecting the Capital Area Greenbelt to the West Shore.
- Promoting alternative modes of transportation and active recreational opportunities.
- Promoting economic development within Wormleysburg.
- Increasing the community's tax base.

The study considered two options for addressing the 525-foot gap in the bridge's western spans: new construction of the missing spans or using spans from a "surplus bridge" to repair the Walnut Street Bridge. A surplus bridge is one typically deemed as unsuitable for vehicular use.

A cost estimate developed in 1998 by engineering firm Modjeski and Masters, Inc., and cited in the 2010 study, estimated new construction at $10.78 million. This estimate was revised in 2003 to include a western approach ramp and an adjustment for inflation, resulting in a new estimate of $14.38 million.

The study identified the Pond Eddy Bridge in Pike County as the only viable surplus bridge available that met criteria necessary for span replacement on the Walnut Street Bridge. The bridge is of the correct length to connect the existing bridge spans and of similar construction and appearance.

The Walnut Street Bridge Evaluation Study—Western Spans

Several months after a January 1996 flood destroyed three of the Walnut Street Bridge's western spans, PennDOT funded a study to identify alternatives for their replacement. The engineering consulting team developed and studied 12 options as part of the alternatives analysis. These included enhancing the adjacent Market Street Bridge for pedestrian and bicycle traffic, and using the CAT Bridge. These options (and their estimated costs) are shown on Table 1.

Table 1: Walnut Street Bridge Study Options Considered

Option	Description	Estimated Cost (in millions of 1997 dollars)
A	Replace the missing spans in-kind and rehabilitate the remaining spans. The resulting appearance would match the Baltimore study original bridge structure and would require using original materials and design.	$11.88
B	A modification of Option A, in that Option B would replace the missing spans with modern materials and details and rehabilitate the remaining structures and piers. The appearance of the trusses would be slightly heavier than the original design.	$10.78
C	Replace the missing spans with a steel I-girder bridge and rehabilitate the remaining spans and piers.	$9.72
D1	Replace the spans with a pre-stressed concrete I-beam bridge and nine concrete piers.	$6.82
D2	Use a steel I-girder bridge and seven concrete piers.	$7.4
D3	Replace all western spans with a long span truss bridge and seven concrete piers.	$13.9
D4	Construct a cable-stayed bridge, with cables leading from the bridge to supporting towers.	$17.0
D5	Use the same bridge as Option D2 but incorporate timber decking.	$8.47
E	Modify the Market Street Bridge to accommodate bicyclists and pedestrians rather than repairing the Walnut Street Bridge. This option would involve widening the Market Street Bridge sidewalk and installing protective fencing for the entire length of the bridge.	$2.52
F	Use the CAT Bridge for pedestrian/bicycle accommodation instead of repairing the Walnut Street Bridge. Work would include clearing of the wooded lot at the western abutment of the CAT Bridge.	$3.85
G1	Group all the trusses together in the center and construct a girder-type bridge at either end.	$12.0
H	A “no-build” option, required to be studied in order to maintain compliance with the National Environmental Policy Act (NEPA). The no-build option would require removal of the remaining trusses between the West Shore and City Island for safety reasons.	$0.575

Source: PennDOT District 8-0

The study concluded that Option B is the preferred option, as it helps maintain the bridge’s historic integrity, but at a slightly lower cost than using original materials.

Option F—involving the CAT Bridge—was cited for its intermodal potential in providing future access to Lemoyne. However, the role of CAT and its CORRIDOR*one* initiative (discussed below), clouded the bridge's future as an alternative to be considered for implementation. Among the 12 alternatives considered by the study, Option F finished a distant second in voting by members of the study's 13-member Community Advisory Committee.

CORRIDOR*one* Planning Studies

The CAT Bridge has been the subject of numerous studies over the past 20 years, given its role as the centerpiece of CAT's plan to introduce regional rail service to the region. In the early 1990s, CAT identified the need for improved public transit services due to increasing highway congestion, population growth, expanding land development patterns, and regional commuting patterns. In response, CAT began a series of planning and engineering studies to develop a future vision of transit services for the Greater Harrisburg region and to define the role and dimensions of transit service in the region.

The scope of the studies has varied over the years, beginning with the 1993 Transit Alternatives Study. The second phase of that study identified commuter rail between Harrisburg and Lancaster (named CORRIDOR*one*) as CAT's initial priority. Subsequent studies, including the 1998 Transportation Investment Study (TIS), selected regional rail as the locally preferred alternative. By 2002, the CAT Board had selected the corridor segment from East Mechanicsburg to Lancaster via Harrisburg as the Minimum Operating Segment (MOS), or initial operating phase. That year also saw the development of a Transitional Analysis, conducted as part of an application to the Federal Transit Administration (FTA) for funding to begin preliminary engineering. The scope of the Transitional Analysis included a detailed engineering inspection of the CAT Bridge, which found no scouring (erosion of soil around the pier foundations) or other major structural deficiencies to the bridge's substructure. This finding in effect reduced the estimated cost to rehabilitate the bridge by $10 million.

The study also estimated that the capital cost of constructing the MOS would be more than $75 million, with an estimated annual operation and maintenance cost of $33 million. In contrast, CAT's operating and maintenance costs for its fixed-route bus system was only $7.5 million at that time.

In 2006, Cumberland County scuttled plans to extend the rail line into Cumberland County, and the state—citing the annual operating deficits that would be incurred by operating the regional rail service—did not provide the funding commitment needed to win federal approval for proceeding to final design.

Table 2 presents an overview of the major studies that have been conducted over the past two decades involving the CAT Bridge and CORRIDOR*one*.

Table 2: CORRIDOR*one* History

Milestone	Year	Result
Transit Alternatives Study	1993	Major regional transit corridors identified.
Phase II Transit Alternatives Study	1996	CORRIDOR*one* selected as first priority out of seven regional corridors for long-term transit improvements.
Transportation Investment Study	1998	Regional Rail selected as the locally preferred alternative—strongly supported by the public.
New Starts Application	2001	CORRIDOR*one* regional rail concept presented to FTA as the preferred alternative for transit improvements in the region.
Transitional Analysis	2002	Responded to FTA's request for further cost and technical analysis, including inspection of CAT Bridge substructure, with the objective of initiating preliminary engineering.
Preliminary Engineering	2006	Provided detailed descriptions of major elements of the CORRIDOR*one* project.

Source: Gannett Fleming

Cumberland County Comprehensive Plan

Cumberland County's most recent comprehensive plan, adopted in 2003 (with updates in 2011), is somewhat dated as it looks ahead to the potential of CORRIDOR*one* and regional rail service in the Greater Harrisburg area. Still relevant, though, is the plan's discussion on potential rail service on the CAT Bridge and associated Shippensburg Secondary, and the need to coordinate rail line modifications/improvements on the proposed CORRIDOR*one* route with Capital Area Transit. The plan references CORRIDOR*one*'s original plans to use Norfolk Southern's existing Shippensburg Secondary line, and the businesses that would potentially be affected by the addition of passenger service.

The plan recommends promoting public transportation and further considering CORRIDOR*one* and other transit alternatives as one means of relieving traffic congestion in the county and region. A recommendation focused on rail freight documents the importance of Cumberland County leaders being actively involved in discussions related to CAT, Norfolk Southern, and CORRIDOR*one*, to ensure that any proposed improvements benefit all parties.

Dauphin County Comprehensive Plan

The Dauphin County plan does not include any specific pedestrian/bicycle projects within the study area, yet it does reference HATS' 2030 RTP and the importance of planning for bicycle and pedestrian needs as a critical element of the county's overall transportation system. The plan recognizes the Capital Area Greenbelt as an important pedestrian/bicycle facility in the county, and three of the Connections Study bridges (Harvey Taylor, Walnut Street, and Market Street) are recognized as part of the county's pedestrian/bicycle network. Among the plan's many findings is: "Poor pedestrian/bicycle access into downtown Harrisburg."

> Access into many parts of the City of Harrisburg…is restricted to a small number of bridge overpasses and underpasses. This impedes the flow of all highway-based transportation modes and further impacts bike/pedestrian transportation by forcing users to utilize highways that are heavily used and often congested. Some of these highways…have significant shoulder and/or sidewalk issues, discouraging many potential bike/pedestrian users into using motorized transportation, which further exacerbates congestion and also safety-related bike/pedestrian problems.
>
> Dauphin County Comprehensive Plan, 2008

Specific recommendations in the plan pertaining to the Connections Study include one that recommends the encouragement, development, and preservation of greenways, rail/trails and open space so that users of non-motorized transportation can use them for both transportation and recreational benefit without having to encounter motorized traffic.

Imagine West Shore Joint Comprehensive Plan

Imagine West Shore was a collaborative planning effort among the communities of Camp Hill, Lemoyne, and Wormleysburg, in part to "realize the communities' vision of serving as the gateway to the West Shore." One of the planning elements of the joint plan included an assessment of the communities' transportation future, which identified the following transportation issues:

- The Walnut Street Bridge should be reopened to pedestrians or should be removed altogether if it is not replaced.
- The Lemoyne Bottleneck provides direct access to the Market Street Bridge, City Island, and Harrisburg. The commuter route is heavily traveled and is poorly lit, narrow, and subject to periodic flooding. The narrow sidewalks at the two railroad bridges are a safety concern.
- The Lemoyne Connector will require a grade-separated crossing to preserve the future viability of the CAT Corridor.
- CORRIDOR*one* should continue to be planned for. Bus Rapid Transit (BRT) should be considered until a rail option is ready.
- There is a choke point along US 11/15 due to the Harvey Taylor Bridge ramps between Pine Street and Edna Street.
- The railroad crossing at Stella Street is a regional issue. The intersection is congested during the PM peak. The lack of signals at Second Street and Front Street contributes to confusion at the intersection. Congestion can result in traffic queuing back onto the Harvey Taylor Bridge during the PM peak period. The use of ITS with traveler information to inform roadway users of blockages would allow for planned use of other routes.
- Conduct a roadway safety audit review (RSAR) to identify and prioritize safety issues.

Imagine West Shore Joint Comprehensive Plan, 2010

One of the plan's four transportation strategies specifically lists the Walnut Street Bridge: "Determine if there is interest and if it is feasible to repair the Walnut Street Bridge that links pedestrian and bicycle traffic in the…region to City Island and Harrisburg." Related to this were "seeking ways to increase safety for pedestrians on the Market Street Bridge."

Existing Conditions Analysis

As part of the existing conditions analysis, civil engineers conducted several data collection activities to assist in the development of near-, mid-, and long-term improvements and/or alternatives for each bridge. The following data collection activities were conducted:

- Origin/destination survey of users on the Market Street Bridge
- Roadway safety audit of bridges and approaches
- Vehicle/pedestrian counts to analyze operations
- Bridge structural characteristics evaluation
- Environmental conditions analysis

Summaries of each activity are discussed below.

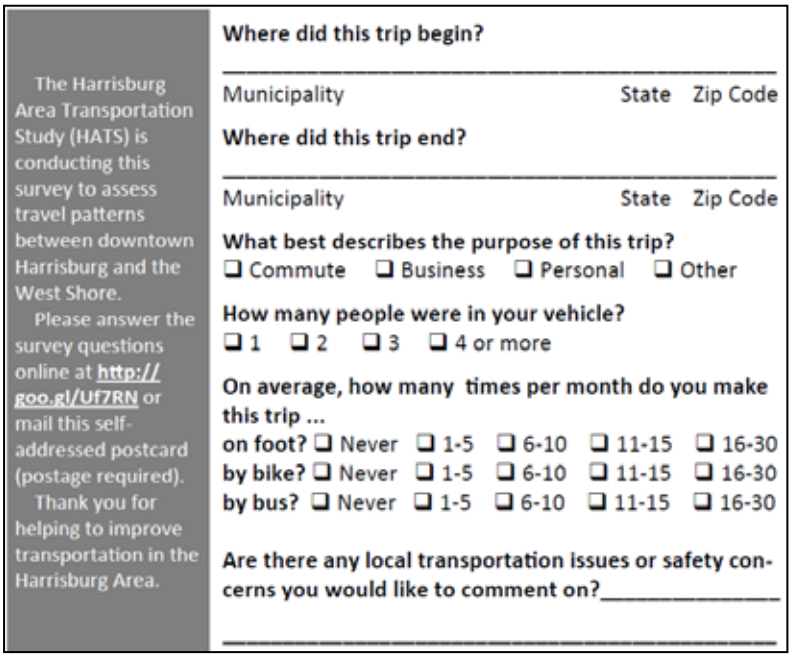
Origin/Destination Survey

Part of the study's data collection effort involved an origin/destination (O/D) survey of users of the Market Street Bridge. The purpose of the O/D survey was to determine how the bridge is currently being used (trip types), and how many trips could potentially be diverted onto an improved Walnut Street Bridge or an improved CAT Bridge. The survey itself was conducted during the AM peak period (6 a.m.–9 a.m.) on Thursday, September 13, 2012. Prior to conducting the survey the study team provided a press release to the news media, and area police forces were contacted for their general awareness.

The weather the day of the survey was seasonable, with partly cloudy skies and temperatures in the low 70s. The interviewing staff positioned themselves at both ends of the bridge to intercept motorists, pedestrians, and bicyclists heading in both directions. They provided 3x5 post cards for respondents to complete a simple six-question survey regarding their trip characteristics. Respondents had the option to complete the survey online. Postcards were also placed on the windshields of vehicles parked on City Island at the end of the AM peak survey period. Given the bridge's annual average daily traffic (AADT) of 12,000, traffic volumes could be estimated at just over 2,000 vehicles during the three-hour peak period. Survey teams distributed a total of 1,790 postcards, and the study team received 231 survey responses—a return rate of 12 percent. With this type of survey, response rates as low as 10 percent are considered acceptable.

Figure 2 displays the survey postcard; a summary of the results follows.

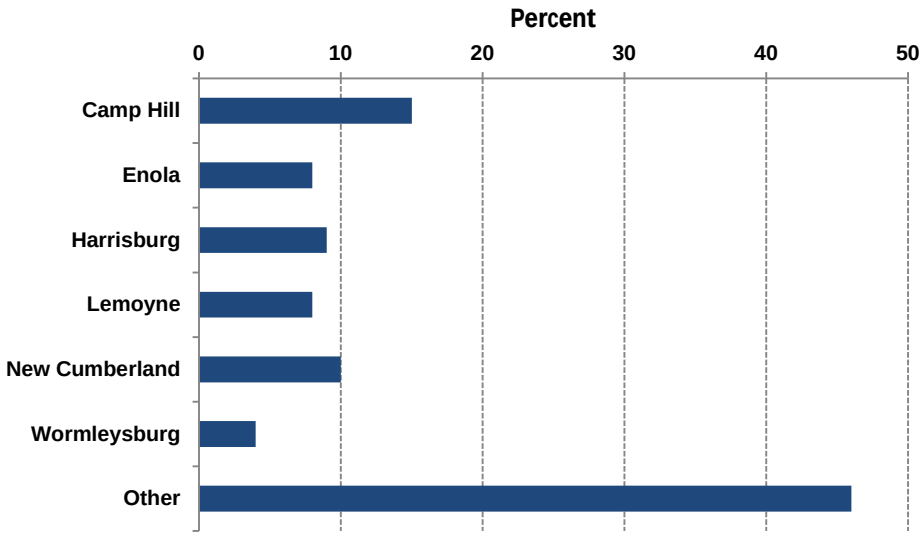
Figure 2: Origin/Destination Survey Postcard



Source: Gannett Fleming

The survey asked bridge users to identify where their trip originated. The web-based survey allowed seven possible responses, including the six communities that are within the study area. As shown on Figure 3, for bridge users, a majority of trips (15 percent) originated in Camp Hill, with an additional 10 percent each from Harrisburg, New Cumberland, and Mechanicsburg.

Figure 3: Market Street Bridge Users - Trip Origin

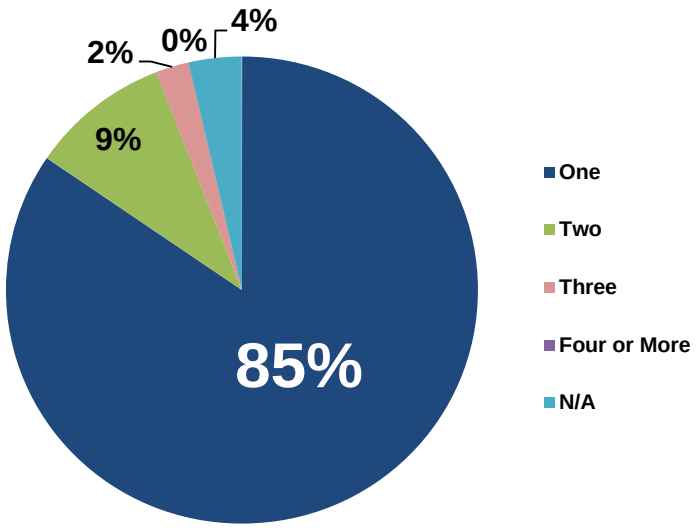


Source: Gannett Fleming O/D Survey

By far the most common destination of bridge users was downtown Harrisburg, with 72 percent reporting the city as their destination. For those headed westbound, "Lemoyne" was the most common response, at 8 percent, followed closely by Camp Hill, at 6 percent. The most common trip type on the bridge was commuting, at 76 percent of all bridge users. An additional 17 percent indicated their trip was for business purposes, while 6 percent said it was for personal reasons.

A majority of vehicles on the Market Street Bridge were single occupant vehicles, as evidenced by responses to question 4: "Including yourself, how many people were in your vehicle?" (Figure 4). Of the 231 users who responded to the survey, only eight were bicyclists or pedestrians. (An additional eight parked on City Island and walked to their final destination.)

Figure 4: Market Street Bridge Users: Vehicle Occupancy



Source: Gannett Fleming O/D Survey

A final question was open-ended, and allowed survey respondents to comment on local transportation issues and concerns. The survey asked, "Are there any local transportation issues or safety concerns you would like to comment on?" A distilled, representative summary of open-ended comments follows:

Public Transportation

- **Safe Parking** – "To provide bus service for the West Shore you would need to have safe parking for commuters so that people could drive from their subdivisions to the bus stops. Leaving your car unattended at a shopping plaza for 8 to 10 hours could be dangerous."

- **Frequency/Accessibility** – "More buses and times available to and from West Shore, specifically the Wormleysburg area. Not many options for commuters that work till 5:00."
- **Additional Service** – "Change and add a bus schedule for New Cumberland Fri. 5am-7pm and weekends."

Bicycle Concerns

- **Bridge Safety** – "Crossing the Market Street Bridge to travel back and forth between Camp Hill and Harrisburg is not optimal. Using the road is dangerous because of traffic volume and lack of a bike lane across the bridge and lack of a bike lane going up through the 'bottleneck.' Traversing the bridge on the sidewalk is not much better. The west side is very narrow and forces bicyclists and pedestrians into unsafe passing situations."
- **Designated Bicycle Routes** – "The bike riders need a separate lane through the bottleneck and across the bridge. They also need to learn to obey the rules. Maybe a bike test is needed in order to ride."
- **Share the Road** – "Bicyclists should not be permitted to use the vehicular lanes. It is very dangerous for both bicyclists and vehicles. This also creates backlogs due to vehicles trying to pass them. I see this happening almost every day. With good weather more people on bicycles—this causes traffic hazards along the Market Street Bridge and into Lemoyne."
- **Roadway Markings** – "Painted stencils on roadway alerting cars to presence of bicycles is faded and needs repainted and would be best if it also appeared on westbound side of bridge as you leave Harrisburg."
- **Bottleneck Safety** – "Bicycling the bottleneck is an issue. Pedaling across Market Street is unnerving. The Harvey Taylor Bridge is the best with the new dividers but out of the way."
- **Systemic** – "Whenever possible, the needs of bicyclists should be considered. Wider streets and paved shoulders would make it easier for those of us who commute, and encourage more people to ride."
- **Bridge Safety** – "I think many, many more people would like to bike if it was a little more safe."

Pedestrian Concerns

- **Safety** – "The railings on the sides of the Market Street Bridge could be a little higher. There needs to be a barrier on Market Street to protect pedestrians from cars."
- **Visibility** – "It is sometimes difficult to see pedestrians crossing Market Street between 2nd and Front streets."
- **Sight Distance** – "The pedestrian walk in front of the Rock Bass is so close to the intersection that drivers do not see pedestrians until they are right on them. The placement of the walkway causes huge congestion at the intersection, especially as to traffic flowing upriver."
- **Roadway Markings** – "Pedestrian walkways on the Wormleysburg side of the river are extremely dangerous. Walking across Market Street (E-W and N-S) is difficult. Traffic is steady and markings are not distinct."

Traffic Safety & Operations

- **Enforcement** – "Have people slow down and stop speeding, using cell phones and running red lights!"
- **Traffic Platoons** – "Traffic on North Front in Harrisburg has to be broken up with more traffic lights—speeds are way too high and law enforcement is next to non-existent."
- **Safety Violations** – "There is a safety concern involving those who do not follow the NO LEFT TURN on Market/Front. There are times in the morning and evening that people ignore it and will turn left right in front of you with no consideration to oncoming traffic."
- **Traffic Signals** – "The traffic backs up terribly over the Market St Bridge. I think the light after the bridge near the court house has something to do with it. The light only allows 2-3 cars to go through at a time and the other turn of light for the other pedestrians gets 5-8 cars through. The light timing for that area needs revamped."
- **Sight Distance** – "We turn right from the Market St Bridge onto Front St in order to go south. It is hard to see the Front St traffic due to the large bridge pillar that obstructs the driver's view."
- **Lane Assignment** – "When they resurfaced Market Street in Lemoyne approaching the Market Street Bridge they switched the merge lanes prior to the stop light. Previously I believe the outside (right side) lane opened into both lanes crossing the bridge. Now the left lane opens into the middle lane so it handles both the traffic turning left and the traffic crossing the river. The left lane backs up every morning with traffic waiting to turn left at the light while people in the right lane wildly speed around the curve and dive into the middle lane from the outside (right) lane. Not sure why it was changed, but from my experience it worked better the way it was before."
- **Signal Coordination** – "I believe that synchronized traffic lights in the City of Harrisburg would help traffic to move more efficiently and safely. Chestnut Street is particularly bad."
- **Bridge Lighting** – "Market Street Bridge safety: half of bridge lights are out, damage to guide rail and steps never fixed from accident a year ago in City Island, bicycles on roadway, misalignment of roadway at City Island, and news trucks being permitted to park on sidewalks at east end of Market Street Bridge, causing pedestrians to step on to roadway to get around."
- **Lane Assignment** – "It would be really nice if there were a RIGHT TURN ONLY lane on the Market Street Bridge in Wormleysburg coming from Harrisburg."
- **Left Turns on City Island** – "Vehicles crossing the center line to access City Island when it is not ever necessary."
- **Drainage Concerns** – "There is poor drainage on the Market Street Bridge, especially in the right lane going westbound."
- **Visibility** – "Too much bicycle traffic on Market Street Bridge is hard to see, early mornings."
- **Vehicular Barriers** – "There should be a divider/guardrail between the two center lanes on the Market Street Bridge to safely separate east bound from west bound traffic."
- **Sidewalk Safety** – "Running/bike lanes and/or sidewalk on the Market Street Bridge are antiquated and not safe, especially in comparison to the Harvey Taylor Bridge. Either fix/update

these services for the Market Street Bridge, or renovate/revive the Wormleysburg link to City Island to carry all pedestrian/bicycle traffic into downtown. There are numerous benefits to this renovation."

