# **TECHNICAL REPORT**

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Feasibility Analysis and Cost Estimates for Project Alternatives

November 2014

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## Introduction

The Free Bridge Area Congestion Relief Project is a pilot grant project funded by the Federal Highway Administration (FHWA) to test Eco-Logical; a process developed by FHWA to "help guide agencies and partners to work proactively in developing and implementing an ecosystem approach for mitigating the effects of infrastructure projects...".

The Thomas Jefferson Planning District Commission (TJPDC) received a grant from FHWA in August 2013 to test the Eco-logical process with regard to Free Bridge, a key link in Charlottesville and Albemarle's transportation infrastructure. Free Bridge brings US 250 across the Rivanna River into the City of Charlottesville.

The grant's purpose is to implement the Eco-Logical process in developing potential alternatives that could help relieve congestion issues on US 250's Free Bridge. The bridge carries approximately 53,000 vehicles daily and currently operates at a level of service F. To implement this process TJPDC staff has assembled a team of local, regional and state stakeholders who are working collaboratively to determine potential infrastructure options that could alleviate congestion on Free Bridge and to assess the ecological impact of these options.

Rinker Design Associates, P.C. (RDA) provided engineering services for feasibility analysis and cost estimates for the potential project alternatives proposed by the stakeholders. Our sub-consultant, T3 Design Corporation, Inc. (T3), assisted with the feasibility analysis by providing a traffic operations and safety assessment of each alternative.

Process

#### Feasibility Analysis

The feasibility analysis of the project alternatives was conducted first to provide information to the stakeholders and generate feedback that would lead to the refinement of the alternatives. The feasibility analysis and project alternative refinements followed the process outlined below:

- Review Previous Studies/Plans/GIS to include County and City Records. Engineering and utility coordination staff collected all available data in the project area of the alternatives. This data was used in the feasibility assessment and in preparation for site visits.
- Site Visits/Google Earth. Engineering and utility coordination staff visited the site and used other digital means such as GIS and Google Earth to gain a firm understanding of the topography, utilities, property access, and other features that had an impact on feasibility.
- Determine/Verify Scope. Results of the review of existing records and the site visit were compared against the alternatives identified by the stakeholders. This was the first step in determining feasibility and resulted in additional dialogue with TJPDC staff to ensure accurate interpretation of the alternatives.
- Develop Concept Drawings. Using aerial imagery as a background, conceptual designs for each alternative were developed and annotated to depict number of lanes including turn lanes, proposed bicycle and pedestrian facilities, right of way limits, property access, utility easements, retaining walls, bridge structures, major drainage structures, and other features pertinent to a given alternative. The drawings were produced in color as 11" x 17" pdf maps and have been included in the Appendix.
- Identify Feasibility Issues/Evaluation Matrix. Construction feasibility issues were identified utilizing the
  information gathered from records research, site visits, and the conceptual designs. Qualitative feasibility
  issues such as property impacts, maintenance of traffic, floodplain influences, terrain, and other factors were
  presented in an evaluation matrix for discussion with the stakeholders.
- Presentation to Stakeholders. RDA and T3 staff presented the concept drawings and our feasibility analysis at the May 21 Stakeholder Team Meeting.
- Refinement of Alternatives. Feedback from the May 21 Stakeholder Team Meeting resulted in the refinement of the project alternatives. The refined alternatives were carried forward to the cost estimating phase.

#### Cost Estimating

Cost estimates were developed for each project alternative to include the preliminary engineering, right of way acquisition, utility relocations, and construction. The process that was used to estimate those items is outlined below:

- Construction. One of two methodologies was used to develop the construction cost for each alternative; the Virginia Department of Transportation (VDOT) Project Cost Estimating System PCES or quantity take-off. PCES is a parametric estimating tool developed by VDOT that estimates project costs using historical price data based on certain project characteristics and measurement inputs. It's best suited for typical roadway widening projects or new roadway construction. On projects not deemed suitable for PCES, quantities of major construction items were calculated and multiplied by unit prices from VDOT Construction Division's District Wide Averages published online. Percentages for incidentals (smaller items not able to be quantified with this level of design) and contingencies were added to arrive at a final construction estimate.
- Right of Way and Utilities. RDA Right of Way Staff researched assessed real estate values to develop a price
  per square foot cost. The square feet of right of way required was measured off of the concept drawings
  (property lines were based on GIS information). A multiplier of 2.75 was used to account for temporary
  easements, permanent easements, damages, and administrative costs. Individual property cost assessments
  were performed for parcels requiring relocation/total take.