- **High Posted Speeds** – "My main egress into the Capitol is by the Market Street Bridge. At City Island, I get off and take the Walnut Street Bridge, then Riverside Park to North and into the Complex. The Market Street Bridge is designated as Bicycle Route J, with a small and faded share-the-road sign on the pavement. There is no bike lane on the bridge and traffic flies by at 50 mph. Why isn't there a bike lane on the bridge and why is the speed limit on the bridge higher than on either end, especially when you are mixing bike and auto traffic? I never feel safe on the bridge, but that seems to be the only practical way in. The route up US 11-15 through Wormleysburg is equally dangerous with no bike lane or shoulder, a high speed crossing to get to the Harvey Taylor Bridge, and a poorly kept bike-pedestrian walkway to go across."
- **Pedestrian/bicycle Connectivity** – "On the west end of the Harvey Taylor, there's no natural flow for bikes to get to the street or to the west. It is as if the engineers were forced to put a walkway on the bridge at gunpoint, with no consideration of who would use it or where they would go on either end."

Regional Rail

- "The proposed light rail would be a great resource—I know I'm only one person, but if there was a light rail that came near Mechanicsburg and traveled downtown I'd ride it every day."
- "Regional rail would be lovely. It would be great if Americans would embrace it. I drive 6 miles each way and my commute home takes nearly 45 minutes."

Bridge/Pavement Condition

- **Maintenance Cycles** – "I believe over the last few years pockets of road in the Harrisburg area have deteriorated without being repaired on their normal schedule."
- **Pavement Conditions** – "Pennsylvania as a whole should focus more on smoother/even road surfaces that cause damage to tires and underbodies of cars. We seem to have the most issues with potholes and road damage compared to surrounding states (Maryland for example) which has high quality roads."
- **Roadway Surface Quality** – "Road quality on Market Street Bridge Eastbound has a long gash in the left lane that should be patched. It is before and slightly into the second half of the span."
- **Prioritize Bridges over Roadways** – "Our bridges are in bad shape and need to be repaired. The roads should be second priority being the bridges are over water."

City Island/Parking

- **City Island Parking** – "City Island parking was so much better and more convenient when we could park on the other side closer to the foot bridge. It adds an extra 8 minutes to every day of my day-to-day routine."

- **Enforce NO LEFT TURN** – "There should be no left turns onto City Island."
- **City Island Median** – "Someone should build a median on Market Street across City Island to stop people from making left turns into and out of the island. They also love making U-turns back into the city which is dangerous."

Walnut Street Bridge

- "The Walnut Street Bridge on West Shore side should be repaired to be available for walkers. Market Street Bridge is not safe in hazardous weather—sidewalks not de-iced/shoveled, etc. Bikers should have their own lane, also."

Miscellaneous

- "If you toll the bridge to Harrisburg from the West Shore I and many like me will do everything in our power to avoid this toll."
- "Prohibit all deliveries to business and government buildings during rush hour. I've been stuck on Market Street Bridge already, traffic backed up to City Island at rush hour in the morning because a Coke truck was making deliveries to the Dauphin County Courthouse."
- "The expansion plates on the Harvey Taylor Bridge are three times as wide as they need to be and make for a very bumpy ride."
- "Some concern regarding angry homeless people I have come in contact with on my travels."
- "We need to pass a significant highway funding bill."
- "Please try to not fix every bridge at the same time."

Roadway Safety Audit

Projects to improve the use of the bridges should enhance safety for motorists, pedestrians, and bicyclists. The consulting team conducted a road safety audit in the vicinity of each bridge. Top roadway safety concerns included:

- Sidewalks ending abruptly, narrow, or non-existent
- Lack of safety barrier between sidewalk and driving lane
- Poor or missing signs
- Faded pavement markings
- Inadequate accommodation (such as curb ramps) for people with disabilities
- Poor lighting at night
- Uneven road surface
- Poor drainage, snow/ice obstructions
- Poor pedestrian/bike connectivity between Wormleysburg and Lemoyne

The audits are intended to provide a general overview of safety conditions. Although the audits identified numerous safety concerns, they do not necessarily identify all roadway concerns. A safety audit is NOT an inspection, but rather a proactive approach to identify common safety issues.

A sample of several safety concerns identified is provided in Table 3. Refer to the appendices for a list of each safety concern along with its respective countermeasure.

Table 3: Roadway Safety Audit Summary

Location	Image	Existing Condition/ Preferred Condition
Camp Hill By-pass at Second Street (North Side)		Pedestrian tunnel is provided underneath the Harvey Taylor Bridge but no signage is provided directing pedestrians or cyclists to it. Install guide signing to pedestrian underpass.
Harvey Taylor Bridge		Shared-use path pavement markings are faded on both sides. Replace shared-use pavement markings.

Location	Image	Existing Condition/ Preferred Condition
Forster Street at Front Street		No lane use signs are provided on the eastbound approach, which can create driver confusion and a safety concern. Install lane use signs on the bridge for the eastbound approach.
Market Street at Front Street (Wormleysburg)		Sidewalks are narrow along Market Street within the Lemoyne-Wormleysburg bottleneck. Widening is not feasible due to the narrow roadway and numerous railroad bridge abutments.
East Shore Riverfront		No connection is provided between Greenbelt and River Walk south of Harvey Taylor Bridge. Provide pedestrian accommodations to connect Greenbelt and River Walk.

Operational Analysis

The study team collected vehicular turning movement counts (TMCs) and pedestrian counts at various locations on Wednesday, September 12, 2012, and Saturday, September 15, 2012. The Wednesday counts were conducted between 6 a.m. and 9 a.m., 11 a.m. and 1 p.m., and 3 p.m. and 6 p.m. The Saturday counts were conducted between 9 a.m. and 3 p.m. All TMCs were tracked by 15-minute intervals.

The study team collected vehicular and pedestrian volumes to assess the existing operational conditions at the study area's four signalized intersections:

1. Harvey Taylor Bridge/Forster Street and Front Street (Harrisburg)
2. Walnut Street Pedestrian Bridge/Walnut Street and Front Street (Harrisburg)
3. Market Street Bridge/Market Street and Front Street (Harrisburg)
4. Market Street/Market Street Bridge and Front Street (Wormleysburg)

TMC volumes for each study intersection listed above are provided in the appendices. In addition to TMCs, automated traffic recording (ATR) devices were placed on the Harvey Taylor and Market Street bridges to obtain average daily traffic volumes. Table 4 summarizes the ATR data.

Table 4: Average Daily Traffic Volumes

Bridge	Direction of Travel	Number of Vehicles per Day
Harvey Taylor	Eastbound	16,066
	Westbound	17,478
Market Street	Eastbound	7,320
	Westbound	6,738

Source: Gannett Fleming

Figure 5: Harvey Taylor Bridge/Forster Street and Front Street (Harrisburg)

The intersection of Harvey Taylor Bridge/Forster Street and North Front Street (Figure 5) is a four-way signalized intersection with simple two-cycle phasing that is part of a coordinated system along Forster Street. The eastbound approach from the Harvey Taylor Bridge provides three through lanes with a shared channelized right-turn lane with yield control. The lanes vary in width, with the left lane flaring to allow side-by-side stacking of vehicles that are queuing for the dual left-turning lanes at the next intersection. The westbound approach of Forster Street provides two through lanes with turning movements prohibited. Motorists were observed violating the left turn restriction. North Front Street is a one-way, three-lane roadway directed south along the Susquehanna River with an additional channelized right-turning lane at the intersection. The lanes are narrow (10 feet to 11 feet wide) with no shoulders.

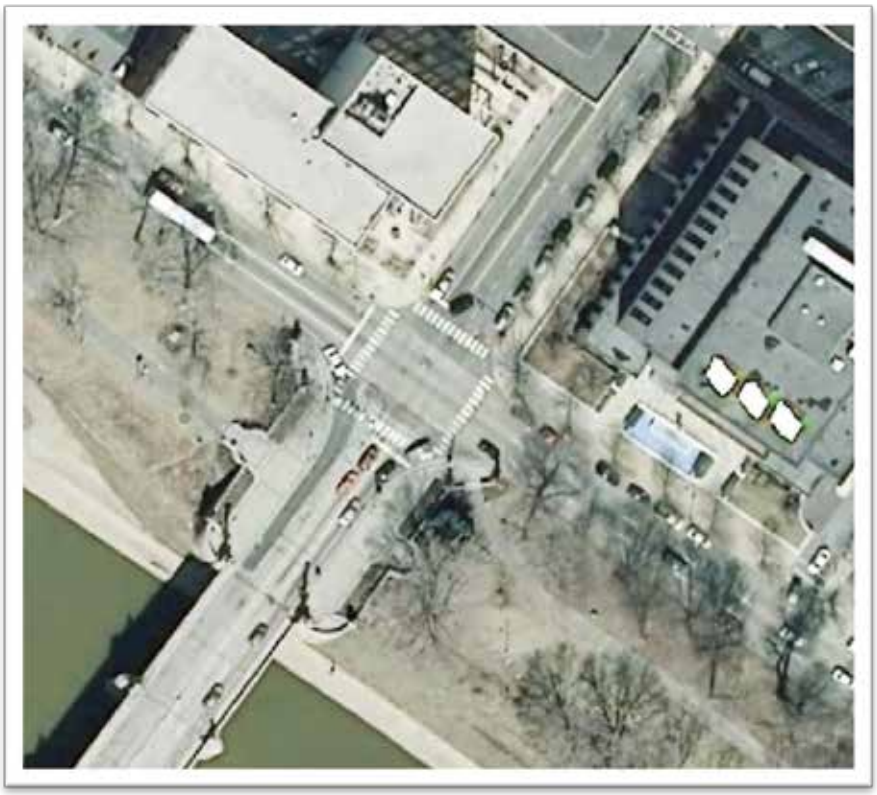
Pedestrian crosswalks are provided for all four legs of the intersection and a pedestrian phase is provided upon actuation. Pedestrian signal heads and sidewalks are provided on all approaches. The Capital Area Greenbelt runs parallel to Front Street between the Susquehanna River and Front Street.

Figure 6: Walnut Street Bridge and Front Street (Harrisburg)

The intersection of the Walnut Street pedestrian bridge/Walnut Street and North Front Street (Figure 6) is a three-way signalized intersection with simple two-cycle phasing that is part of a coordinated system along North Front Street. The westbound approach of Walnut Street is one-way and provides two left-turn lanes onto North Front Street. North Front Street is a one-way, three-lane roadway directed south along the river. The three lanes vary in width between 11 feet and 12 feet, with no shoulders, for a total roadway width of 34 feet.

Pedestrian crosswalks are provided across the southbound and westbound legs of the intersection and pedestrian signal heads are provided. Sidewalks are provided on both sides of all approaches in close proximity to the roadway.

Figure 7: Market Street Bridge and Front Street (Harrisburg)



The intersection of Market Street Bridge/Market Street and Front Street (Figure 7) is a four-way signalized intersection with simple two-cycle phasing that is part of a coordinated system along North Front Street. The eastbound approach from the Market Street Bridge provides a pair of 10-foot-wide through lanes with a shared right-turn lane. The westbound approach of Market Street provides two through lanes with turning movements prohibited. During the traffic count, motorists were observed violating the left turn restriction. The right lane is 12 feet wide and the left lane is 10 feet wide. Front Street is a one-way, three-lane roadway directed south along the river with a shared through right on the rightmost lane. The lanes vary between 12 and 13 feet wide, with no shoulders, for a total roadway width of 38 feet. The receiving lanes of Front Street south of the intersection narrow to 10 feet wide, as on-street parking is allowed along the south side of the roadway.

Pedestrian crosswalks are provided on all four legs of the intersection. Pedestrian signal heads and sidewalks are provided on all approaches.

Figure 8: Market Street Bridge and Front Street (Wormleysburg)

The intersection of Market Street/Market Street Bridge and Front Street (Figure 8) is a three-way signalized intersection with unique phasing due to the irregular orientation of the legs. The eastbound approach from Market Street provides a left-turn lane with protected phasing and two right-turn lanes. There are two sets of signal heads on the approach which provide a clearance interval so traffic does not become trapped between the two sets of signal heads. The left-turn lane is 16 feet wide and the right-turn lanes are each 13 feet wide. The westbound approach from the Market Street Bridge provides two 11-foot-wide left-turn lanes, the leftmost shared with the right-turn movement. The southbound approach of Front Street provides a 14-foot-wide right-turn lane and an 11-foot-wide left-turn lane. The right-turn lane operates with a protected overlap phase concurrent with the eastbound left turn.

Pedestrian crosswalks are provided across the southbound and westbound legs of the intersection and a pedestrian phase is provided upon actuation. Pedestrian signal heads and sidewalks are provided on all approaches.

Level of Service Analyses

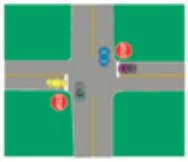
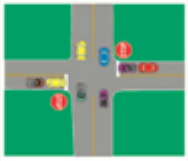
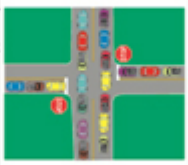
An operational analysis was performed using Synchro 8 traffic analysis software to measure the Level of Service (LOS) at each intersection. LOS is a qualitative measure of intersection performance. Letters are assigned to correspond with different delay thresholds, as detailed in Figure 9. In general, LOS A and B are considered excellent or good, LOS C (rural area) and D (urban area) are acceptable, and LOS E and F are unacceptable. A LOS D or better as defined by the Transportation Research Board's *Highway Capacity Manual* for a signalized intersection is an average control delay of less than 55 seconds per vehicle. Control delay is defined as the total delay experienced by a vehicle negotiating an intersection: deceleration, queuing, stopped time, and acceleration back to regular travel speed.

Figure 9: Levels of Service

The Definition of Quality and Levels of Service

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Level of Service (LOS)

LOS	Roadway Sections		Signalized Intersection		Unsignalized Intersection	
A		Free-flow conditions. Vehicles unaffected by other vehicles. Movement within the traffic stream is good. Minor disruptions to flow are absorbed without change to speed.		Very low delay, less than 10.0 sec. per vehicle. Most vehicles arrive during the green phase. Most vehicles do not need to stop.		Delays less than 10.0 sec. per vehicle. Little or no delay to minor street traffic.
B		Free-flow conditions. Other vehicles become more noticeable. Less freedom to maneuver. Minor disruptions to flow are absorbed, although local deterioration in LOS is more obvious.		Delay in range of 10.1 to 20.0 sec. per vehicle. More vehicles stop than LOS A.		Delay in range of 10.1 to 15.0 sec. per vehicle. Short traffic delays to minor street traffic.
C		Traffic density on roadways become noticeable. Traffic becomes affected by other vehicles. Travel speeds may become reduced. Queuing occurs with serious traffic disruption.		Delay in range of 20.1 to 35.0 sec. per vehicle. Number of vehicles stopping is significant. Cycle failures may begin to appear.		Delay in range of 15.1 to 25.0 sec. per vehicle. Average traffic delays to minor street traffic.
D		Movement becomes restricted due to traffic congestion. Speed is reduced by increasing traffic. Minor disruptions can be absorbed without extensive queues forming and the service deteriorating.		Delay in range of 35.1 to 55.0 sec. per vehicle. Congestion more noticeable. Many vehicles stop. Cycle failures noticeable.		Delay in range of 25.1 to 35.0 sec. per vehicle. Long traffic delays to minor street traffic.
E		Operations at or near capacity. Minimum spacing for maintaining uniform flow. Speeds are highly variable and unpredictable.		Delay in range of 55.1 to 80.0 sec. per vehicle. Cycle failures frequent.		Delay in range of 35.1 to 50.0 sec. per vehicle. Very long delays to minor street traffic.
F		Forced or breakdown flow. Vehicle speeds are less then 30 mph. Complete congestion.		Delay in excess of 80.0 sec. per vehicle. Delay unacceptable to most drivers. Many cycle failures.		Delay in excess of 50.0 sec. per vehicle. Extreme delays with queuing. Congestion affects other intersections. Warrants improvement to intersection.

Gannett Fleming

Results of the Synchro analysis are shown in the following tables.

Table 5: LOS Harvey Taylor Bridge/Forster Street and Front Street (Harrisburg)

Intersection		Existing AM	Existing Mid-day	Existing PM	Existing Saturday
1. Harvey Taylor Bridge/Forster Street and North Front Street	Eastbound	C	B	C	A
	Westbound	B	B	D	B
	Northbound	-	-	-	-
	Southbound	F	C	F	B
	Overall	F	C	E	B
	Delay (in seconds)	101.8	21.7	55.8	11.8

Source: Gannett Fleming

The results of the operational analysis indicate that the intersection does not function at an acceptable LOS during the existing AM and PM peaks (Table 5). The southbound approach in particular experiences most of the delay and operates at an LOS F during the AM and PM peaks.

Table 6: LOS Walnut Street Pedestrian Bridge/Walnut Street and Front Street (Harrisburg)

Intersection		Existing AM	Existing Mid-day	Existing PM	Existing Saturday
2. Walnut Street Pedestrian Bridge/Walnut Street and North Front Street	Eastbound	-	-	-	-
	Westbound	C	B	C	A
	Northbound	-	-	-	-
	Southbound	A	C	C	B
	Overall	A	C	C	B
	Delay (in seconds)	7.0	27.7	23.0	11.2

Source: Gannett Fleming

The results of the operational analysis indicate that the intersection functions at an acceptable LOS during all existing peaks (Table 6).

Table 7: LOS Market Street Bridge/Market Street and Front Street (Harrisburg)

Intersection		Existing AM	Existing Mid-day	Existing PM	Existing Saturday
3. Market Street Bridge/Market Street and North Front Street	Eastbound	E	C	D	B
	Westbound	C	C	C	B
	Northbound	-	-	-	-
	Southbound	A	B	D	B
	Overall	C	B	D	B
	Delay (in seconds)	27.2	17.3	43.8	14.1

Source: Gannett Fleming

The results of the operational analysis indicate that the intersection functions at an acceptable LOS during all existing peaks; however, the eastbound approach operates at an LOS E during the AM peak, which is not acceptable (Table 7).

Table 8: LOS Market Street Bridge/Market Street and Front Street (Wormleysburg)

Intersection		Existing AM	Existing Mid-day	Existing PM	Existing Saturday
4. Market Street/Market Street Bridge and South Front Street	Eastbound	C	B	C	B
	Westbound	B	B	D	B
	Northbound	-	-	-	-
	Southbound	C	B	D	B
	Overall	C	B	D	B
	Delay (in seconds)	23.3	15.6	43.1	14.2

Source: Gannett Fleming

The results of the operational analysis indicate that the intersection functions at an acceptable LOS during all existing peaks (Table 8).

Pedestrian/Bicycle Demand

Data collected by the study team during the turning movement counts show that more than 1,200 bicyclists and pedestrians use the study area river crossings during the peak periods. This includes the Harvey Taylor, Market Street, and Walnut Street bridges. Table 9 and Table 10 show the variation in demand for travel among bicyclists and pedestrians on the three bridges on both a weekday and weekend, respectively.

Table 9: Current Bicycle and Pedestrian Volumes (by weekday peak periods)

Bridge	AM	Mid-day	PM	Total
Harvey Taylor	90	110	200	400
Walnut Street	150	360	80	590
Market Street	100	60	80	240
Total	340	530	360	1,230

AM peak period is 6 a.m. to 9 a.m., mid-day peak period is 11 a.m. to 1 p.m., PM peak period is 3 p.m. to 6 p.m.
Source: Gannett Fleming

Table 10: Current Bicycle and Pedestrian Volumes (Saturday, 9 a.m. to 3 p.m.)

Bridge	Total
Harvey Taylor	150
Walnut Street	1,170
Market Street	130
Total	1,450

Counts taken on September 15, 2012, with activities on City Island
Source: Gannett Fleming

Structural Characteristics

This section of the report outlines the structural characteristics of the four bridges, with a special emphasis on the CAT Bridge.

Table 11 outlines the various structural characteristics of the four study area bridges, based on various bridge elements, including:

- Year constructed
- Year rehabilitated
- Bridge type
- Length
- Traffic lanes
- Sidewalks
- Sidewalk protection

Table 11: Bridge Structural Characteristics

Bridge	Harvey Taylor	Market Street East Spans	Market Street West Spans	Market Street over City Island	Walnut Street West Spans	Walnut Street East Spans	CAT Bridge
Year Constructed	1951	1928	1928	1928	1890	1890	1915
Year Rehabilitated	2001	1962	1962	2005		1996	
Type	Steel two-girder system with floor beam and stringer, concrete deck	Concrete arch	Adjacent prestressed concrete box beams	Spread prestressed concrete box beams	Truss	Truss	Concrete arch
Length (in feet)	4,219	1,415	1,426	75	1,400	1,420	4,000
Traffic Lanes	Eastbound: Two 11'-0" traffic lanes with 2'-0" shoulder Westbound: Two 11'-0" traffic lanes with 2'-0" shoulder	Eastbound: Two 10'-0" traffic lanes with no shoulder Westbound: Two 10'-0" traffic lanes with no shoulder	Eastbound: Two 10'-0" traffic lanes with no shoulder Westbound: Two 10'-0" traffic lanes with no shoulder	Eastbound: Two 10'-0" traffic lanes with 4'-0" shoulder Westbound: Two 10'-0" traffic lanes with 2'-0" shoulder	N/A	N/A	27'-0" ballasted track way

Bridge	Harvey Taylor	Market Street East Spans	Market Street West Spans	Market Street over City Island	Walnut Street West Spans	Walnut Street East Spans	CAT Bridge
Sidewalks	8'-0" sidewalk on each side	6'-0" sidewalk on each side	4'-7" sidewalk on each side	7'-0" sidewalk on each side	Pedestrian/bicycle-only 12'-0" open grid deck lane, 6'-0" concrete sidewalk	Pedestrian/bicycle-only 12'-0" open grid deck lane, 6'-0" concrete sidewalk	3'-6" sidewalk on each side
Sidewalk Protection (separation from motorized traffic)	4'-6" high pedestrian railing on outside, 4'-6" concrete barrier w/ railing between sidewalk and traffic lane	4'-0" high concrete barrier on outside, 8"curb between sidewalk and traffic lane	3'-0" high pedestrian railing on outside, sidewalk is elevated 1'-5/8" above traffic lane with curb 2'-3" higher than traffic lane	3'-6" high concrete barrier on outside, curb between sidewalk and traffic lane	Closed to all traffic	Closed to vehicular traffic	3'-0" high open metal railing on outside

Source: PennDOT and Gannett Fleming

CAT Bridge Inspection

In evaluating the proposed CORRIDOR*one* regional rail line, engineers inspected the CAT Bridge in March 2005. As part of this Connections Study, bridge engineers revisited the CAT Bridge in August 2012 to perform a cursory inspection and verify that bridge deterioration had not progressed significantly. Engineers updated the estimated rehabilitation costs from the 2005 In-Depth Inspection Report, with order-of-magnitude costs for potential future uses.

General Description

The original bridge, constructed circa 1840, was a 23-span wooden truss supported on stone masonry piers with span lengths varying from approximately 170 feet to 180 feet. Circa 1915, the Pennsylvania Railroad strengthened the original bridge by constructing new concrete piers mid-span between the old piers. The old stone masonry piers were lengthened and widened by encasing them in concrete. The existing bridge is a 48-span structure consisting of 45 concrete arch bridge spans and three steel through-girder type spans with floorbeams and a concrete deck. The current span numbering starts with the first concrete arch span at the east end of the structure. The arch spans have three different span lengths. These clear distances, measured from face to face of pier, are 69'-0", 74'-6", and 77'-0". This was accomplished by varying the encasement thickness covering the stone masonry piers. The intermediate piers were held to a 9'-0" thickness. There are high voltage electric conduits running in the upstream spandrel walls.