RDA Utility Staff used the VDOT Project Cost Estimating System (PCES) to estimate utility relocation costs with the input data based on field reconnaissance and utility records research.

 Preliminary Engineering. Design cost was estimated as a percentage of the Construction Cost using a sliding scale from 20% for a \$5 million project to 10% for a \$400 million project.



### Alternative A: Free Bridge Overpass/Expressway

#### Original Concept

Alternative A includes construction of an elevated structure that would route two lanes of 250 east and west bound traffic over the intersections of US 250/20 and US 250 and High Street. The existing intersections and bridge remain below the flyover structure. A loop road passing under existing Free Bridge connecting River Road with High Street was also included.



Alternative A





Examples of an elevated structure



#### Original Alternative A Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts			Х
Utility Impacts			Х
Park Impacts	Х		
Trail Impacts		Х	
Railroad Impacts	Х		
Maintenance of Traffic Impacts			Х
Bridges			Х
Floodway Influence		Х	
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls			Х
Construction Feasibility	Х		
Expected Congestion Relief @ Free Bridge			Х
Expected Cost			Х

#### Alternative A Refinements

The original Alternative A was split into A-1 and A-2. Alternative A-1 only includes construction of an elevated structure that would route two lanes of US 250 east and westbound traffic over the intersections of US 250/20 and US 250/High Street. The existing intersections and bridge remain below the flyover structure. Alternative A-2 includes reconfiguring the US 250 and High Street intersection to eliminate left turn movements from westbound US 250. In this configuration traffic wanting to make a left turn would pass through the intersection and make a right at Landonia Circle. A new connector road would then join Landonia Circle to River Road where a traffic light would be installed.



Alternative A-2

#### Alternative A-1 Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts			Х
Utility Impacts			Х
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts			Х
Bridges			Х
Floodway Influence	Х		
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities		Х	
Earthwork/Terrain	Х		
Retaining Walls			Х
Construction Feasibility	Х		
Expected Congestion Relief @ Free Bridge			Х
Expected Cost			Х

- Property Impacts There will be a building impacted at the corner of Free Bridge Lane. Additional right of way and utility easement will be significant throughout the corridor due to the structure support columns on both sides of the road. The relocation and rebuilding of the retaining walls along WB Route 250 will create significant property impacts during construction.
- Access Impacts The transition areas to enter/exit the center express lanes and the bridge abutment structures
  will limit left turn ingress and egress particularly at Landonia Circle and People Place along with various
  commercial entrances at the east end of the project.
- Utility Impacts All of the aerial utilities along the corridor including the major electric transmission line near the Route 20 intersection will be impacted and require relocation. It's highly probable that underground utilities, including water and sewer will be in conflict with the various bridge structure piers and foundations throughout the project. See the Utility Impact Summary in Appendix C for more detail.
- Maintenance of Traffic Impacts The construction activities in the median of Route 250 would require routine lane closures to allow the contractor to mobilize equipment, stage materials, and provide room to work. To erect the structural steel for the overpass would require multiple shutdowns of Route 250.
- Bridges This alternative requires over 1/2 mile of elevated bridge structure
- Floodway Influence Aligning the proposed bridge structure pies and abutments with the existing Free Bridge substructure will minimize floodway impacts.
- Drainage Structures Drainage from the elevated structure and storm water management provides a unique challenge in comparison to the typical project.
- Retaining Walls The existing retaining wall along WB Route 250 near Burnley-Moran Elementary School will
  need to be reconstructed. Mechanically stabilized earth (MSE) walls will be needed at the express lane termini.



- Construction Feasibility The maintenance of traffic impacts for the overpass will require major traffic detours and/or road closures resulting in a great deal of disruption to the community.
- Expected Congestion Relief @ Free Bridge The expected congestion relief for Free Bridge is high in Alternative A as the EB and WB through traffic between US 20 and US 250 will be routed through a 2-lane elevated structure over Free Bridge.