The original longitudinal profile of the tracks was a -0.5 percent grade from west to east (a slight downward slope from the West Shore to Harrisburg) amounting to a 20-foot difference in elevation over the length of the bridge. The total length of the bridge is approximately 4,000 feet.

Amtrak currently maintains a turnaround track on the east end of the bridge. The track extends onto the southern side of the east end for the first five spans. Overhead electrification for this track terminates at Pier 7. The two original tracks and ties have been removed except as noted above. According to Ivan Frantz, a member of the Pennsylvania Railroad Technical and Historical Society, the main train traffic on the bridge ended in 1980.

2012 Cursory Inspection Findings

For the cursory inspection conducted in August 2012, no specialized access equipment was used. A boat was used to view the piers and arches from the waterline. All inspection, in fact, was performed from the waterline.

The spall areas on the piers and the arches appear slightly larger than reported in 2005 (Figure 10). The growth of the spall is estimated at approximately 5-10 percent. The only area noted with significantly more spalling than reported in 2005 was the cap on the top of the spandrel walls. The 2005 report noted various spans with smaller spalled areas. However, the current inspection notes that the exterior of the cap, typically, has spalls and cracks with efflorescence throughout, as shown in the accompanying image.

Figure 10: Spalled Concrete Visible on CAT Bridge

In 2010, engineers removed delaminated and loose concrete on the spans over City Island (Spans 21 thru 24), which included the spans around the public boat access. Part of the hand railing on top of the structure was also removed and concrete patching was placed to anchor the concrete around the boat ramp, creating a safer environment for patrons launching boats.

As noted in the 2005 report and confirmed in the 2012 cursory inspection, the bridge is in satisfactory condition overall. After the rehabilitation (proposed in 2005 and awaiting funding) is completed, the structure will be able to carry a variety of passenger rail equipment and a limited range of infrequent freight and maintenance vehicles. A comparison of these loads with standard roadway HS loadings[1] confirms that the structure has sufficient capacity for two lanes of bus use.

In 2005, the inspection process involved a visual inspection of the entire structure, sounding all exposed concrete elements with a chipping hammer, noting areas of visible deterioration and/or hollow-sounding concrete, and collecting material samples for laboratory testing. An inspection crane (snooper truck) with a 50-foot reach allowed access to the structural components of the bridge. Two passes along the structure were made, one from the downstream side and one from the upstream side. Highlights from this particular inspection included:

- Overall **surface deterioration** was found to be more evident on the downstream (south) side of the structure. Spalling and surface cracking on this face is enhanced by frequent cycles of freeze-thaw action due to southern exposure.
- Incipient (early stages of) **spalling is a concern** both for boat traffic on the river and vehicle and pedestrian traffic on City Island. Delaminated areas of concrete have the potential to dislodge and fall.

[1] "HS loading" consists of a tractor truck with semi-trailer

- **Unauthorized pedestrian use** on the topside of the bridge was observed. There are no barricades or gates at the ends of the bridge. There is also a concern for public safety due to the advanced deterioration of the sidewalks and handrail on the structure.
- **Spandrel walls** – Spandrel walls are in good condition except for the top surface, which serves as a sidewalk.
- **Hand railing** – The steel hand railing has advanced section loss and requires replacement.
- **Arch ribs** – The concrete arch ribs are in satisfactory condition with some minor spalls and hollow areas. A full depth crack is present in the upstream (north) arch rib near the east end of the span. This portion of the bridge appears to have experienced an overload either from a heavy trainload, temperature-induced load, or a combination of those loads.
- **Drainage System** – The existing drainage system is in serious condition and is causing deterioration. Water running down the surface of the pier faces causes heavy spalling and deterioration.
- **Substructure** – Condition ranges from good to fair, with all elements being structurally sound. Loss of concrete due to ice abrasion on the upstream nose of the piers ranges from minor to very heavy. Underwater inspection reports found the submerged portions of the concrete piers to be in satisfactory condition.
- **Utilities** – Steel utility (catenary) poles that carry electric power and a fiber optic cable across the structure appear to be in good condition, except for the paint. Fiber optic cables are also buried in the ballast on the bridge and would need to be addressed as part of any rehabilitation work to the bridge.
- **Laboratory testing** – Engineers tested 49 core samples taken from various locations throughout the bridge. The overall quality and compressive strength of the concrete was judged to be good, yet it is susceptible to stress and further cracking due to cyclic freezing and thawing at critically water-saturated conditions.

Environmental Overview

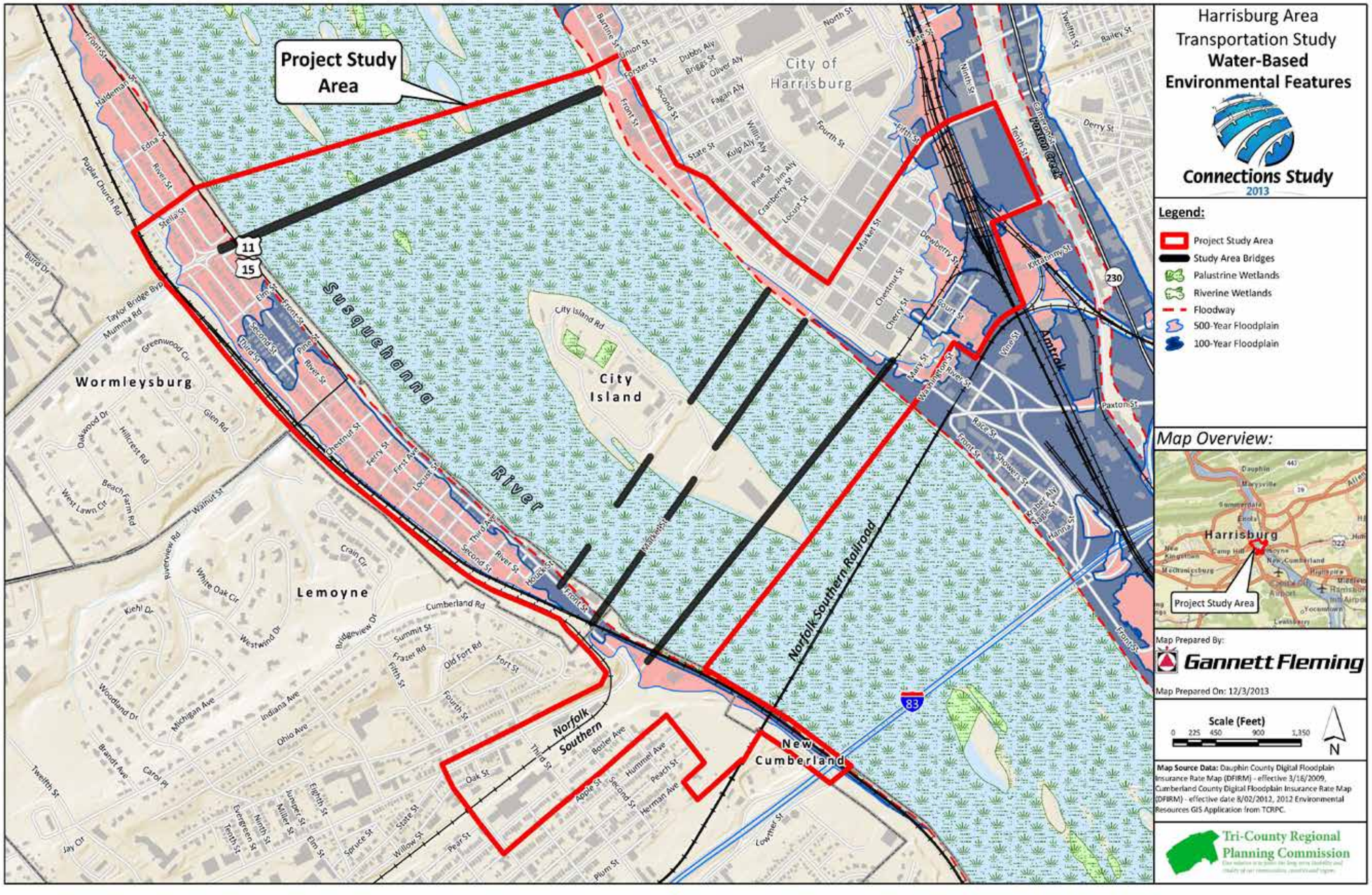
The Connections study area is predominantly urban as it encompasses portions of downtown Harrisburg adjacent to the Susquehanna River, City Island within the Susquehanna River, and portions of the boroughs of Wormleysburg, Lemoyne, and New Cumberland on the West Shore. Key environmental features within or adjacent to the study area were identified through secondary source information primarily derived from Tri-County Regional Planning Commission's (TCRPC's) Environmental Resources Geographic Information Systems (GIS) Application data layers, combined with field reconnaissance of selected areas and features to verify the secondary source information.

Natural Resources

Surface Waters

Surface waters within and adjacent to the study area are shown on Figure 11. The Susquehanna River is the predominant surface water feature in the study area. The Susquehanna River is approximately one mile wide within the study area and is designated by the Pennsylvania Fish and Boat Commission (PFBC) as a water trail. According to Chapter 93 of the Pennsylvania Code, the section of the Susquehanna River within the study area is designated as a warm water fishery (WWF) with migratory fishes (MF). A WWF designation indicates that the water body allows for the maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat. The MF designation indicates that the water body allows for the passage, maintenance, and propagation of anadromous and catadromous fishes and other fishes that move to or from flowing waters to complete their life cycle in other waters. On the West Shore, two unnamed tributaries to the Susquehanna River flow through Wormleysburg adjacent to both Walnut Street and the Camp Hill Bypass. These two unnamed tributaries to the Susquehanna River are also classified as WWFs with MF. Paxton Creek, a tributary to the Susquehanna River, lies east of the study area in Harrisburg. Paxton Creek is also classified as a WWF with MF.

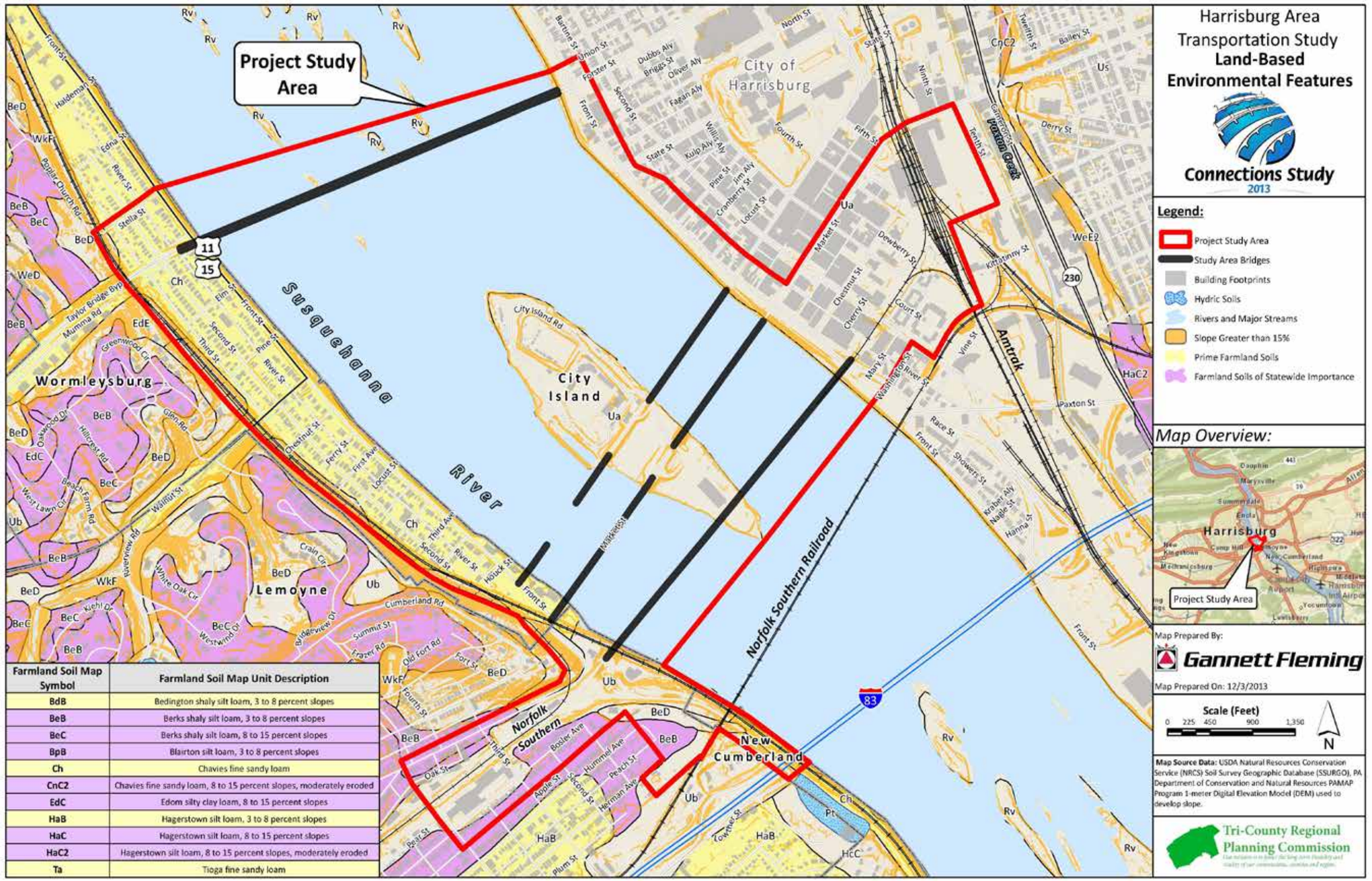
Figure 11: Water-Based Environmental Features



Wetlands

Wetlands present within and adjacent to the study area are shown on Figure 11. The wetlands shown on Figure 11 were obtained through TCRPC's Environmental Resources GIS application, which were derived from the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps. The Susquehanna River within its banks is identified as being riverine wetlands. Several palustrine wetlands are identified on islands within the Susquehanna River, including City Island. No other USFWS NWI-mapped wetlands are present in the study area, however, additional potential wetlands beyond those identified by the USFWS NWI maps may be present in and adjacent to the study area. Potential wetland areas may be present along the banks of the Susquehanna River, especially along the west bank in Wormleysburg, Lemoyne, New Cumberland, and around City Island; along unnamed tributaries to the Susquehanna River; along Paxton Creek; along drainage channels adjacent to rail corridors; and in areas with hydric soils. Hydric soils are one indicator of potential wetland areas and are shown on Figure 12. As shown in Figure 12 there are no areas of hydric soils identified within the study area, but there is one area immediately adjacent to the study area in New Cumberland. Further investigation of wetlands would be necessary for those potential improvement projects that would require ground disturbance outside of the existing bridge or roadway footprint in the vicinity of USFWS NWI-mapped wetlands or those potential wetland areas identified above.

Figure 12: Land-Based Environmental Features



Farmland Soil Map Symbol	Farmland Soil Map Unit Description
BdB	Bedington shaly silt loam, 3 to 8 percent slopes
BeB	Berks shaly silt loam, 3 to 8 percent slopes
BeC	Berks shaly silt loam, 8 to 15 percent slopes
BpB	Blairton silt loam, 3 to 8 percent slopes
Ch	Chavies fine sandy loam
CnC2	Chavies fine sandy loam, 8 to 15 percent slopes, moderately eroded
EdC	Edom silty clay loam, 8 to 15 percent slopes
HaB	Hagerstown silt loam, 3 to 8 percent slopes
HaC	Hagerstown silt loam, 8 to 15 percent slopes
HaC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded
Ta	Tioga fine sandy loam

Floodplains

Floodplains are present along the Susquehanna River and Paxton Creek within the study area as shown on Figure 11. On the West Shore, the majority of Wormleysburg within the study area lies within the 500-year floodplain, with two areas within the 100-year floodplain—the area between Elm Street and Pine Street and the area along Front Street near the Walnut and Market Street bridges. In Lemoyne and New Cumberland the area between the Norfolk Southern railroad tracks and the Susquehanna River is within the 100-year floodplain; areas immediately west of the tracks are within the 500-year floodplain. In Harrisburg, the majority of Riverfront Park from the Harvey Taylor Bridge to the Market Street Bridge lies within the 500-year floodplain, while the area between the Market Street Bridge and the CAT Bridge has both 100-year and 500-year floodplain present along Riverfront Park. South and east of the CAT Bridge, the 100-year floodplain expands to include the Shipoke neighborhood and areas along the Amtrak railroad corridor.

Potential Threatened and Endangered Species

An online Pennsylvania Natural Diversity Inventory (PNDI) environmental review was performed for the study area to identify the potential presence of federal and/or state threatened or endangered species. No federal or state threatened or endangered species were identified through the PNDI environmental review. However, five potential state species of concern were identified within the study area. These are the peregrine falcon, known to be present in downtown Harrisburg and under the jurisdiction of the Pennsylvania Game Commission (PGC), and four mussel species of concern (elktoe, triangle floater, yellow lampmussel, and rainbow mussel) within the Susquehanna River and under the jurisdiction of the Pennsylvania Fish and Boat Commission (PFBC).

Any proposed improvement action that would require construction outside of the existing bridge and roadway footprint and beyond existing disturbed areas would require coordination with the PGC and the PFBC. This coordination should take place as individual projects move forward during the project development process.

Soils

Soil types within the study area are shown on Figure 12. The majority of soil types in Harrisburg are urban soils disturbed by development. Native soils in the West Shore communities of Wormleysburg, Lemoyne, and New Cumberland include a variety of soil types that are suitable for agricultural production and are classified as either prime farmland soils or farmland soils of statewide importance; however, no lands are actively farmed within the study area as the vast majority of land is devoted to urban uses.

Steep Slopes

Steep slopes have a high potential for erosion and present constraints and challenges for development. For example, it is harder to build on a steep slope than on a gentle one. For planning purposes, areas with slopes of 15 percent or greater are considered difficult for construction. Areas with slopes greater

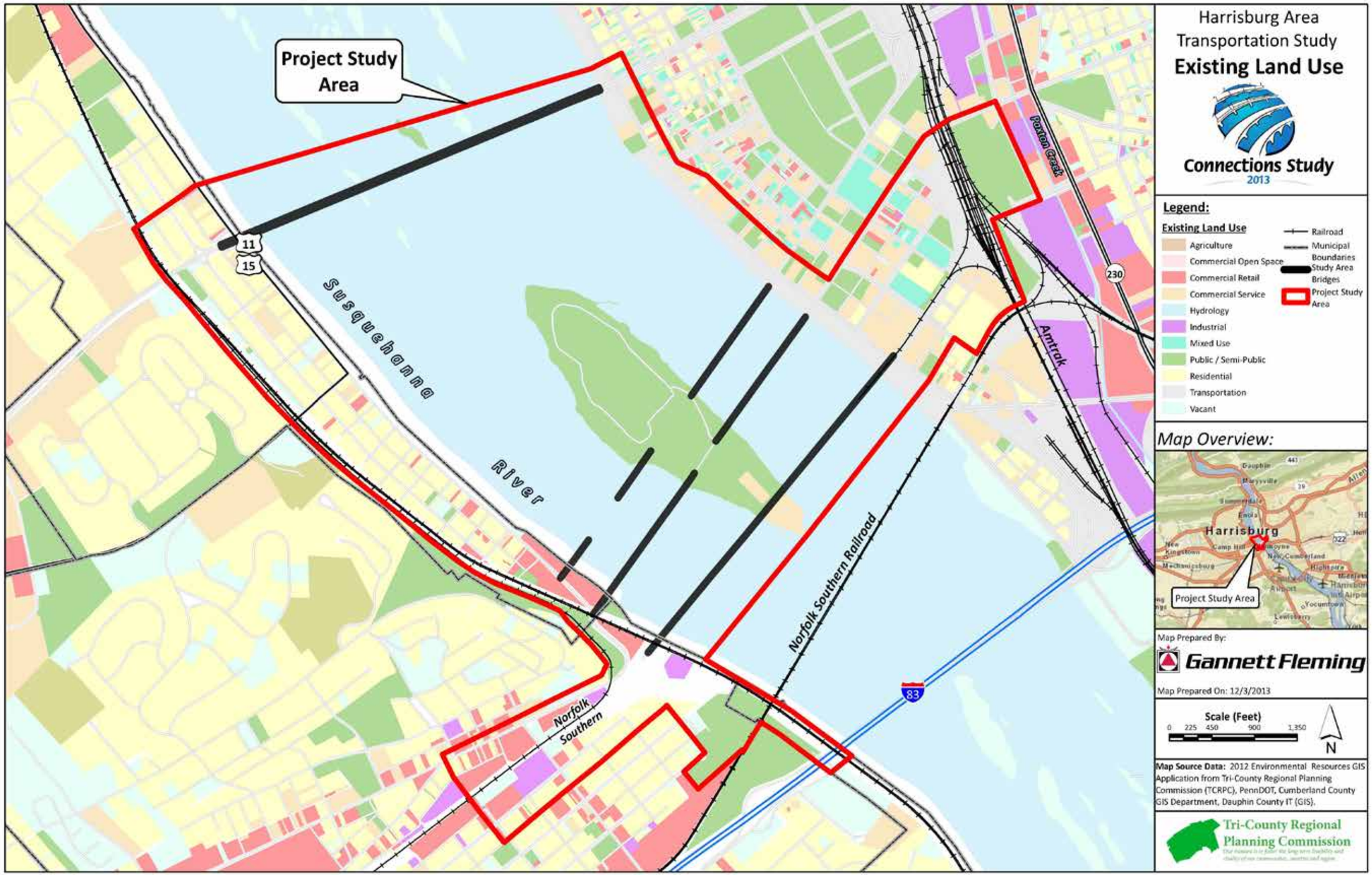
than 15 percent are shown on Figure 12. Several areas with steep slopes are present along the banks of the Susquehanna River on both the Harrisburg and West Shore sides. Steep slope areas are also present along the Norfolk Southern railroad tracks between Wormleysburg and Lemoyne, through the Lemoyne Bottleneck, and between the Susquehanna River and the Norfolk Southern railroad tracks in Lemoyne and New Cumberland.

Land and Community Resources

Existing Land Use

Existing land uses within and immediately adjacent to the study area are shown on Figure 13. Existing land uses in downtown Harrisburg within and adjacent to the study area include a mix of commercial services, residential, public/semi-public, transportation, and mixed uses. Existing land uses on City Island are public/semi-public (recreational uses) and commercial service uses (parking garage and boat storage). Existing land uses in Wormleysburg within and adjacent to the study area are predominantly residential with scattered commercial retail, commercial service, and public/semi-public uses north of Houck Street, while commercial retail uses dominate south of Houck Street in the vicinity of the Walnut Street Bridge and the Market Street Bridge. Existing land uses in Lemoyne within and adjacent to the study area are a mix of commercial retail, residential, industrial, public/semi-public, and vacant uses. Existing land uses in New Cumberland within and adjacent to the study area consist of public/semi-public and vacant uses.

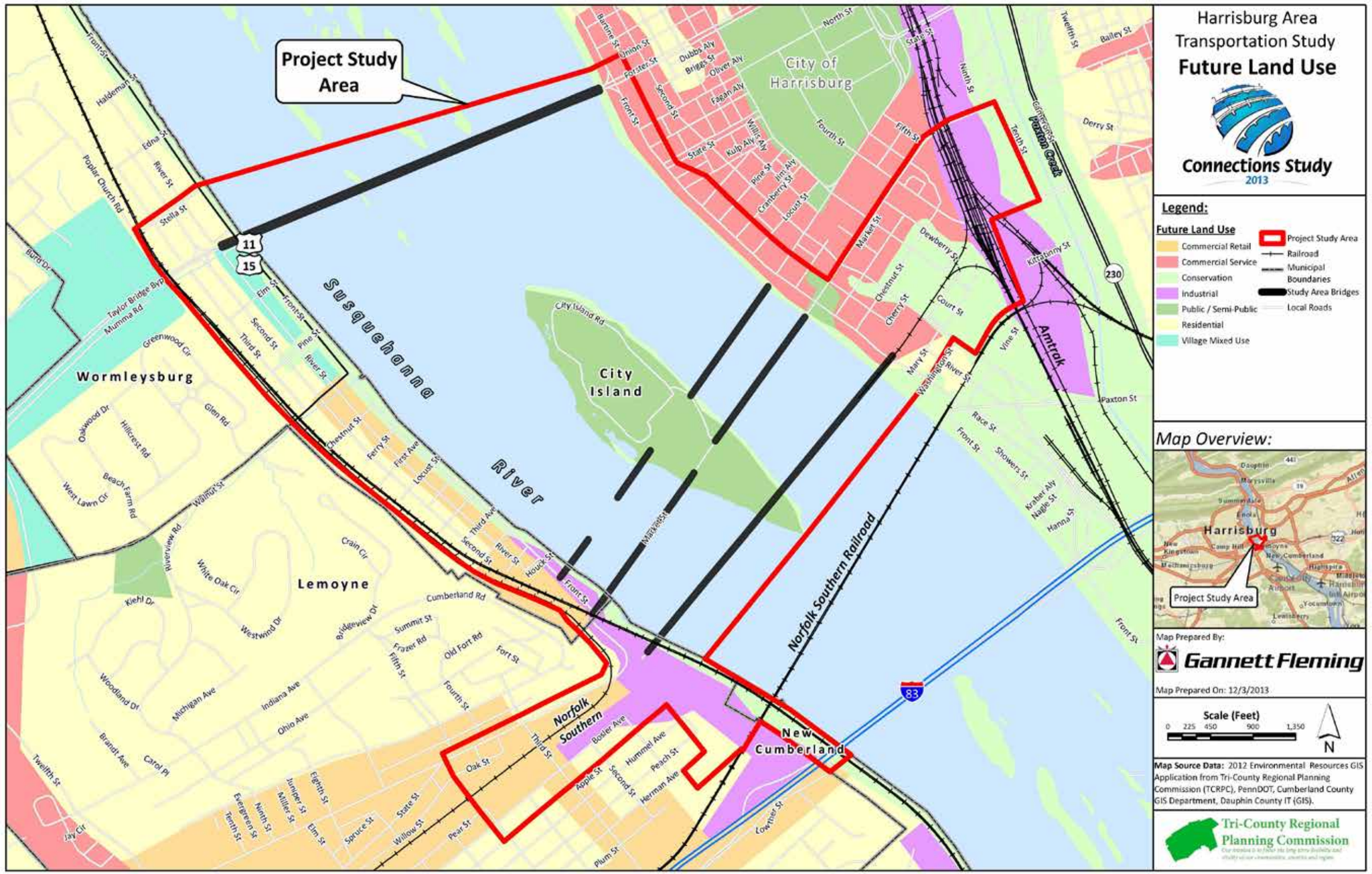
Figure 13: Existing Land Use



Future Land Use

Future land use designations within and immediately adjacent to the study area are shown on Figure 14. Future land use designations in downtown Harrisburg consist primarily of commercial services with public/semi-public, residential, industrial, and conservation uses. The future land use designation for City Island is public/semi-public. Future land use designations for the portion of Wormleysburg within and adjacent to the study area consist of a mix of conservation, residential, commercial retail, industrial, and village mixed uses in Wormleysburg, with the commercial retail and industrial uses dominating at the southern end of the borough near the Walnut and Market Street bridges. Future land use designations in both Lemoyne and New Cumberland within and adjacent to the study area consist of commercial retail, industrial, residential, and conservation uses.

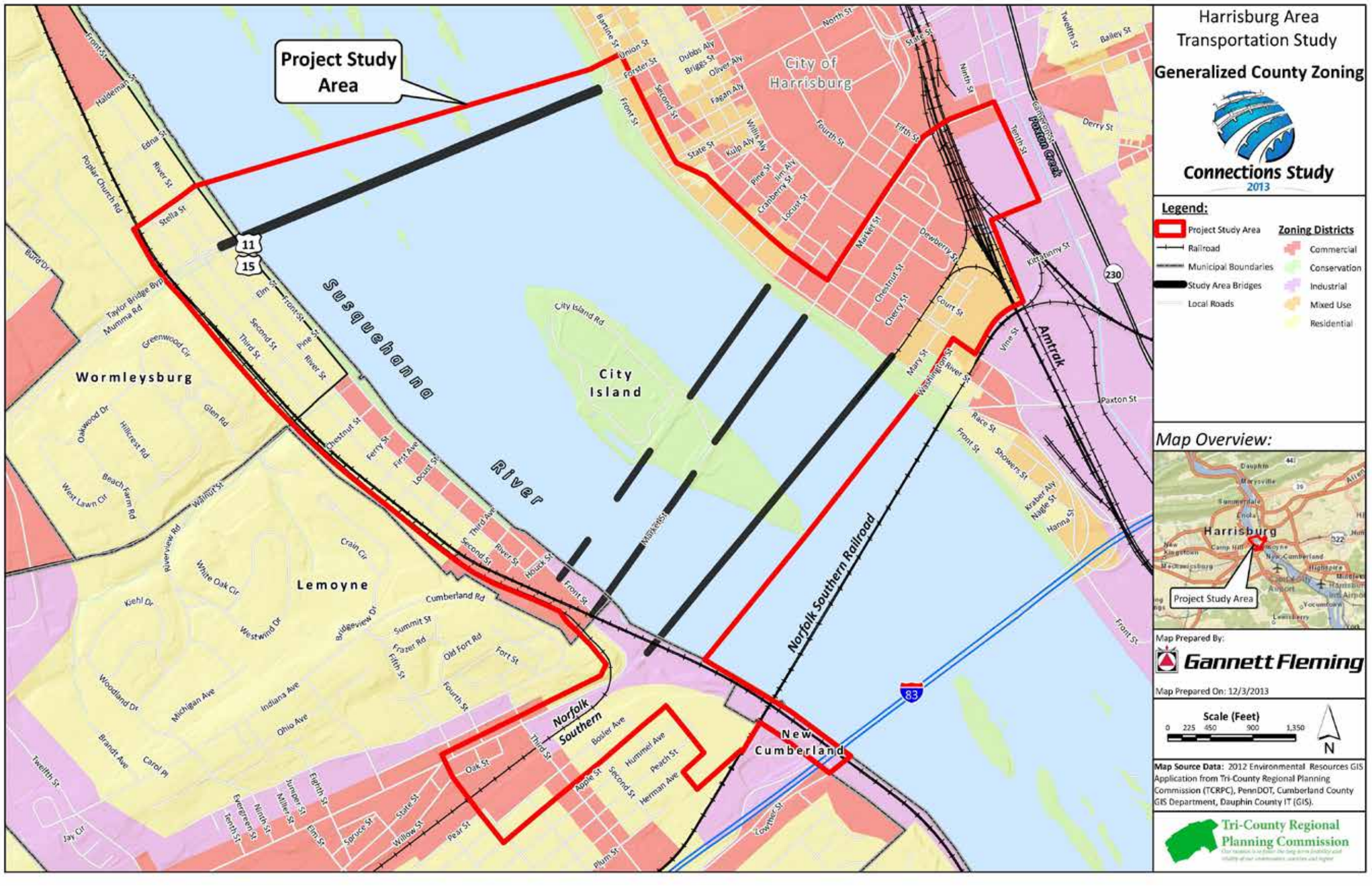
Figure 14: Future Land Use



Zoning

Generalized county zoning designations within and immediately adjacent to the study area are shown on Figure 15. The generalized zoning designations in downtown Harrisburg consists a mix of commercial, residential, industrial, conservation, and mixed uses. The generalized zoning designation for City Island is conservation. The generalized zoning designations for the portion of Wormleysburg within and adjacent to the study area consists of a mix of commercial, residential, industrial, and conservation uses, with commercial and industrial uses dominating at the southern end of the borough near the Walnut and Market Street bridges. The generalized zoning designations in both Lemoyne and New Cumberland within and adjacent to the study area consist of commercial, industrial, and residential uses.

Figure 15: County Zoning



Community Facilities and Services

Community facilities and services, such as public parks; schools; libraries; municipal, county and state facilities and buildings; police, fire, and EMS facilities; and others are present within and adjacent to the study area as shown on Figure 16 and Table 12.

Figure 16: Community Facilities

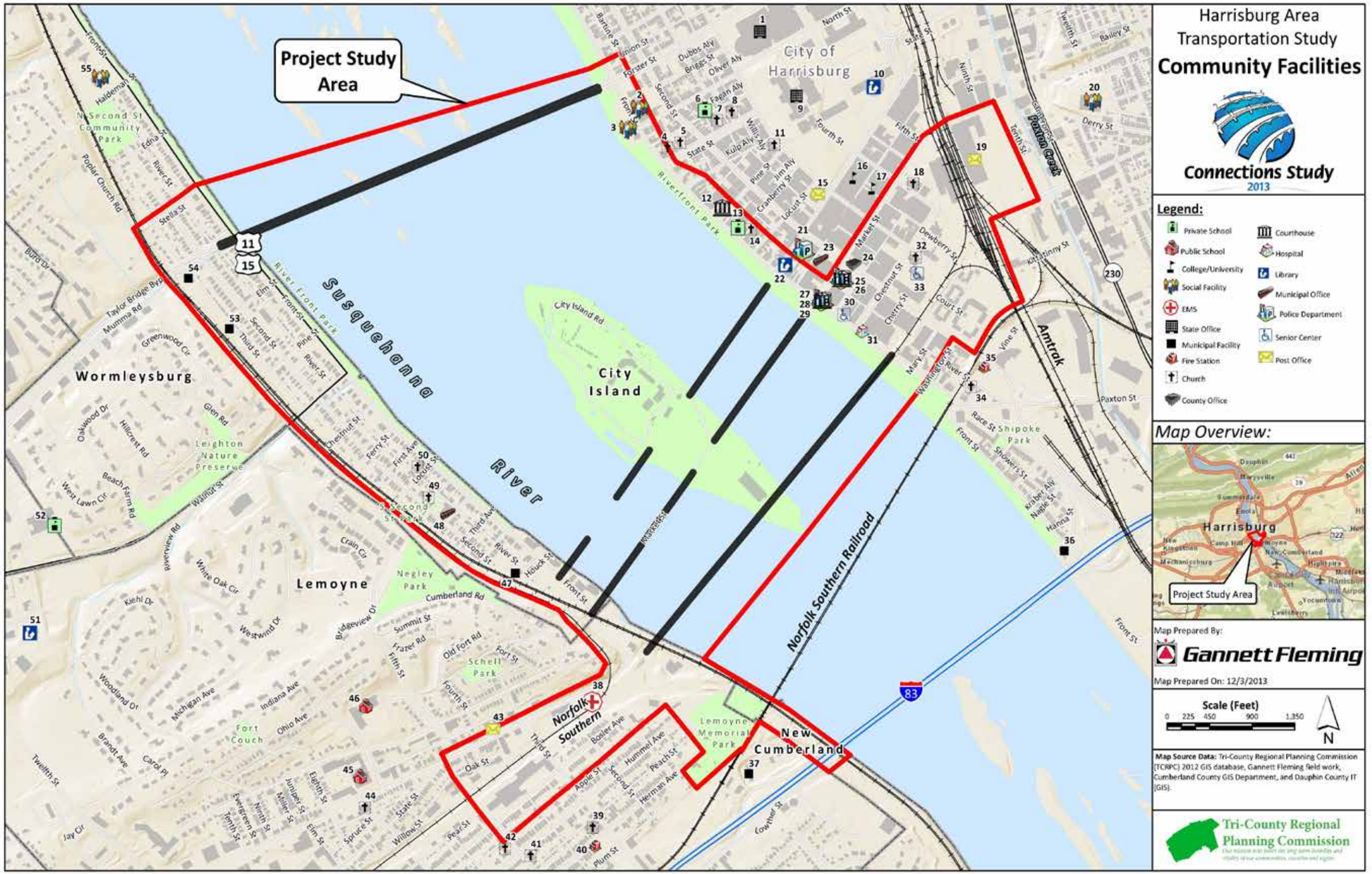


Table 12: Community Facilities

Map ID Number	Name	Map ID Number	Name
1	Pennsylvania State Museum	29	Dauphin County Sheriff's Department/DA Office
2	East Shore YMCA	30	County of Dauphin Area Agency on Aging
3	Harrisburg Civic Center	31	Pinnacle Health System
4	Cathedral Chapel of St. Lawrence	32	Salem United Church of Christ
5	St. Michael's Lutheran Church	33	B'nai B'rith Apartment Center
6	Cathedral School	34	St. Mark Coptic Orthodox Church
7	Cathedral Parish of St. Patrick	35	Paxton Fire Company
8	Grace United Methodist Church	36	Harrisburg Sewage Pumping Station
9	Pennsylvania State Capitol Complex	37	The Municipal Authority of Borough of Lemoyne
10	State Library	38	West Shore EMS Station & Fleet Maintenance
11	Pine Street Presbyterian Church	39	Grace United Methodist Church
12	Superior Court	40	West Shore Bureau of Fire, Station 1
13	St Stephen's Episcopal School	41	First Christian Church
14	St Stephen's Episcopal Church	42	Trinity Evangelical Lutheran Church
15	Federal Building & Post Office	43	Lemoyne Post Office
16	Temple University, Harrisburg	44	Calvary United Methodist Church
17	Harrisburg University	45	Lemoyne Middle School
18	Zion Lutheran Church	46	Washington Heights Elementary School
19	Keystone Post Office	47	Wormleysburg Borough Public Works Garage 1
20	Harrisburg YWCA	48	Wormleysburg Borough Offices
21	Harrisburg City Police Department	49	Wormleysburg Church of God
22	McCormick Riverfront Library	50	Cornerstone Fellowship Assembly of God
23	Harrisburg City Office	51	M. Courtney Family Health Library
24	Dauphin County Government Center	52	Harrisburg Academy
25	Clerk of Orphans Court	53	Wormleysburg Pump Station
26	Dauphin County Criminal Investigation Division	54	Wormleysburg Borough Public Works Garage 2
27	Dauphin County Court House	55	American Legion PA Headquarters
28	Dauphin County Law Library		

One of the more prominent community facility types in relation to the four studied bridges is public parks. There are five public parks within the study area:

1. Riverfront Park in Harrisburg (part of the Capital Area Greenbelt)
2. City Island
3. River Front Park in Wormleysburg
4. Unnamed Park in southwest quadrant of Market Street Bridge in Lemoyne
5. Memorial Park in Lemoyne

All four studied bridges either touch down at or span over Riverfront Park in Harrisburg. The Walnut Street, Market Street, and former CAT bridges touch down at or cross over City Island. Riverfront Park in Harrisburg is a linear park that lies between the Susquehanna River and Front Street. The portion of Riverfront Park between the Harvey Taylor Bridge and the Market Street Bridge and City Island hosts numerous community events. City Island is home to the Harrisburg Senators minor league baseball team, the Harrisburg City Islanders pro soccer team, and Pride of the Susquehanna riverboat, as well as a miniature golf course, children's playground, and picnic areas. It serves as a major point of boating access to the Susquehanna River. River Front Park in Wormleysburg is a linear park along the west bank of the Susquehanna River that provides boating access, walking trails, and picnic tables at several locations and serves as a nature preserve for passive recreation. The Harvey Taylor Bridge spans over River Front Park in Wormleysburg. There is a small unnamed park in the southwest quadrant of Market Street Bridge in Lemoyne. This unnamed park consists of a triangular shaped grassy and wooded area with no formal facilities. Memorial Park in Lemoyne sits above the west bank of the Susquehanna River and west of the Norfolk Southern railroad tracks. Memorial Park has tennis courts as well as a baseball field, playground, gazebo, pavilion, and picnic areas, and it is home to Lemoyne's outdoor community swimming pool.

Environmental Justice Populations

Environmental justice is about the pursuit of equal justice and equal environmental protection for all people, regardless of race, ethnicity, or economic conditions. Executive Order 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," signed by President Clinton on February 11, 1994, directed all federal agencies to make environmental justice part of their mission by identifying and addressing disproportionately high and adverse effects of programs, policies, and activities on minority populations and low income populations. The four minority groups addressed in Executive Order 12898 are: Black (African American), Hispanic, Asian American and American Indian and Alaskan Native populations. Minority populations are defined as any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans). Low income is defined as a person whose household income is at or below the Department of Health and Human Services poverty guidelines. Low income populations are defined as any readily identifiable group of low income persons who live in geographic proximity, and, if circumstances warrant,

geographically dispersed/transient persons. Projects receiving federal funding are considered federal activities, and thus must comply with Executive Order 12898.

Information on environmental justice populations obtained through TCRPC's Environmental Resources GIS application was derived from U.S. Census data. The U.S. Census collects data on a variety of population variables, including minority and low income populations. With regard to minority populations the U.S. Census collects data on both race (Black, Asian, American Indian, etc.) and ethnicity (Latino/Hispanic). Environmental justice populations are present within and adjacent to the study area as shown on Figure 17, Figure 18, and Figure 19. Figure 17 depicts the percentage of minority populations present by census tract block group, minus those of Latino/Hispanic ethnicity. Figure 18 presents the percentage of Latino/Hispanic ethnic populations. Figure 19 depicts low income populations based the percentage of people living below the poverty level. As shown on Figure 17, concentrations of minority populations are present within and adjacent to the study area, primarily in Harrisburg. The percentage of minority populations in the study area block groups in Harrisburg range from 25 to 50 percent. Higher minority concentrations, ranging from 55 to 90 percent, are present south and east of the study area. Blacks/African Americans are the predominant minority race within Harrisburg. As shown on Figure 18, concentrations of Latino/Hispanic populations are not prevalent within the study area (less than 10 percent per block group) but are more prevalent south and east of the study area in Harrisburg (25 to 50 percent). As shown on Figure 19, concentrations of low income populations are more prevalent to the east and south of the study area in Harrisburg with percentages of the population below poverty ranging from 30 to 55 percent. Within the study area the block groups in Harrisburg and the block group in Lemoyne adjacent to Memorial Park have percentages of the population below poverty ranging from 10 to 20 percent.

Figure 17: Environmental Justice Areas (Minority)

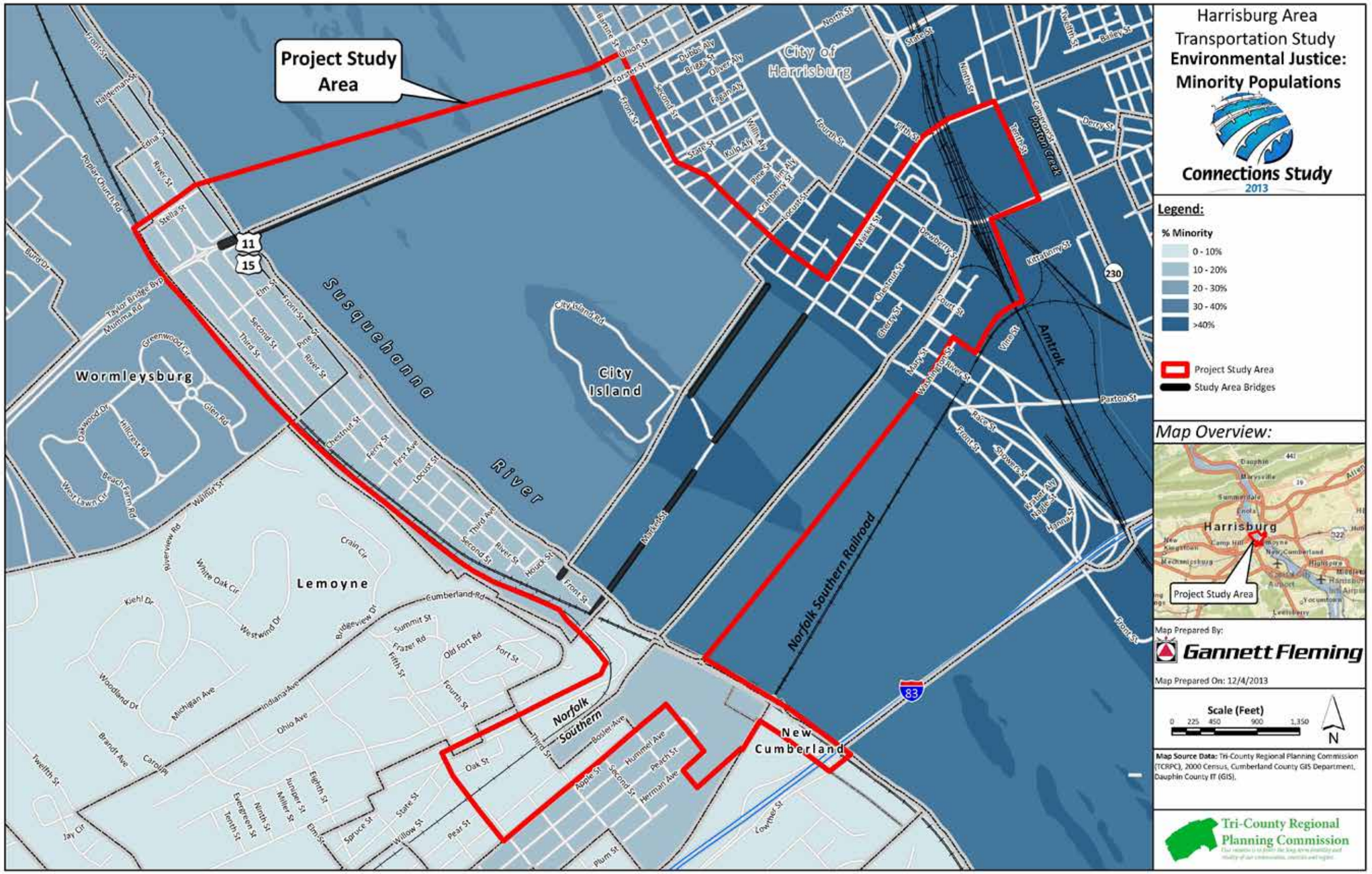


Figure 18: Environmental Justice Populations (Hispanic/Latino)

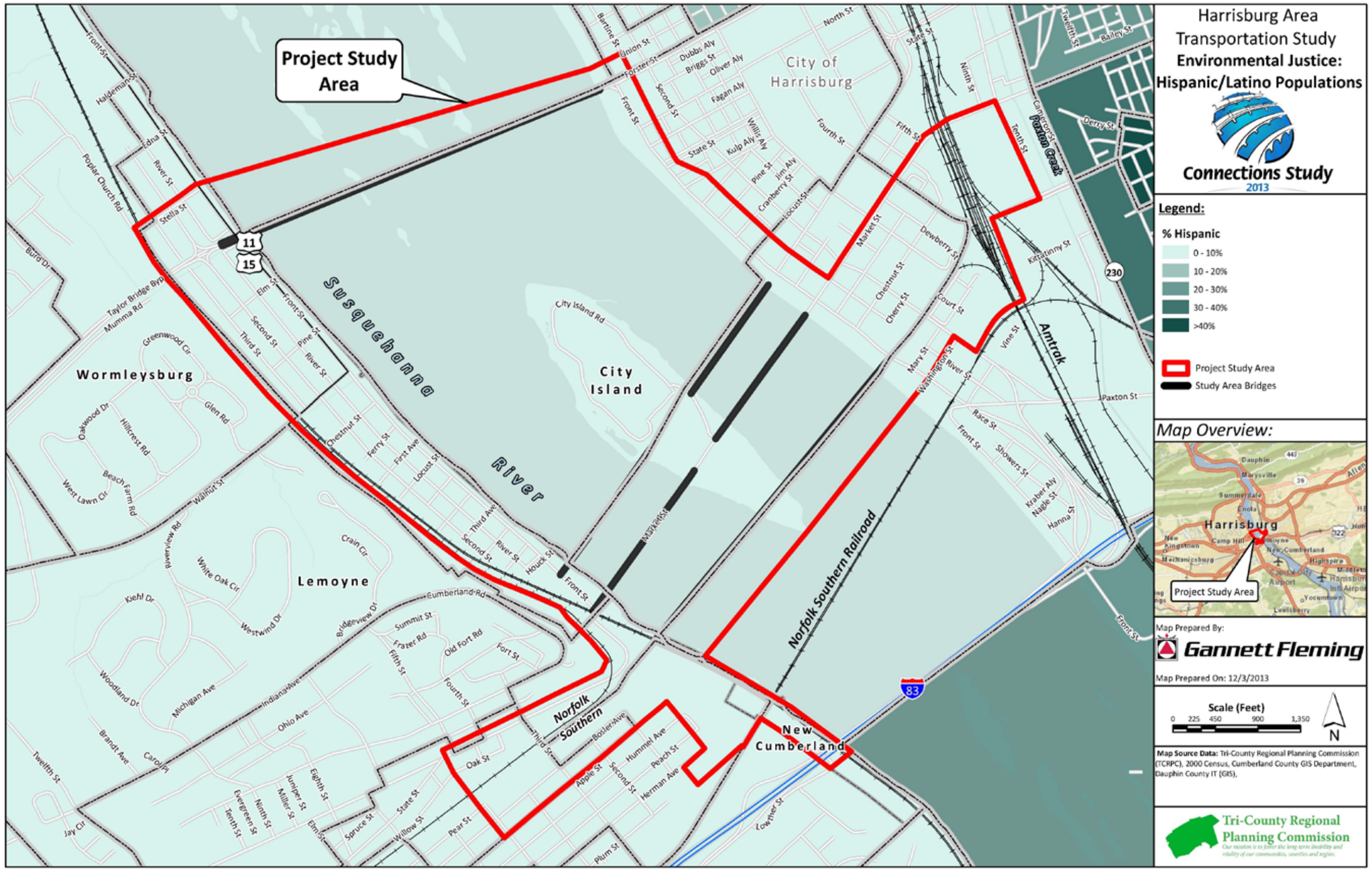
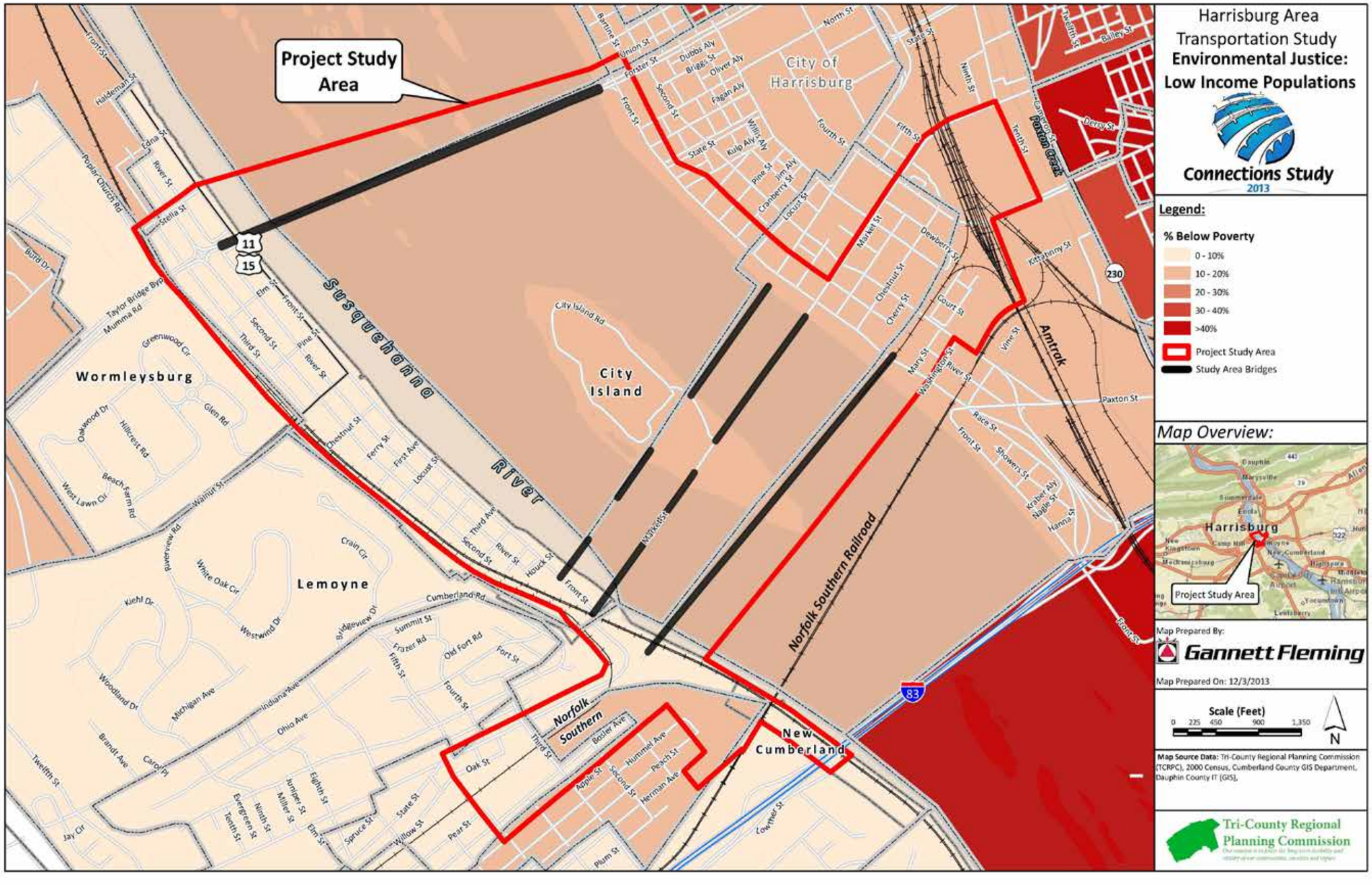


Figure 19: Environmental Justice Populations (Low Income)



Potential Hazardous Waste Sites

Potential hazardous waste sites are present within and adjacent to the study area are shown on Figure 20. Information on potential hazardous waste sites obtained through TCRPC's Environmental Resources GIS application were derived from various state and federal databases. Two potential hazardous waste sites were identified within the study area:

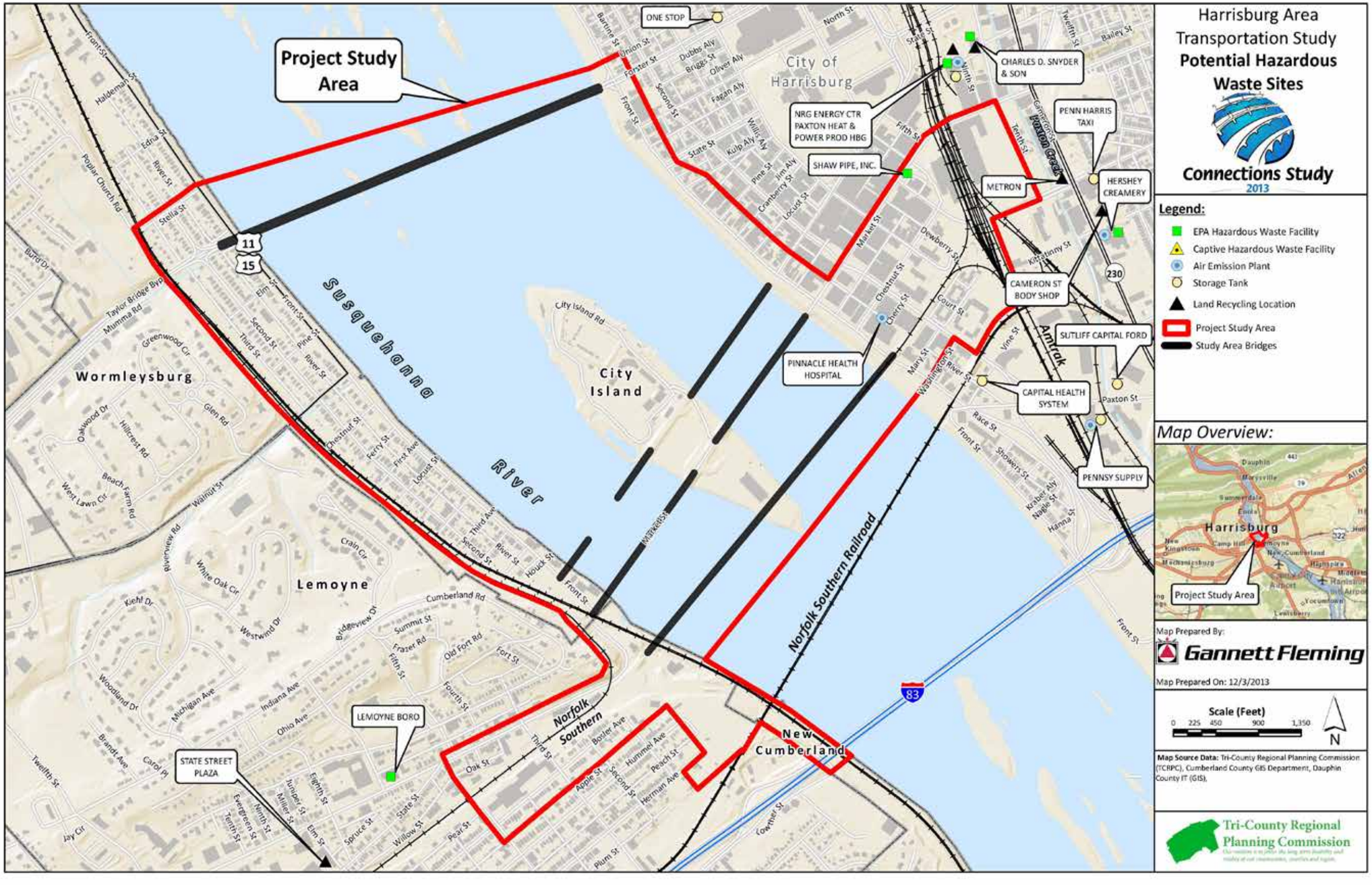
- Pinnacle Health Hospital – air emission plant in Harrisburg; and
- Shaw Pipe Inc – EPA hazardous waste facility on Grace Street in Harrisburg.

Several potential hazardous waste sites adjacent to the study area in Harrisburg that appear on multiple state and federal listings are:

- NRG Energy Center
- The former Charles D. Snyder & Son Electroplating building
- The Hershey Creamery
- Pennsy Supply

In addition to the hazardous waste sites identified through review of federal and state databases, potential hazardous waste sites may be present along existing or former railroad lines and yards, industrial sites, gas stations, and automotive service and repair properties. Further investigation of potential hazardous waste sites would be necessary for those potential improvement projects that would require ground disturbance outside of the existing bridge or roadway footprint in the vicinity of potential hazardous waste sites.

Figure 20: Potential Hazardous Waste Sites



Cultural Resources

Cultural resources within and adjacent to the study area include both above ground historic and below ground archaeological resources. Above ground historic resources consist of bridges, buildings, districts, and sites and are shown on Figure 21 and Table 13. Information on above ground historic resources obtained through TCRPC's Environmental Resources GIS application were derived from The Pennsylvania Historical and Museum Commission's and PennDOT's Cultural Resources GIS database. The vast majority of the identified above ground historic resources are in Harrisburg with just a few on the West Shore. Two of the four studied bridges (Walnut Street Bridge and Market Street Bridge) are listed on the National Register of Historic Places (National Register). One of the studied bridges (CAT Bridge) has been determined to be eligible for listing on the National Register as a part of the Cumberland Valley Railroad (Lemoyne to Shiremanstown) historic district, while one bridge (Harvey Taylor Bridge) has been determined not eligible for the National Register.

In addition to the four studied bridges, there are two National Historic Landmarks (NHLs) within the study area (John Harris Mansion – Simon Cameron House and Harrisburg Central Railroad Station and Trainshed – Pennsylvania Railroad Station) and one NHL adjacent to the study area (Pennsylvania State Capitol Complex).

There are four historic districts (HDs) listed on the National Register within the study area (Harrisburg HD, Midtown Harrisburg HD, Old Downtown Harrisburg Commercial HD, and Old Downtown Harrisburg Commercial HD Boundary Increase) and three adjacent to it (Allison Hill HD, Mount Pleasant HD, and Mount Pleasant HD Extension). There are four HDs eligible for listing on the National Register within the study area (Harrisburg City Parks 7 Parkway Plan – Capital Area Greenbelt (includes Riverfront Park in Harrisburg and City Island), Pennsylvania State Capitol Complex, Pennsylvania Railroad – Enola Branch Low Grade Freight Line (Enola to Parkersburg), and Cumberland Valley Railroad (Lemoyne to Shiremanstown)).

There are seven buildings listed on the National Register within the study area (John Wormley House – Valentine Hummel House, William R. Griffith House, Keystone Building, Salem United Church of Christ, Dauphin County Courthouse, William Seel Building, and Colonial Theatre – Lochiel Hotel) and one building (Pennsylvania Railroad Harris Switch Tower) and one bridge (Soldiers and Sailors Memorial Bridge – State Street Bridge) adjacent to it.

There are eight buildings eligible for the National Register within the study area. Adjacent to the study area there are six eligible buildings and one eligible bridge. Seventeen buildings and one railroad within or adjacent to the study area have been evaluated for listing on the National Register, but their eligibility is undetermined at this time. Seven buildings, two bridges, one district, and one site within or adjacent to the project area have been determined to be ineligible for listing on the National Register, while an additional seven buildings and two sites are identified as being demolished. A cursory field view of the study area revealed that there are numerous buildings that are greater than 50 years old that may be potentially eligible for the National Register that have yet to be evaluated.

The study area contains the potential for both pre-contact and historic archaeological resources. Although much of the study area has been disturbed by development and the construction of the four bridges, substantial areas remain that have the potential for containing buried archaeological resources. These resources would tend to be concentrated along the banks of the Susquehanna River and in the older sections of Harrisburg, Wormleysburg, and Lemoyne within the study area. Further investigation of potential pre-contact and historic archaeological resources would be necessary for those potential improvement projects that would require ground disturbance outside of the existing bridge or roadway footprint.

Figure 21: Historic Resources

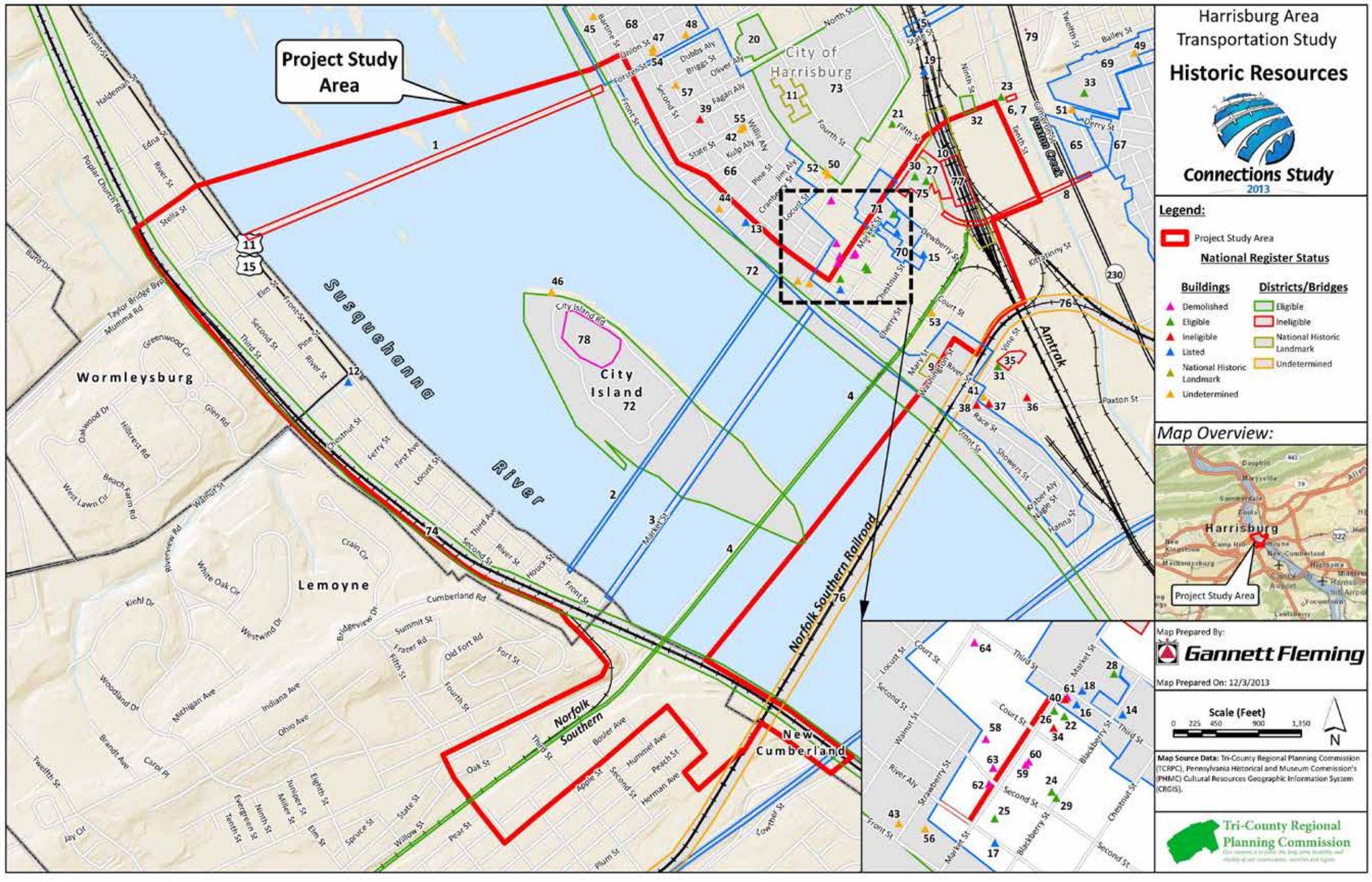


Table 13: Historic Resources

Map ID Number	Name
1	M. Harvey Taylor Bridge
2	Walnut Street Bridge
3	Market Street Bridge
4	Cumberland Valley Railroad (Lemoyne to Shiremanstown)
5	Soldiers & Sailors Memorial Bridge; State Street Bridge
6	No Name: SR 230/Amtrak/Conrail
7	No Name: Paxton Creek
8	Unknown
9	Simon Cameron House; John Harris Mansion
10	Harrisburg Central Railroad: Station and Train Shed; Pennsylvania Railroad: Station
11	Pennsylvania State Capitol; State Capitol Building
12	John Wormley House; Valentine Hummel House
13	William R. Griffith House
14	Keystone Building
15	Salem United Church of Christ
16	William Seel Building
17	Dauphin County Courthouse
18	Colonial Theatre; Lochiel Hotel
19	Pennsylvania Railroad: Harris Switch Tower
20	William Penn Memorial Museum Building; State Museum of Pennsylvania
21	Harrisburg Technical High School; Harrisburg City Hall
22	Kunkle Building; Feller Building
23	Market Street Trust Company
24	Menaker Building
25	Blackstone Building
26	Dauphin Deposit Bank
27	Zion Lutheran Church
28	Pomeroy's Annex
29	Market Square Presbyterian Church
30	First Church of God
31	Paxton Fire Station
32	Emerson-Brantingham Building
33	Sylvan Heights; Col. John Brandt House
34	YMCA of Greater Harrisburg

Map ID Number	Name
35	G.R. Kinney Company Building
36	D.A. Marshall Service Station
37	James H. Lutz Building
38	Buchwald/Aronson Garage
39	Hope Fire Station No. 2
40	McCrory Building
41	Unknown
42	Unknown
43	Governor Schultz House
44	John Simonton Mansion
45	William Morganthaler House
46	Public Bath House
47	Fritchey Mansion
48	Unknown
49	Ellsworth G. Hoover House
50	Harrisburg Hotel
51	Charles S. Lingle House
52	Mary Sachs Building
53	Peanut House
54	Bauier Property
55	Unknown
56	Findlay Mansion
57	Carriage house at 216 Briggs St. (rear)
58	Warner Hotel (demolished)
59	Yoffee Building (demolished)
60	Goldsmith Building (demolished)
61	Bergner Building (demolished)
62	Senate Hotel (demolished)
63	Greenawalt Building (demolished)
64	Telegram Building (demolished)
65	Allison Hill Historic District - HDA
66	Harrisburg Historic District
67	Mount Pleasant Historic District
68	Midtown Harrisburg Historic District
69	Mount Pleasant Historic District Extension
70	Old Downtown Harrisburg Commercial Historic District
71	Old Downtown Harrisburg Commercial Historic District (Boundary Increase)

Map ID Number	Name
72	Harrisburg City Parks 7 Parkway Plan; Capital Area Greenbelt
73	Pennsylvania State Capitol Complex; Pennsylvania Capitol Historic District
74	Pennsylvania Railroad: Enola Branch Low Grade Freight Line (Enola to Parkesburg)
75	Harrisburg Old Downtown Transportation Historic District
76	Philadelphia & Reading Railroad
77	PA GGI Electric Locomotive No. 4859
78	Harrisburg Filtration Plant (demolished)
79	Automobile & Aeroplane Mechanical School (demolished)

Alternatives Evaluation

Alternatives were developed to enhance safety and multimodal connectivity between the City of Harrisburg and West Shore communities. Existing and future needs were considered when developing alternatives, which were further shaped by agency and public input. Alternatives were developed for the near, mid, and long term to meet the needs discussed previously. A benefit-to-cost matrix was used to compare alternatives and determine which alternatives were the most feasible while enhancing safety and multimodal initiatives. A phased approach was considered where possible to manage implementation costs. Long-term considerations such as ownership, potential stakeholder road blocks, costs, and funding sources are also discussed in this section.

Agency and Public Input

Agency stakeholders were identified at the beginning of the study and consulted throughout the process to help develop and shape alternatives. After the alternatives were developed and evaluated, they were presented to the public in an open house format to solicit feedback and additional ideas. The study concluded with presentations to the CAT Board on January 30, 2014, and to the Technical Committee Meeting on February 14, 2014.

Summaries of stakeholder and public input are documented in this section.

Stakeholder Consultations

At its kick-off meeting, the study steering committee identified a list of 19 potential stakeholders to be contacted as part of the "issue identification" phase of the study. The purpose of this task was to identify key stakeholder issues related to safety, congestion, connectivity, and mobility. The study team received responses from 15 of the 19 stakeholders contacted (Table 14). Stakeholder consultation continued throughout the study process through steering committee and technical committee meetings.

Table 14: Summary of Stakeholder Involvement – Issues Cited

Stakeholder	Bicycle/Pedestrian Safety on Market Street	Congestion	Funding	Harvey Taylor Bridge Connectivity	Multimodal Options	Operations	Preserving Capacity	Preserving Walnut St East	Public Safety	Smart Transportation Principles
Amtrak		X	X	X	X	X	X			
Capital Area Transit	X			X	X					
Commuter Services of Pennsylvania	X	X			X					
Capital Region Economic Development Corporation (CREDC)	X				X	X		X	X	
DCNR										X
Friends of CVRR (CAT) Bridge	X	X	X		X				X	
Front/Market Streets Master Plan	X				X				X	
Harrisburg Downtown Improvement District	X							X		
Harrisburg Hospital		X								
Harrisburg Senators		X						X		
Harristown	X			X	X			X		
Norfolk Southern							X			
PennDOT Bureau of Public Transportation			X							
Walnut St Bridge Society/ People's Bridge Coalition	X		X	X	X			X	X	

Source: Gannett Fleming Stakeholder Consultations

Through the interviews conducted by the study team with study stakeholders, a series of common themes emerged:

Bicycle and Pedestrian Safety on the Market Street Bridge – One of the more common issues mentioned during stakeholder consultations was that of safety on the Market Street Bridge. (This is a concern that was echoed in the origin/destination survey responses.) Substandard bridge lighting, drainage problems, sight distance, and lack of separation between pedestrians and vehicular traffic were all identified as concerns. Stakeholders cited the pedestrian/bicycle improvements that were made on

the Harvey Taylor Bridge a decade ago (a $3.5 million improvement) as an example of what could be done to the Market Street Bridge.

Congestion – Various stakeholders noted that their constituents (including commuters, emergency response personnel, and those attending special events on City Island) are affected by roadway congestion and time lost sitting in traffic. Harrisburg Hospital noted the effect on its operations of increased system-wide travel demand—congestion on the John Harris (South) Bridge (I-83) can affect response times to incidents and access to the hospital. The Harrisburg Senators also highlighted congestion concerns during their peak periods.

Funding –Funding priorities for the bridges are somewhat uncertain, but actual funding is more promising given the recent federal and state transportation funding laws. Funding opportunities from alternative sources should also be evaluated (e.g., public-private partnerships and various grant monies such as TIGER grants).

Connectivity of the Harvey Taylor Bridge to the West Shore – Stakeholders praised the work of PennDOT and HATS to improve bicycle and pedestrian accommodation when the bridge was rehabilitated in 2001. The new cantilevered lanes provide a connection for bicyclists and pedestrians between Harrisburg and the West Shore that is especially needed since the 1996 flood that destroyed three spans of the Walnut Street Bridge. Nevertheless, the pedestrian/bicycle lanes end abruptly on the West Shore with no signs to direct travelers to West Shore destinations or the pedestrian underpass below the bridge. The Camp Hill Bypass is signed for no bicyclists or pedestrians, yet many have been observed using it.

Multimodal Options – There is a desire for mode choice among the stakeholders interviewed. There is interest in determining whether or not the CAT Bridge could sustain a mix of modal options—a shared use among bicyclists, pedestrians, and premium bus service, along with the Amtrak turnaround that is active on the eastern spans.

Operations (Signals) – Traffic signal timing could be improved for motorists navigating study area intersections. Results of the Synchro analysis show that levels of service are currently unacceptable at several study area locations, including Front Street at Forster Street during the AM and PM peak periods. Other locations, such as Market and Front Street in Harrisburg and Market Street and Front Street in Wormleysburg, are operating at level of service “D” during the PM peak.

Preserving Capacity – The railroads in particular voiced a desire to maintain existing operating rights and capacity as well as options for expanding that capacity, if necessary. Norfolk Southern, a Class I freight carrier, needs to preserve its ability to construct the Lemoyne Connector to facilitate the movement of trains from its Lurgan Branch to the yards in Enola. Likewise, Amtrak views its wye at the eastern end of the CAT Bridge as “essential trackage” for turning trains around. Amtrak currently uses cab-car consists, yet it needs to preserve the option for turning trains around in the future in the event of equipment malfunctions or failures.

Preserving the Eastern Spans of the Walnut Street Bridge – These spans are seen as essential to providing a pedestrian/bicycle link between the city and special events and recreational attractions on City Island. Stakeholders urged that the state should continue maintaining it as a pedestrian/bicycle link. The bridge provides a unique and valuable connection by enabling commuters to park on City Island and walk or bicycle downtown, and, vice-versa, enabling downtown garages to provide overflow parking for City Island events.

Public Safety – This was mentioned with regard to the abandoned CAT Bridge and to the western spans of the Walnut Street Bridge. If no future purpose can be defined for one or both structures, then the study should include order-of-magnitude costs for their demolition. Engineers recently removed delaminated and loose concrete on the CAT Bridge's spans over City Island to allow for safer access to the boat ramps below. The remaining spans will eventually pose a public safety hazard to recreational users of the river, such as the Pride of the Susquehanna Riverboat cruises and boaters. The Walnut Street Bridge study completed in 1997 noted that the cost to demolish the remaining spans over the western channel would be approximately $575,000. No cost estimates presently exist for demolition of the CAT Bridge.

Smart Transportation Principles – Smart Transportation principles that help facilitate the safe movement of bicyclists and pedestrians, in the context of the primary uses of the facilities, should be included in any improvement options that are advanced through the study.

Public Input

A public meeting was held October 22, 2013, to obtain public input regarding the proposed alternatives. Attendees circulated among five stations where they could sign in, review existing conditions, examine project needs, evaluate improvement alternatives, and provide additional feedback through a survey/questionnaire. Below is a summary of the survey results and common themes from the questionnaire responses.

Survey Summary

Figure 22: Survey Responses – Location of Residence

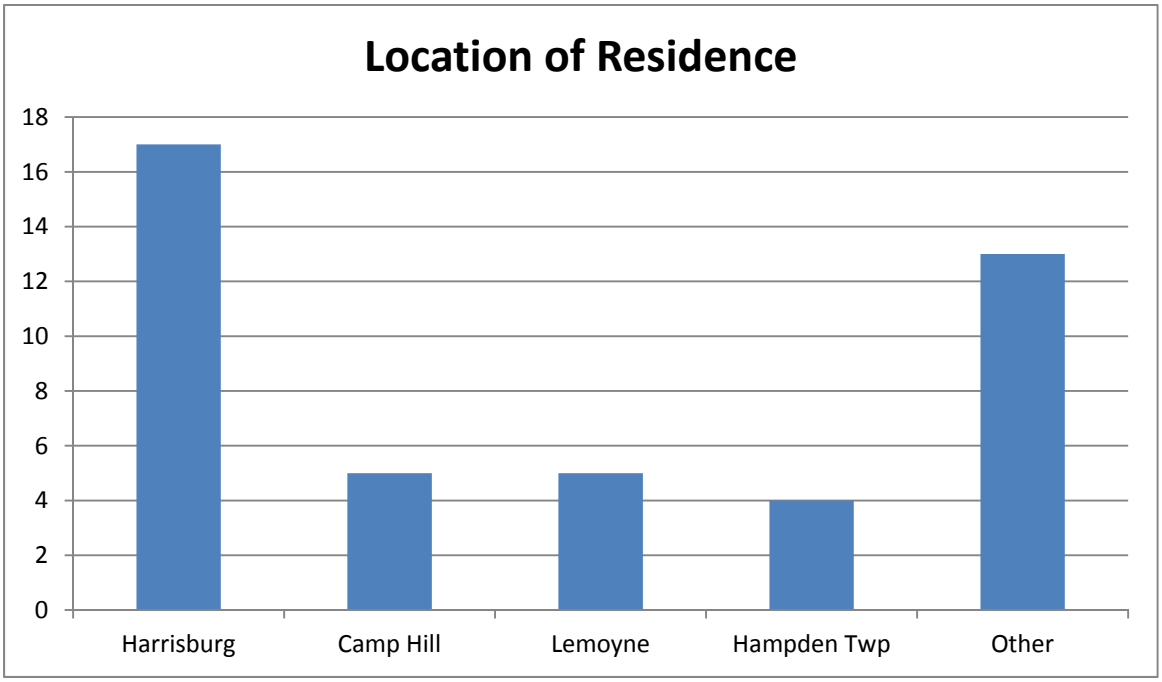


Figure 23: Survey Responses – Interest in Study Area

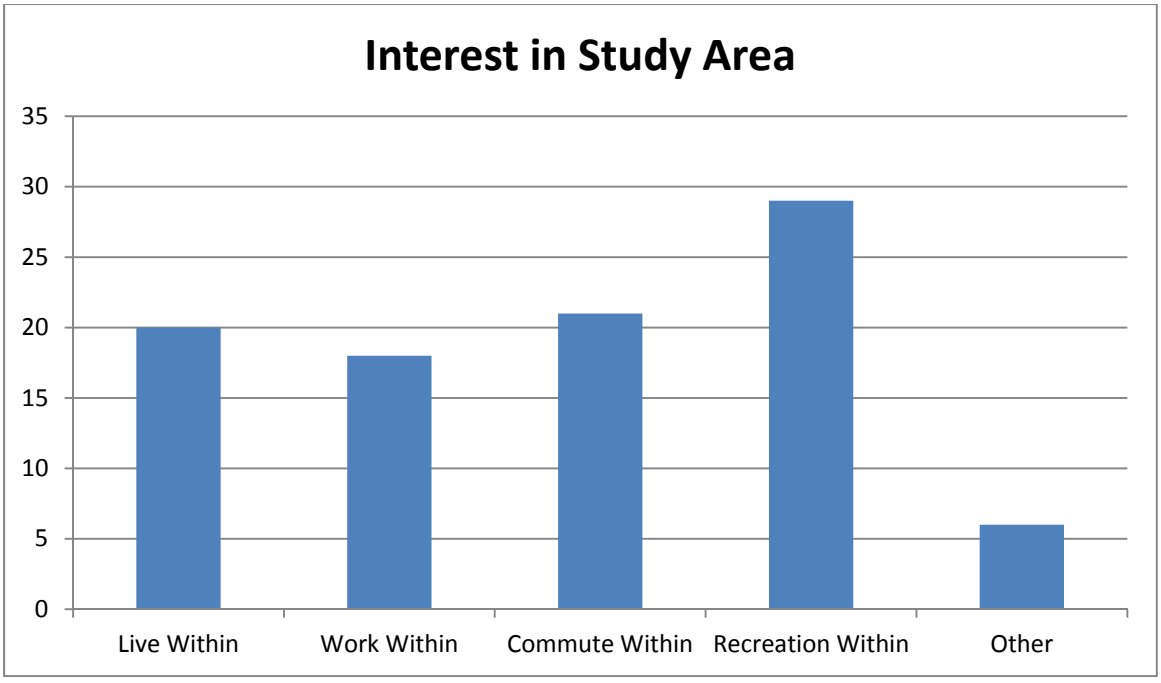


Figure 24: Survey Responses – Travel within Study Area

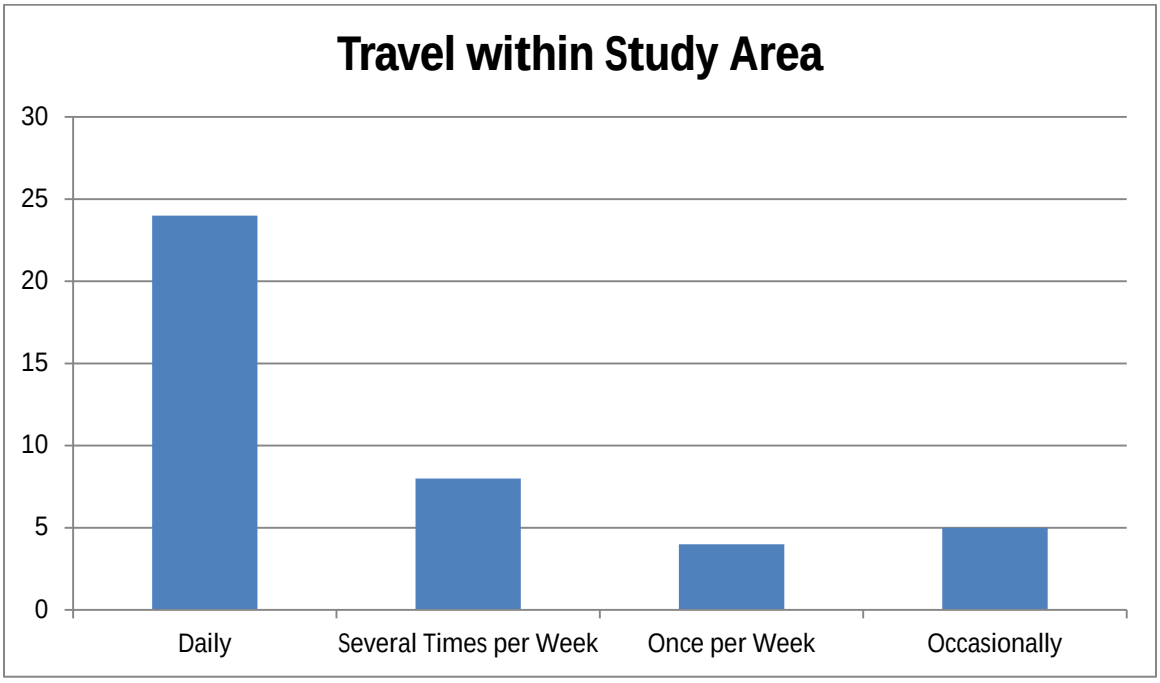
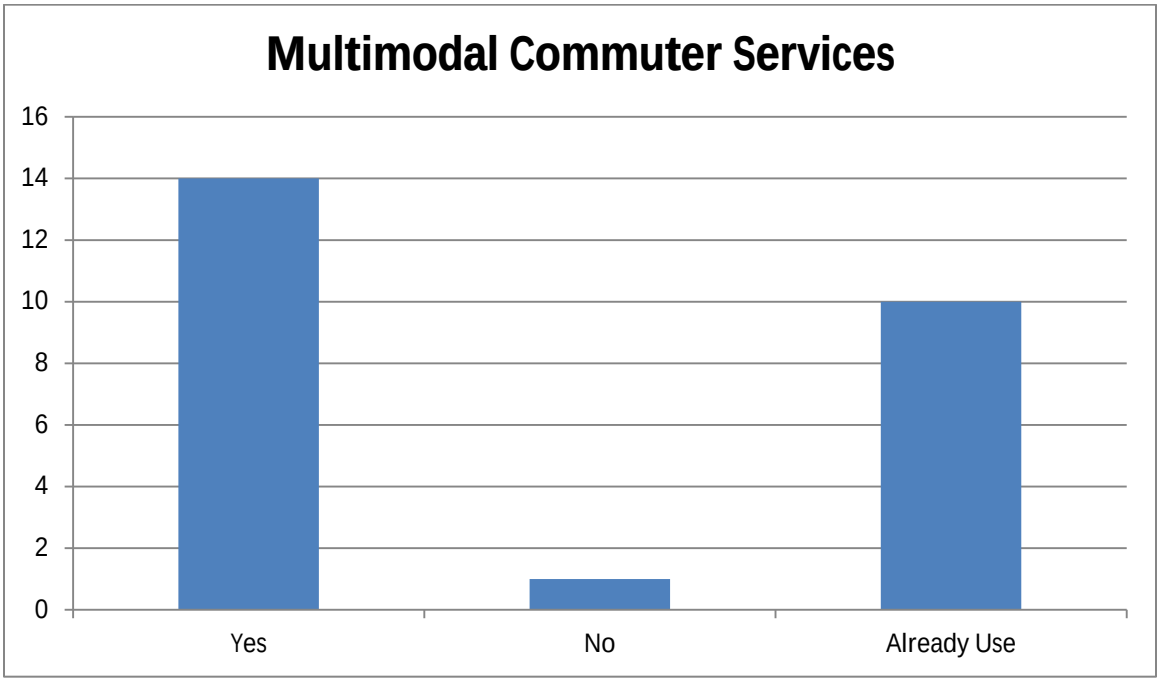


Figure 25: Survey Responses – Multimodal Commuter Services



Questionnaire Common Themes

Harvey Taylor Bridge

- Poor connectivity and signage at bridge ends for pedestrians and cyclists
    - No connection for cyclist on the West Shore; Harrisburg side not as bad
    - No ADA ramps at bridge termini on West Shore to get cyclists off shared-use path

Walnut Street Bridge

- Would like to see western spans reconstructed for ped/bike connection or utilize remaining spans as an attraction, such as:
    - Gardens/park
    - Art attraction
    - Recreational area
- Install solid surface over steel [grid] bridge deck

Market Street Bridge

- Improve sidewalks
    - Concerned with sidewalk width when bicycles and pedestrians are on sidewalk at same time
    - Poor condition at multiple locations
    - Concerned with railing height to prevent bicycles and pedestrians from falling onto the roadway
- Need to improve safety for bikes
    - Would like to see bike lanes
- Lighting needs to be upgraded

CAT Bridge

- Want the park and bicycle/pedestrian connection alternatives to move forward
    - Majority of respondents preferred a strictly pedestrian/bicycle use instead of shared use with a transit priority lane
    - At a minimum, bridge should be opened to pedestrian/bicycle traffic
- Concerned with aesthetics and handling of storm water. Address through:
    - Landscaping
    - Park connections at each end of the bridge
    - Pervious surfaces and rain gardens

Harvey Taylor Bridge

The Harvey Taylor Bridge provides the northernmost primary multimodal connection. Shared-use paths are provided on both the north and south sides of the bridge for pedestrians and bicyclists. The east terminus of the bridge abuts Riverfront Park in the City of Harrisburg, providing a connection to the Capital Greenbelt. An at-grade interchange (right-turn access only) is provided on the west terminus of the bridge in Wormleysburg. Pedestrian and bicycle activity is restricted farther west on the Camp Hill Bypass.

Near-Term

Proposed near-term improvements include:

- (Figure 26) Designate a shared pedestrian/bicycle route between the bridge and points on the West Shore, with exact signing and routing details determined as part of the actual project:
  - River Street from the Harvey Taylor Bridge pedestrian tunnel to Walnut Street
  - Walnut Street from Front Street to points west
  - As an alternative to River Street, Elm and Second Streets
  - Install bicycle guide signing similar to that shown
- Install pedestrian/bicycle guide signing for tunnel
- Improve signage and lane markings at Forster and Front Streets to ensure motorists are in the appropriate lane for the next signal at Forster and Second Street (shown on Figure 27 with mid-term improvements)

Figure 26: Near-Term – Designate West Shore Pedestrian/Bicycle Route

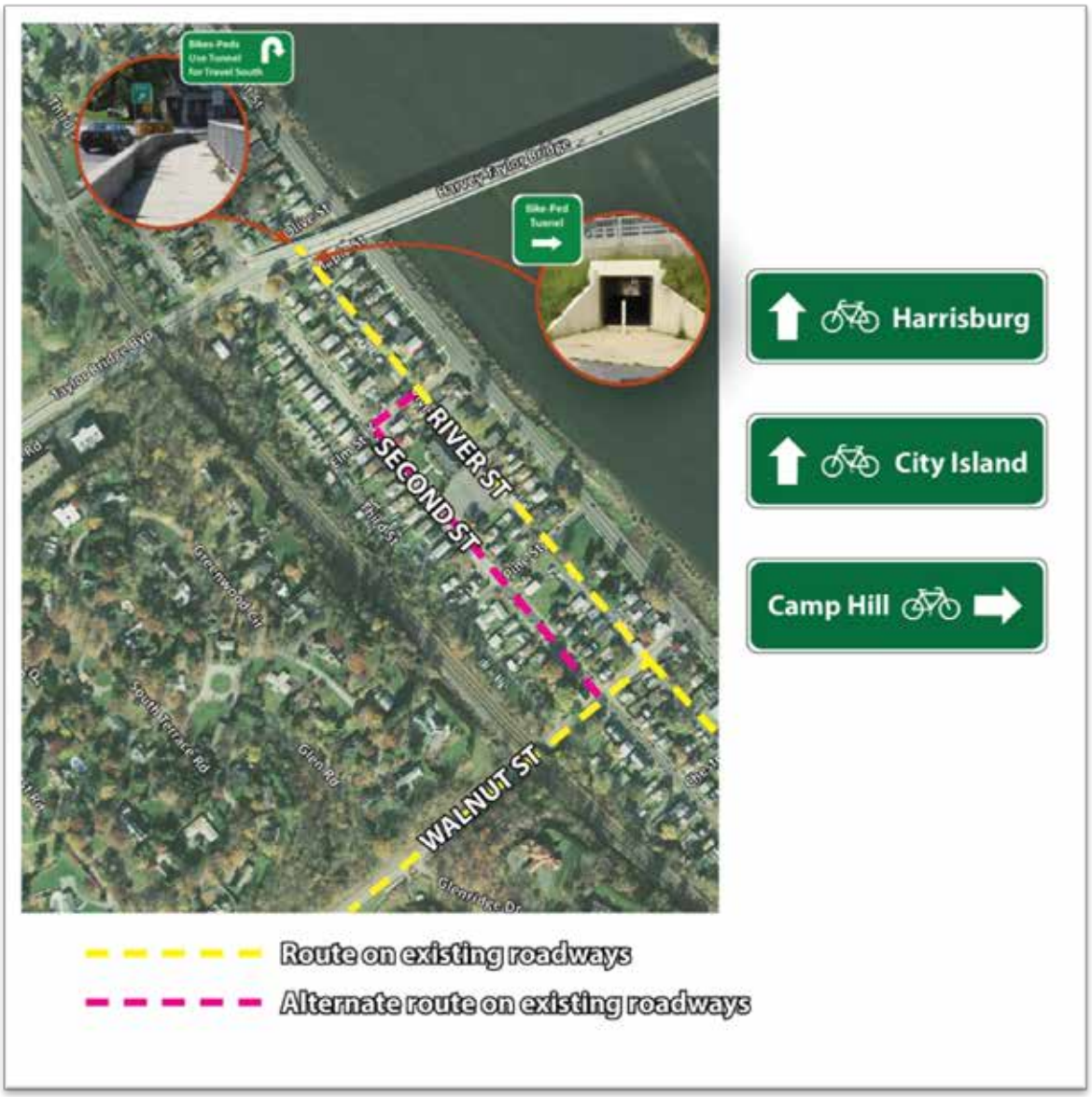


Table 15 is an evaluation matrix comparing potential benefits to the feasibility of implementing the alternative/improvement where L = Low, M = Medium, and H = High.

Table 15: Harvey Taylor Bridge Near-Term Improvements Evaluation Matrix

Proposed Near-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Pedestrian/bicycle signing	H	L	H	H	H	H	H	H
Bike route along River Street	M	L	H	H	-	H	-	H
Forster signs and markings	H	M	H	H	-	-	-	H

Mid-Term

Proposed mid-term improvements include:

- (Figure 27) Enhance pedestrian infrastructure by reducing pedestrian crossing distance and upgrading signal equipment at Forster and Front Streets:
  - Upgrade pedestrian signal equipment
  - Eliminate excess pavement by providing bulb-outs and pedestrian islands to better delineate vehicle and pedestrian paths
- (Figure 28) Connect River Walk and Greenbelt

Figure 27: Mid-Term – Upgrade Front & Forster Streets Signal Equipment and Provide Pedestrian Islands

Figure 28: Mid-Term – Connect River Walk and Greenbelt

Table 16 is an evaluation matrix comparing potential benefits to the feasibility of implementing the alternative/improvement where L = Low, M = Medium, and H = High.

Table 16: Harvey Taylor Bridge Mid-Term Improvements Evaluation Matrix

Proposed Mid-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Forster pedestrian upgrades	H	L	H	H	H	H	H	H
Greenbelt connection	M	-	M	H	H	H	H	H

Market Street Bridge

The Market Street Bridge provides the primary multimodal connection between the City of Harrisburg, City Island, and the West Shore communities. Sidewalks are provided on the north and south sides of the bridge for pedestrians. No dedicated facilities are provided for bicyclists; they are required to share the roadway with vehicular traffic due to the lack of shoulders and 4- to 5-feet-wide sidewalks. The east terminus of the bridge abuts Riverfront Park in the City of Harrisburg, providing a connection to the Capital Greenbelt. A signalized intersection is provided on the west terminus of the bridge in Wormleysburg where vehicular and non-vehicular traffic can safely interact.

Near-Term

Proposed near-term improvements include:

- Restripe Front Street to provide shoulders/bike lanes to shorten the pedestrian crosswalk distances (Figure 29)
- Repair existing sidewalk, as needed, within the bottleneck (Figure 30)
- Upgrade pedestrian/bicycle connections between Walnut Street and Market Street bridges
- Restrict left turns at City Island with raised concrete islands on the minor approaches (Figure 31)

Figure 29: Near-Term – Restripe Front Street in Wormleysburg

Figure 30: Near-Term – Repair Sidewalk within Lemoyne Bottleneck

Figure 31: Near-Term – Restrict Left Turns at City Island

Table 17 is an evaluation matrix comparing potential benefits to the feasibility of implementing the alternative/improvement where L = Low, M = Medium, and H = High.

Table 17: Market Street Bridge Near-Term Improvements Evaluation Matrix

Proposed Near-term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
City Island access modifications	H	H	H	M	-	-	-	H
Widen sidewalk between curves in bottleneck	H	-	H	H	H	-	H	H
Front Street Wormleysburg pedestrian/bicycle improvements	H	M	H	H	H	H	H	H

Mid-Term

Proposed mid-term improvements include:

- Widen bridge and sidewalk to provide standard height railing/barrier to separate shared-use path from traffic on the north side of the bridge (Figure 32)
- Incorporate streetscaping plan recommendations for walkable promenade in Wormleysburg

Figure 32: Mid-Term – Widen Bridge and Sidewalk

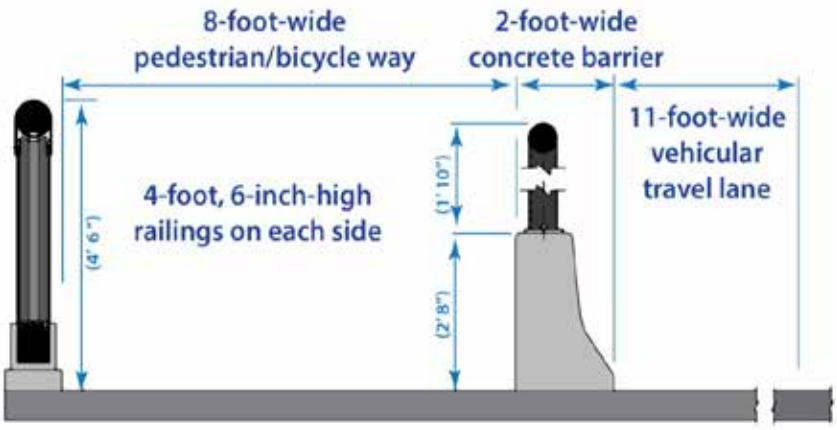


Table 18 is an evaluation matrix comparing potential benefits to the feasibility of implementing the alternative/improvement where L = Low, M = Medium, and H = High.

Table 18: Market Street Bridge Mid-Term Improvements Evaluation Matrix

Proposed Mid-term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Widen sidewalk within entire bottleneck	H	M	M	L	H	L	H	M

Walnut Street Bridge

The Walnut Street Bridge provides pedestrian and bicycle connectivity between the City of Harrisburg and City Island on the east side of the river. A portion of the western spans of the Walnut Street Bridge were destroyed during a winter storm in 1996; however, the nearby Market Street Bridge accommodates pedestrian and bicycle travel to and from the West Shore, albeit with the presence of vehicular traffic.

Near-Term

Proposed near-term improvements include:

- Upgrade pedestrian/bicycle connections between Walnut Street and Market Street bridges (Figure 33)
- Increase commuter parking demand on City Island by establishing a bike-share program so commuters can ride between City Island and Harrisburg (Figure 34)

Figure 33: Upgrade City Island Pedestrian/Bicycle Connections

Figure 34: Bike-Share Station in Arlington, Virginia

Future Use

There is no transportation "need" for the West Shore spans of the Walnut Street Bridge. Even if the missing spans were replaced, the remaining portions of the bridge can only accommodate bicycles and pedestrians. The Market Street Bridge is located 500 feet to the southeast and provides vehicular, bicycle, and pedestrian connectivity. To reconstruct the western spans is cost-prohibitive considering that only pedestrians and bicyclists would use the bridge and an easily accessible alternative bridge is already located nearby. The study team determines that the restoration of the missing spans should not be considered for transportation purposes. The funds utilized to restore the missing spans should be utilized to improve the other study bridges which provide connectivity for all modes.

CAT Bridge

The CAT Bridge is restricted to rail traffic only but none of the major railroads in the Tri-County Area are currently crossing the bridge. Norfolk Southern owns the right-of-way on the west terminus while Amtrak owns the east terminus; any projects would require an agreement with the railroads. The rail right-of-way was once reserved for the CORRIDOR*one* project, which was to bring regional rail service to the City of Harrisburg, but this project did not receive Cumberland County approval so at this time appears unlikely.

Mid-Term

Proposed mid-term improvements are listed below. These can be constructed without rehabilitating the bridge. Although ongoing maintenance of the bridge superstructure is also not necessary for these improvements, it should occur at regular intervals.

West Shore

- Construct pedestrian and bicycle connections between CAT Bridge and Wormleysburg/ Lemoyne/New Cumberland (Figure 35)
    - Improvement would require an agreement with Norfolk Southern
- Build an elevated pedestrian and bicycle connection between the CAT Bridge and the Market Street Bridge on the West Shore (Figure 36)

Figure 35: Mid-Term – Construct Pedestrian/Bicycle Connections to West Shore

Figure 36: Mid-Term – Build an Elevated Connection between CAT Bridge and Market Street Bridge (West Shore)

View from Market Street Bridge looking downstream toward the West Shore

Bridge

- Convert bridge to pedestrian and bicycle shared-use pathway.

Figure 37: Mid-Term – Convert Bridge to Pedestrian and Bicycle Pathway

City Island

- Construct an elevated pedestrian connection from the bridge to the City Island parking garage (Figure 38)

Figure 38: Mid-Term – Construct Elevated Pedestrian Connection to City Island

East Shore

- Construct a ramp to provide pedestrian and bicycle connection between the CAT Bridge and Front Street/Greenbelt (Figure 39)

Figure 39: Mid-Term – Construct Pedestrian/Bicycle Ramp to Front Street/Greenbelt

Long-Term Considerations

Long-term alternatives were proposed for each study bridge. Future needs, multimodal mobility, and agency/public input were all considered when finalizing the alternatives. A benefit to cost matrix was used to compare alternatives and determine which were the most feasible while enhancing safety and multimodal initiatives. A phased approach was considered where possible to stage improvements in a cost effective manner to benefit all modes of transportation and reduce reconstruction costs.

Potential Improvements

Long-term improvements and alternatives are documented below for each study bridge. Not all of the alternatives remain under consideration based on agency stakeholder feedback and feasibility. If an alternative has been dismissed, documentation is provided why the alternative is no longer considered viable.

Harvey Taylor Bridge

A shared-use pedestrian and bicycle path was proposed along the south side of the Camp Hill Bypass. The shared-use path would provide access from the Harvey Taylor Bridge to Erford Road. This alternative was dismissed for two reasons: Camp Hill Bypass is limited access between the Harvey Taylor Bridge and 21st Street, and Erford Road does not provide adequate pedestrian or bicycle infrastructure. Providing bicycle and pedestrian access to Erford Road would only create a safety concern along that

corridor where there are narrow shoulders and incomplete sidewalk; therefore, this alternative was dismissed.

Table 19 is an evaluation matrix comparing potential benefits to the feasibility of implementing the alternative, where L = Low, M = Medium, and H = High.

Table 19: Harvey Taylor Bridge Long-Term Improvements Evaluation Matrix

Proposed Long-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Bike path along Bypass	M	L	M	L	-	H	H	M

Walnut Street Bridge

Two alternatives were considered for the Walnut Street Bridge: replace the missing western spans and widen the eastern span sidewalk. As discussed previously, replacing the western spans is not fiscally responsible given that the Market Street Bridge currently provides mobility to all users approximately 500 feet to the south. Widening the sidewalk on the eastern spans was considered, but after performing a structural analysis, it was found that the added load of the additional sidewalk would make the bridge structurally deficient. Both alternatives were dismissed.

Table 20 is an evaluation matrix comparing potential benefits to the feasibility of implementing each alternative, where L = Low, M = Medium, and H = High.

Table 20: Walnut Street Bridge Long-Term Improvements Evaluation Matrix

Proposed Long-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Replace western spans	M	-	L	M	H	H	H	M
Widen eastern span sidewalk	H	-	M	M	-	-	H	None

Market Street Bridge

No alternatives or improvements were identified for the long term. All improvements can be implemented in the near- or mid-term.

CAT Bridge

Two alternatives were developed for the CAT Bridge. The first alternative is to convert the bridge to a shared transit, pedestrian, and bicycle facility (Figure 40). A one-lane, two-way busway would be provided on the bridge along with the pedestrian/bicycle shared-use path that was suggested in the mid-term improvements. In order for this alternative to come to fruition, buy-in and cooperation from both railroads will be required since they own the property at each bridge termini. If one or neither of the railroads is willing to cooperate, the proposed multimodal alternative will not work.

Figure 40: Long-Term – Shared Transit, Pedestrian, and Bicycle Facility

The other alternative, if the railroads do not cooperate, is to convert the bridge into an elevated park for pedestrian and bicycle use only (Figure 41 and Figure 42). The elevated park could provide a safer connection between the City of Harrisburg and West Shore communities for non-vehicular traffic. In addition, the elevated park could potentially be used for festivals, a fireworks viewing area, lunch hour/weekend destinations, and provide emergency vehicle access (dependent upon connections at each shore).

Other regions have converted outdated bridges to elevated parks; examples follow.

Figure 41: Elevated Park Example – Highline Park, New York City

In Manhattan, a 1.45-mile-long historic elevated freight rail line was converted into a public park above the city. Two sections are open with a third currently under construction. The park has spurred development and increased property values nearby.

Figure 42: Elevated Park Example – Walkway over the Hudson, Poughkeepsie, NY

The former Poughkeepsie-Highland Railroad Bridge was transformed into a 1.28-mile-long state park spanning the Hudson River. It attracts 750,000 visitors per year, bringing revenue to the local economy.

Chattanooga, Tennessee, Pedestrian Bridge: the 1891 Walnut Street Bridge in Chattanooga was preserved as a half-mile-long pedestrian bridge. It is on the National Register of Historic Places and connects a revitalized area of downtown with the North Shore of the Tennessee River.

The following parks are either in the planning stages or under construction:

Beltline, Atlanta: The first segments of the Beltline—envisioned as a 22-mile pedestrian/bicycle loop around Atlanta reusing historic railroad corridors—opened in 2010. http://beltline.org

The 606, Chicago: Opening in Fall 2014, The 606 is a conversion of the former Bloomingdale rail line to multi-use trails. A public-private partnership and the work of more than a dozen community groups were instrumental in making the City's proposal become a reality. http://the606.org

The Trestle, St. Louis: Opening in 2016, the 1.5-mile Trestle in St. Louis will convert abandoned elevated rail alignment into an urban park and greenway. http://www.friendsofthetrestle.org

The Rail Park, Philadelphia: "Friends of the Rail Park," founded in 2010, is building support to transform a 3-mile segment of the former Philadelphia and Reading Railroad into a linear park. http://therailpark.org

Table 21 is an evaluation matrix comparing potential benefits to the feasibility of implementing each alternative, where L = Low, M = Medium, and H = High.

Table 21: CAT Bridge Long-Term Improvements Evaluation Matrix

Proposed Long-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Rehabilitate bridge with one-lane, two-way busway and ped/bike path	H	M	L	H	M	M	M	H
Rehabilitate bridge with ped/bike path and elevated park	M	M	L	M	H	H	H	M

Assuming the railroads are willing to provide access through their right-of-way for the multimodal connection alternative (transit/pedestrian/bicycle facility), potential connections and improvements were examined in detail for the East and West Shores.

West Shore Connection

Two connections were considered on the West Shore. The first connection considered was a multimodal connection at the Lemoyne Market Street Bottleneck. This connection would provide a bus ramp and shared-use path from the CAT Bridge to Market Street at the curve between the existing railroad bridges (Figure 43). This connection is not preferred because bus traffic would still need to traverse the bottleneck, providing limited benefit to bus travel times. In addition, the proposed busway intersection is located on a curve with limited sight distance and would likely need to be signalized, creating a safety concern for buses and vehicles along Market Street.

Figure 43: Long-Term – Multimodal Connection at Lemoyne Bottleneck

The second connection examined was a shared bus-way to 5th Street in Lemoyne. This is the preferred option and would allow buses to run along Norfolk Southern right-of-way from the CAT Bridge to 5th Street. This proposed busway would allow buses to avoid the Lemoyne Bottleneck, thereby improving bus travel times. Pedestrians and bicyclists would be restricted from using the busway and would have a separate connection into Lemoyne through Bosler Avenue initially, which would then be replaced by one at Hummel Avenue if Norfolk Southern constructs their proposed connector of the Lurgan Branch and Shippensburg Branch rail lines. Norfolk Southern commented specifically that they do not want pedestrian and bicycle activity in their right-of-way, therefore a separate connection is proposed for pedestrians and bikes. See Figure 44 for potential multimodal connections in Lemoyne.

Figure 44: Long-Term – Potential Multimodal Connections in Lemoyne

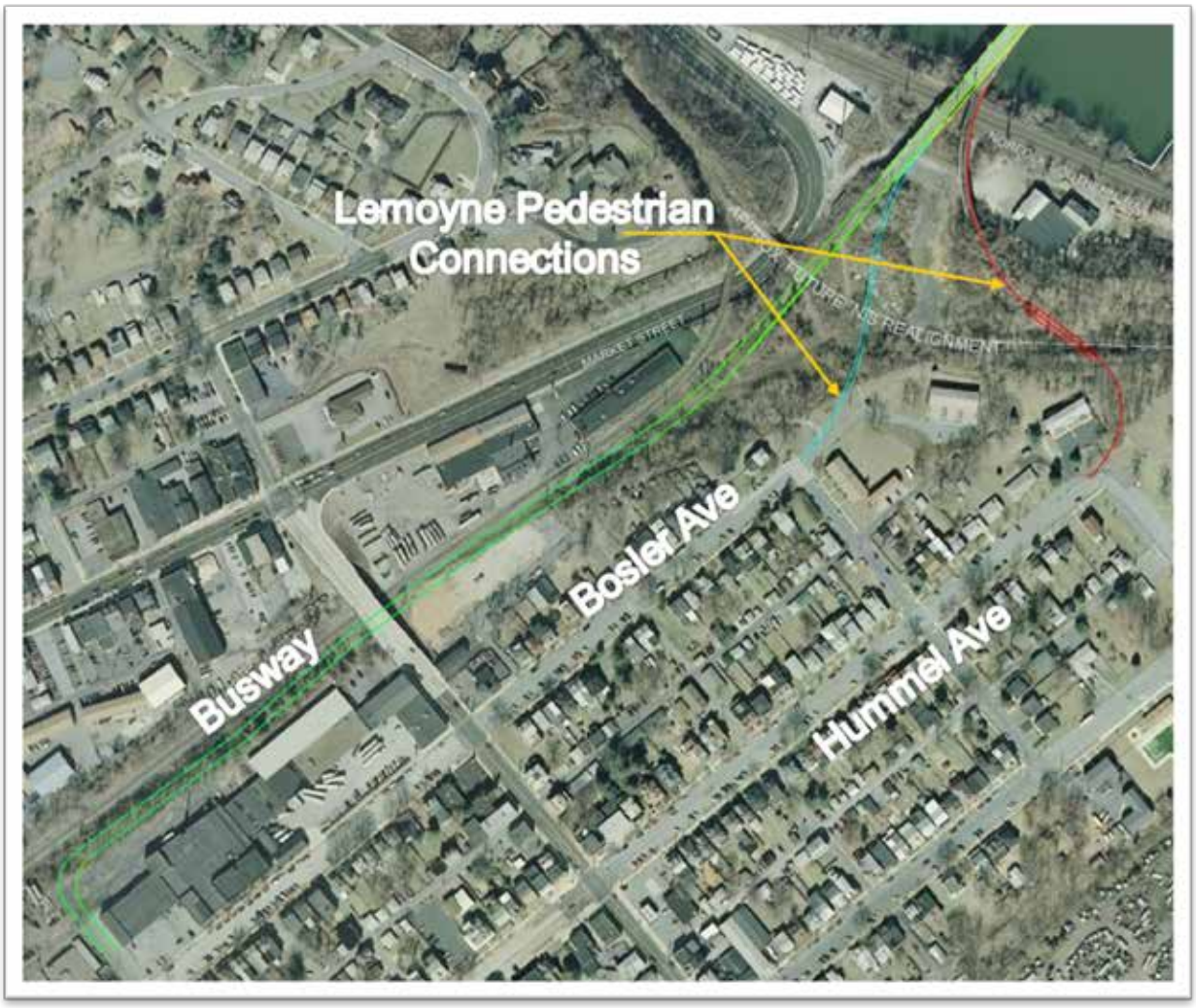


Table 22 is an evaluation matrix comparing potential benefits to the feasibility of implementing each alternative, where L = Low, M = Medium, and H = High.

Table 22: Harvey Taylor Bridge West Shore Long-Term Improvements Evaluation Matrix

Proposed Long-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Busway and peds/bikes connecting to Bottleneck	L	L	L	L	L	L	M	L
Busway to 5th Street with ped/bike connections to Hummel/Bosler	H	M	M	H	H	H	H	M

East Shore Connection

Two connections were considered on the East Shore. Both connections provide a busway to the Harrisburg Transportation Center (HTC) and a shared-use path for pedestrians and bicyclists from CAT Bridge to Front Street. The first alternative considers using Third and Dewberry Streets to provide access between the HTC and the CAT busway (Figure 45). The second alternative provides a new turnaround through existing parking lots to provide access to the HTC from the CAT busway. Both alternatives are feasible, but Amtrak would prefer using the Third and Dewberry Streets alternative.

Figure 45: Long-Term – Connections to Front Street and Harrisburg Transportation Center

Table 23 is an evaluation matrix comparing potential benefits to the feasibility of implementing each alternative, where L = Low, M = Medium, and H = High.

Table 23: Harvey Taylor Bridge East Shore Long-Term Improvements Evaluation Matrix

Proposed Long-Term Improvement	Safety	Congestion	Economical	Support	ADA	Bike	Ped	Feasibility
Third/Dewberry connection to HTC	M	M	H	M	H	H	H	H
Amtrak ROW connection to HTC	H	H	M	M	H	H	H	M

Other Issues

Bridge Ownership

Current ownership of the CAT Bridge and the bridge termini create challenges regarding a consensus and a shared long-term vision for the bridge to enhance mobility throughout the Tri-County region. Three entities currently own a portion of the CAT Bridge: Amtrak (east termini), CAT (from East Shore to West Shore), and Norfolk Southern (west termini). As with several of the proposed mid-term alternatives, full cooperation, support, and buy-in from each entity are also required for any of the proposed long-term alternatives to move forward.

CAT supports all proposed long-term alternatives, but ideally would prefer a ped/bike/transit alternative to improve its operations. Neither railroad has supported or detracted any of the alternatives at this time. Potential concerns and issues for each railroad are discussed below.

Amtrak Issues

Amtrak controls the east termini and currently uses the tracks on the east side of the bridge to turn its trains around. Amtrak's rail line extends approximately 250 feet onto the bridge from the East Shoreline. Amtrak has stated that new engines will make it unnecessary to turn trains around, but it appears apprehensive about giving up rights to the property and the rail line. The proposed busway alternatives all require the busway to cross over the active rail line, requiring the track to be relocated in order to avoid an at-grade intersection. Amtrak is evaluating the feasibility of relocating the track or eliminating it altogether. Other concerns include pedestrian/bicycle activity next to active rail lines, bus access via 2nd Street or 3rd Street, and the fact that the bus lane would have to cross the existing rail line at the east termini.

Norfolk Southern Issues

Norfolk Southern controls the west termini and has rail lines below the CAT Bridge and farther west near the Lemoyne Bottleneck. Norfolk Southern is currently proposing a new connector to enhance operations near the CAT Bridge that could potentially impact proposed pedestrian, bicycle, and transit connections. If the proposed connector is constructed at grade, the busway to 5th Street in Lemoyne would no longer be an option. Norfolk Southern said it would consider the proposed busway running parallel Norfolk Southern's right-of-way into Lemoyne, as well as pedestrian/bicycle connections, if the improvements do not impact their operations. Some initial concerns with the proposed alternatives are limiting overall rail capacity, impeding freight movements, pedestrian/bicycle activity near active rail lines, and loss of right-of-way in the study area.

CAT Bridge Maintenance and Rehabilitation

The mid-term pedestrian/bike option for this bridge is independent of the regular maintenance and long-term rehabilitation required for the bridge superstructure. This maintenance and rehabilitation will be required even if the bridge remains unused. In the event that no use is identified for the bridge, rather than committing funds to its maintenance and rehabilitation, one option would be to demolish the bridge. The cost to do so, however, is estimated at $10 M, relatively close to the $12-$15 M estimated for a long-term rehabilitation.

Summary of Recommendations and Costs

A summary of all the near-, mid- and long-term improvements that are still being considered to enhance multimodal connectivity are documented in this section. Near-term are projects likely to occur in less than 7 years, mid-term between 7 and 14 years, and long-term greater than 15 years. In addition to each improvement and alternative, associated costs are provided. The costs provided are high-level planning estimates that vary from thousands of dollars to several million dollars.

Near- and Mid-Term Improvements

Table 24 highlights recommended near- and mid-term improvements and their estimated cost. The location numbers correspond to the map on Figure 46, following.

Table 24: Summary of Near- and Mid-Term Preferred Improvements and Costs

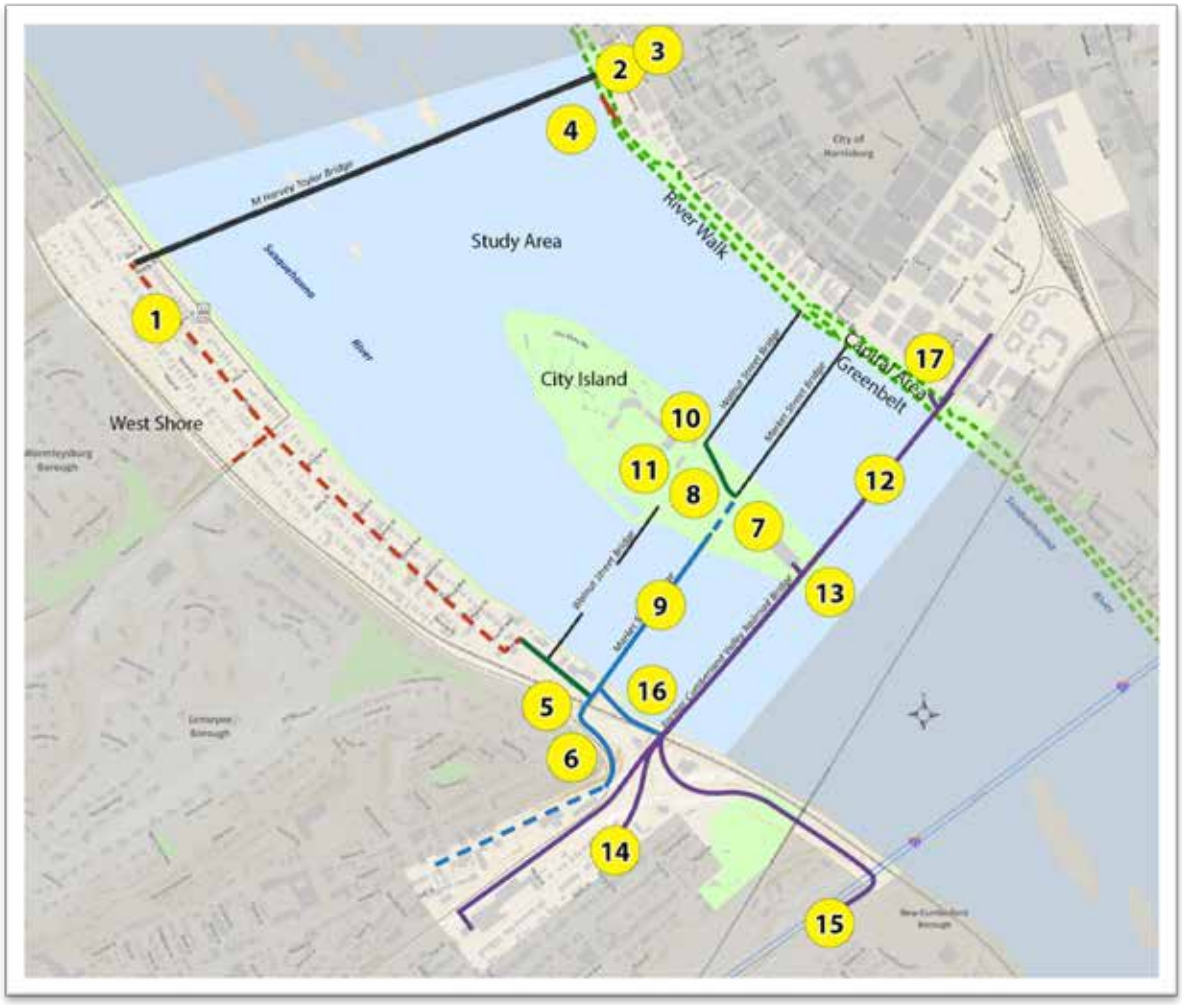
Identifier (Sponsor)	Bridge	Improvement	Timeframe	2014 Cost
1 (TBD)	Harvey Taylor	West Shore Ped/Bike Routing	Near-Term	$2,000
2 (PennDOT)	Harvey Taylor	Harrisburg Front & Forster Sign/Marking Upgrades	Near-Term	$2,500
3 (PennDOT)	Harvey Taylor	Harrisburg Front & Forster Pedestrian Improvements	Mid-Term	$170,000
4 (TBD)	Harvey Taylor	Harrisburg Riverfront Walk and Greenbelt Connection	Mid-Term	$1.8 M
5 (TBD)	Market Street	Wormleysburg Front Street Restriping/Ped Improvements	Near-Term	$3,500
6 (PennDOT)	Market Street	Wormleysburg-Lemoyne Bottleneck Sidewalk Repair	Near-Term	$10,000-$20,000
7 (PennDOT)	Market Street	City Island Left-Turn Restrictions	Near-Term	$5,000
8 (TBD)	Market Street	City Island Ped/Bike Paths through Parking Area	Near-Term	$20,000
9 (PennDOT)	Market Street	Widen Sidewalk on North Side as part of Necessary Rehab	Mid-Term	$200,000
10 (TBD)	Walnut Street	Ped/Bike Signing for Travel between WSB and MSB	Near-Term	$2,000
11 (TBD)	Walnut Street	City Island Bike Share System	Near-Term	Self Sufficient
12 (CAT)	CAT	Demolish CAT Bridge (Not a preferred option – provided as information only)	-	$10 M
12 (CAT)	CAT	Maintenance of Bridge (Concrete repairs necessary at approximately 5-year intervals whether or not the bridge is put to use)	Mid-Term	$1.5 M

Identifier (Sponsor)	Bridge	Improvement	Timeframe	2014 Cost
12 (CAT)	CAT	Convert Bridge to Ped/Bike Pathway*	Mid-Term	$3.2 M
13 (CAT)	CAT	Construct Connection to City Island	Mid-Term	$150,000
14 (TBD)	CAT	West Shore Construct At-Grade Bosler Connection to Lemoyne**	Mid-Term	$450,000
15 (TBD)	CAT	West Shore Construct Lowther Connection to New Cumberland**	Mid-Term	$430,000
16 (TBD)	CAT	West Shore Construct Elevated Connection MSB and CAT**	Mid-Term	$1.8 M
17 (TBD)	CAT	East Shore Construct Connection Ramp Greenbelt to CAT**	Mid-Term	$1.7 M

*Previous CAT Bridge inspection performed during 2004. Prior to any detailed design another in-depth inspection should be considered.

**Agreements with Norfolk Southern and/or Amtrak would be necessary.

Figure 46: Map of Recommended Near- and Mid-Term Improvements



Long-Term Considerations

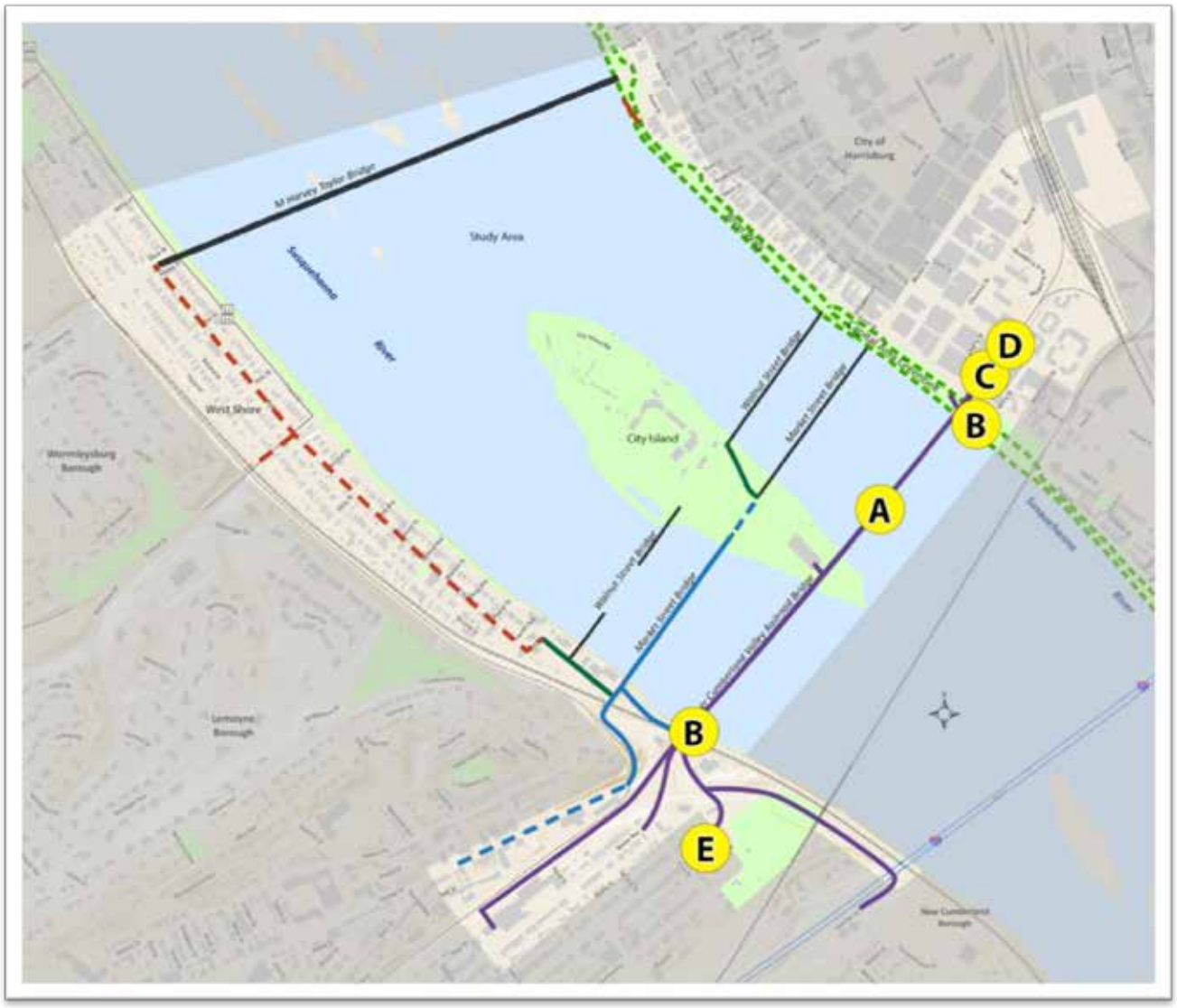
Additional analyses and further discussions with railroad stakeholders will be required for continued consideration of more detailed improvement options and any administration agreements necessary to advance major improvement projects for the CAT Bridge. For this reason and due to the complexity of the numerous alternatives developed for that bridge and its approaches, the improvements were deemed "long term." The majority of the improvements under consideration will require cooperation from the railroads (Norfolk Southern and Amtrak) that own the right-of-way at the bridge termini. It should be noted that the bridge will require a structural rehabilitation in the long term to prolong its life and to prevent significant deterioration of its superstructure.

The long-term considerations are detailed within this report. An improvement table summarizing potential improvements/alternatives on the CAT Bridge is presented as Table 25 along with associated costs where appropriate. The location identifiers in the improvement table correlate with the letters on the long-term improvements map in Figure 47.

Table 25: Potential Long-Term Improvements and Costs

Identifier (Primary Owner)	Location	Improvement	Timeframe	2014 Cost
A (CAT)	CAT Bridge	Bridge rehabilitation (Necessary even if the bridge remains unused. Includes waterproof membrane, concrete repairs, and repair of scour holes with grout bags.)	Long-Term	$12-$15 M
A (CAT)	CAT Bridge	Pavement or rail to accommodate potential transit use. Since the limits of any potential transit corridor are uncertain, cost only on bridge itself and not approaches. Does not include gates, signaling, lighting, and other appurtenances.	Long-Term	$300,000 (Pavement) $700,000 (Rail/Track)
B (CAT)	CAT Bridge Approaches	The limits of any potential transit corridor are uncertain; however bus or railway infrastructure would be necessary as well as pavement, track, gates, signaling, lighting, etc.	Long-Term	Unknown
C (Amtrak)	Harrisburg Amtrak Line	Track relocation/modification of Amtrak line would be required to accommodate any potential transit use.	Long-Term	Unknown
D (Amtrak)	2nd Street Overpass	Transit use may require rehabilitation of the Second Street overpass.	Long-Term	Unknown
E (TBD)	Proposed Norfolk Southern Lemoyne Connector	If the Norfolk Southern proposed connector of the Lurgan Branch and Shippensburg Secondary is built, the Bosler pedestrian/bicycle connection would be abandoned and a grade-separated pedestrian/bicycle connection to Lemoyne would be required via Hummel Ave.	Long-Term	$1.6 M

Figure 47: Map of Potential Long-Term Improvements



Next Steps

The improvements presented in this report were developed with a phased approach to include near-, mid-, and long-term projects. Project implementation will require the establishment of a project sponsor and following the regional project development process through the Harrisburg Area Transportation Study (HATS) MPO in cooperation with PennDOT. All projects utilizing federal funding are required to be placed on the Regional Transportation Plan and included on the Transportation Improvement Program (TIP) in order to receive funding. The HATS Project Development Process, including the RTP and TIP requirements, can be accessed on the HATS website at http://www.tcrpc-

pa.org/HATS/Pages/Project-Development.aspx. Some mid-term and long-term projects may require additional detailed study and analysis in order to better define all aspects of the improvements including specific project engineering design, environmental constraints, refined cost estimates, project sponsors, project funding, agency agreements, etc.

Potential Funding Sources

Improvements require funding, and while some improvements can be accomplished through existing maintenance programs or as part of other projects, major improvements and alternatives will require dedicated programming and funding. The proposed mixed use of the CAT Bridge opens up numerous funding opportunities for this project. Because the improvements address multiple travel modes, multiple funding sources should be explored for eligibility. This section discusses those and other potential funding sources.

PA Transportation Funding Bill

On November 25, 2013, Governor Corbett signed House Bill 1060, Pennsylvania's most comprehensive state transportation legislation in decades. New funding streams will be made available for transit, pedestrian/bicycle, and multimodal projects. The bill offers more flexibility than in the past for using state transportation money for pedestrian safety, streetscaping, and lighting projects. Some highlights of the bill include:

- Increased funding for 36 transit agencies, approximately $475 million for public transportation in year 5
- A new multimodal fund that will increase from $30 to $144 million over five-year period
- Increased funding for roads and bridges—$242 million in year 1 to $1.8 billion in year 5
- Local tax for mass transportation and multimodal transportation

Grants and Programs

A number of federal programs and grants are made available annually to assist with the implementation of transportation projects. The grants described below may be sources of funding for project phases or entire improvements.

Surface Transportation Program (STP)[2]

The Surface Transportation Program (STP) (23 U.S.C. 133) is one of the primary sources of flexible funding available for transit or highway purposes. STP provides the greatest flexibility in the use of funds. These funds may be used (as capital funding) for public transportation capital improvements, car and vanpool projects, fringe and corridor parking facilities, bicycle and pedestrian facilities, and intercity or intracity bus terminals and bus facilities. As funding for planning, these funds can be used for surface transportation planning activities, wetland mitigation, transit research and development, and environmental analysis. Other eligible projects under STP include transit safety improvements and most

[2] http://www.dot.gov/livability/grants-programs

transportation control measures. STP funds are distributed among various population and programmatic categories within a state. Some program funds are made available to metropolitan planning areas containing urbanized areas over 200,000 population; STP funds are also set aside to areas under 200,000 and 50,000 population. The largest portion of STP funds may be used anywhere within the state to which they are apportioned. Both state and local governments are eligible for this program.

Highway Safety Improvement Program (HSIP)[3]

The Highway Safety Improvement Program (HSIP) (23 USC 130 and 148) provides funds for highway safety improvement projects. These types of projects are defined as any strategy, activity, or project on a public road that is consistent with the data-driven State Strategic Highway Safety Plan (SHSP) and corrects or improves a hazardous road location or feature or addresses a highway safety problem. MAP-21 provides an example list of eligible activities, but HSIP projects are not limited to those on the list.

The program does include potentially eligible set-asides including:

- Railway - highway crossings—$220 million.
- A proportionate share of funds for the state's Transportation Alternatives (TA) program.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program[4]

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) (23 U.S.C. 149) is the other major source of flexible funding. CMAQ has the objective of improving the nation's air quality and managing traffic congestion by supporting transportation projects that contribute to emissions reductions of carbon monoxide, particulate matter, and ozone and its precursors. Eligible activities under CMAQ include transit system capital expansion and improvements that are projected to realize an increase in ridership, travel demand management strategies and shared ride services, pedestrian and bicycle facilities, and promotional activities that encourage bicycle commuting. State and local governments and private sector elements through a public sponsor are all eligible to receiving CMAQ funding.

Pennsylvania Act 13 Conservation and Recreation Funding[5]

In February 2012, Pennsylvania's General Assembly passed legislation that gives counties where unconventional (horizontal) wells have been drilled the authority to impose an impact fee on such wells. By law, the funds must go to the counties, municipalities, and state agencies for the Pennsylvania Utility Commission to disperse funds. Funds may be used for parks, recreation, and conservation projects. For projects that involve development, rehabilitation, and improvements to public parks, recreation areas, greenways, trails, and river conservation, a grant of $250,000 may be issued. Most projects require a 50 percent local match of the total project cost. Municipalities, councils of governments, authorized organizations, institutions of higher education, and watershed organizations are all eligible for funding.

[3] http://www.fhwa.dot.gov/map21/factsheets/hsip.cfm
[4] http://www.fhwa.dot.gov/environment/air_quality/cmaq/
[5] http://pagrowinggreener.org/wp-content/uploads/2013/02/Act-13-Funding.pdf

Urbanized Area Formula Grant Program (Transit Grants for Mid- and Large Urban Areas)[6]

This program (49 U.S.C. 5307) makes federal resources available to urbanized areas and to state governors for transit capital and operating assistance in urbanized areas and for transportation-related planning. An urbanized area is an incorporated area with a population of 50,000 or more that is designated as such by the U.S. Department of Commerce, Bureau of the Census. Eligible purposes include planning, engineering design, and evaluation of transit projects and other technical transportation-related studies; capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment, and construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. All preventative maintenance and some Americans with Disabilities Act complementary paratransit service costs are considered capital costs. For urbanized areas with populations of 200,000 or more, operating assistance is not an eligible expense. In these areas, at least one percent of the funding apportioned to each area must be used for transit enhancement activities such as historic preservation, landscaping, public art, pedestrian access, bicycle access, and enhanced access for persons with disabilities.

Eligibility for funding includes urbanized areas with a population of 50,000 or greater. For populations of 50,000 to 200,000, funds are apportioned to the governor of each state for distribution. A few areas under 200,000 in population have been designated as transportation management areas and receive apportionments directly. For areas with population of 200,000 and greater, funds are apportioned and flow directly to a designated recipient selected locally to apply for and receive federal funds.

Transportation, Community, and System Preservation Program[6]

The Transportation, Community, and System Preservation (TCSP) Program is a comprehensive initiative of research and grants to integrate transportation, community, and system preservation plans and practices that improve the efficiency of the transportation system of the United States; reduce environmental impacts of transportation; reduce the need for costly future public infrastructure investments; ensure efficient access to jobs, services, and centers of trade; and examine community development patterns and identify strategies to encourage private sector development patterns and investments that support these goals. States, metropolitan planning organizations, local governments, and tribal governments are all eligible for the program.

Rail Line Relocation and Improvement Capital Grant Program[6]

This program provides financial assistance for local rail line relocation and improvement projects. Under this program, a state is eligible for a grant from FRA for any construction project that improves the route or structure of a rail line and 1) involves a lateral or vertical relocation of any portion of the rail line, or 2) is carried out for the purpose of mitigating the adverse effects of rail traffic on safety, motor vehicle traffic flow, community quality of life, or economic development.

[6] http://www.dot.gov/livability/grants-programs

Transportation Alternatives Program (TAP)[7]

The TAP replaces the funding from pre-MAP-21 programs including Transportation Enhancements, Recreational Trails, Safe Routes to School, and several other discretionary programs, wrapping them into a single funding source. This new program provides funding for a variety of alternative transportation projects, including many that were previously eligible activities under separately funded programs.

Funds may be used for projects or activities that are related to surface transportation and described in the definition of "Transportation Alternatives:" [23 USC 101(a)(29)]

- Construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other non-motorized forms of transportation.
- Conversion and use of abandoned railroad corridors for trails for pedestrians, bicyclists, or other non-motorized transportation users.
- Construction of turnouts, overlooks, and viewing areas.
- Community improvement activities, including:
    - inventory, control, or removal of outdoor advertising;
    - historic preservation and rehabilitation of historic transportation facilities;
    - vegetation management practices in transportation rights-of-way to improve roadway safety, prevent against invasive species, and provide erosion control; and
    - archaeological activities relating to impacts from implementation of transportation projects eligible under 23 USC.
- Any environmental mitigation activity, including pollution prevention and pollution abatement activities and mitigation to:
    - address stormwater management, control, and water pollution prevention or abatement related to highway construction or due to highway runoff; or
    - reduce vehicle-caused wildlife mortality or to restore and maintain connectivity among terrestrial or aquatic habitats.

In addition to defined Transportation Alternatives (as described above), TAP funds may be used for:

- the recreational trails program under 23 USC 206, and
- planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.

Eligible entities for TAP funding include: local governments, regional transportation authorities, transit agencies, schools, and any other local or regional government entity with responsibility for oversight of transportation or recreational trails (other than a metropolitan planning organization or a state agency) that the state determines to be eligible, consistent with the goals of subsection (c) of section 213 of title 23.

[7] http://www.fhwa.dot.gov/map21/tap.cfm

Recreational Trails Program[8]

The RTP provides funds to the states to develop and maintain recreational trails and trail-related facilities for both nonmotorized and motorized recreational trail uses. Each state develops its own procedures to solicit and select projects for funding. States may make funds available to federal, tribal, state, or local government agencies. Some states allow private non-profit organizations to apply directly.

Federal Transportation Investment Generating Economic Recovery (TIGER) Grant[9]

The TIGER Discretionary Grant program provides a unique opportunity for the U.S. Department of Transportation to invest in road, rail, transit, and port projects that promise to achieve critical national objectives. Congress dedicated $1.5 billion for TIGER I, $600 million for TIGER II, $526.944 million for FY 2011, and $500 million for the FY 2012 round of TIGER grants to fund projects that have a significant impact on the nation, a region, or a metropolitan area.

FTA Capital Investment Program: New Starts, Small Starts, and Core Capacity Improvements Grant[10]

This is FTA's primary grant program for funding major transit capital investments, including rapid rail, light rail, bus rapid transit, commuter rail, and ferries. In July 2012, a new authorization was enacted entitled the Moving Ahead for Progress in the 21st Century Act (MAP-21) that changed several aspects of the program. Prior to MAP-21, from 2005 through mid-2012, the authorizing legislation guiding FTA's programs was the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

FTA Alternatives Analysis Grant[11]

The objective of the Alternatives Analysis program (49 U.S.C. 5339) is to assist in financing the evaluation of all reasonable modal and multimodal alternatives and general alignment options for identified transportation needs in a particular, broadly defined travel corridor. The transportation planning process of Alternatives Analysis:

- Includes an assessment of a wide range of public transportation or multimodal alternatives, which will address transportation problems within a corridor or subarea.
- Provides ample information to enable the Secretary to make the findings of project justification and local financial commitment.
- Supports the selection of a locally preferred alternative.
- Enables the local Metropolitan Planning Organization to adopt the locally preferred alternative as part of the long-range transportation plan.

[8] http://www.fhwa.dot.gov/environment/recreational_trails/
[9] http://www.fta.dot.gov/grants/13094_13647.html
[10] http://www.fta.dot.gov/grants/13094_5221.html
[11] http://www.fta.dot.gov/grants/13094_7395.html

Preparedness (Non-Disaster) Grants[12]

Numerous preparedness grants exist, including among others Homeland Security. It may be possible for the CAT Bridge to qualify if it is deemed critical surface transportation infrastructure. It does provide an almost direction connection to the Harrisburg Hospital that could be used for emergency access.

Public Private Partnerships (P3)

A P3 project is a contractual agreement between a public entity and private entity that:

- § transfers the responsibility of a facility's engineering, construction, operation and/or maintenance to the private sector for a defined period of time;
- § allows the private sector to perform by contract a service previously provided by the public sector; and
- § ensures the private firm receives payments either from existing revenue sources or through the collection of new tolls or user fees.

DCNR

Community Recreation and Conservation Program (C2P2)[13]

This program funds projects that plan for, acquire, develop and/or rehabilitate public park, recreation, open space, greenway, trail, and conservation areas and facilities.

Pennsylvania Recreational Trails Program (C2P2)[14]

This program funds projects that help develop and maintain recreational trails, as well as trail-related facilities for both motorized and non-motorized recreational trail use. It also provides for the purchase of trail-related equipment.

Rails-to-Trails Program (C2P2)[15]

This program funds projects that plan for, acquire, and/or develop rail-trail corridors, to include trails and support facilities such as comfort stations, trail heads, interpretive facilities, landscaping, signage, etc.

[12] http://www.fema.gov/preparedness-non-disaster-grants
[13] https://www.grants.dcnr.state.pa.us/LearnMore.aspx?GrantProgramId=68
[14] https://www.grants.dcnr.state.pa.us/LearnMore.aspx?GrantProgramId=71
[15] https://www.grants.dcnr.state.pa.us/LearnMore.aspx?GrantProgramId=72