#### Traffic Operations and Safety Assessment

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional (local plus trips outside the MPO) and the neighborhood traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, traffic volumes generated by the developments in the neighborhood or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

- The two-lane structure will not be adequate to route EB and WB through traffic on US 250. The through traffic or regional traffic volume traveling on Free Bridge is about 66% of the local traffic traveling on Free Bridge. The through traffic traveling on Free Bridge is estimated to be about 46,000 vpd by 2040 which is above the threshold defined for a two-lane highway operating at LOS D. According to HCM 2010, for a two-lane highway, the daily service volume range is between 13,800 vpd to 17,899 vpd at LOS D.
- Traffic congestion is expected at the merge area from the flyover exit ramps and the two-lane US 250.
- Safety concerns or rear-end crashes are likely at the merge area, especially during the peak period.

	LOW	MODERATE	HIGH
Property Impacts		Х	
Access Impacts		Х	
Utility Impacts		Х	
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts	Х		
Bridges	Х		
Floodway Influence	Х		
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls		Х	
Construction Feasibility			Х
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost	Х		

#### Alternative A-2 Feasibility Assessment



- Property Impacts Their will be a impacts to the parking lot of Merchant's Tire as well as the back yards of the homes along Coleman Street. The unimproved portion of the parcel at the corner of Belleview and River Road will be significantly impacted.
- Access Impacts Left turn ingress and egress will be eliminated at Landonia Circle will negatively impact Merchant's Tire and The All American Car Wash.
- Utility Impacts This alternative would impact the aerial utilities along Route 250. See the Utility Impact Summary in Appendix C for more detail.
- Retaining Walls There appears to be existing retaining walls along Landonia Circle and behind the Tractor Supply building. Impacts and/or improvements to these walls may be necessary.
- Expected Congestion Relief @ Free Bridge The expected congestion relief for Free Bridge is low. Eliminating the eastbound left turning phase will improve the mainline throughput and hence relieve Free Bridge congestion to some extent. However, the southbound split phase will require extended green time to clear additional traffic volume and therefore the overall intersection capacity may not change considerably.

#### Traffic Operations and Safety Assessment

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional (local plus trips outside the MPO) and the neighborhood traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, traffic volumes generated by the developments in the neighborhood or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

- There are three through lanes on the eastbound approach which drop down to two through lanes downstream of the intersection. The lane drop is likely to cause congestion at the merging area downstream of the intersection.
- This alternative adds a traffic signal along River Road, approximately 400 feet north of US 250. The addition of a traffic signal about 400 feet north of the US 250 and River Road intersection does not meet VDOT's access management standards of minimum 660 feet spacing between signalized intersections on a collector roadway with a 25 mph of posted speed. The closely spaced traffic signals are likely to cause congestion and queue spill back along River Road and increase the potential of rear-end crashes.

The concept drawings can be found in Appendix A.



#### Cost Estimates

Alternative	Preliminary Engineering	Right of Way	Construction	Total
A-1: Free Bridge Overpass/ Expressway	\$13,791,000	\$7,000,344	\$120,453,482	\$141,244,826
A-2: Jug Handle/ Left turn elimination at US 250 W and High Street	\$823,855	\$4,508,527	\$3,744,793	\$9,077,175

Documentation for these cost estimates can be found in Appendix B.



### Alternative B: Park and Ride & Bike/Pedestrian

#### Original Concept

Alternative B includes a new park and ride lot in the vicinity of the US 250/22 (Shadwell) intersection and limited stop transit service (fixed Rail or bus) from the lot to Martha Jefferson Hospital, Downtown Charlottesville and UVA Grounds. This alternative also includes paving the existing bike/pedestrian trail on the Albemarle County side of the Rivanna River (Old Mills Trail), construction of a bridge crossing in the vicinity of Riverside Avenue (Riverview Park), bike/pedestrian trail access from the park and ride lot to the Old Mills Trail system, and improvements to the Old Mills Trail.



Alternative B



#### Original Alternative B Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts	Х		
Utility Impacts	Х		
Park Impacts		Х	
Trail Impacts	Х		
Railroad Impacts			Х
Maintenance of Traffic Impacts	Х		
Bridges		Х	
Floodway Influence		Х	
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities		Х	
Earthwork			Х
Retaining Walls	Х		
Construction Feasibility		Х	
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost		Х	

#### Alternative B Refinements

The refinement to Alternative B relocated the proposed park and ride lot to the VDOT property across from the quarry and eliminated the rail transit option. The trail will cross under the railroad and run parallel to the Rivanna River and cross the river on a new bike and pedestrian bridge in the vicinity of Riverview Park. The trail will provide the opportunity for making connections further downstream along the river.





Alternative B Refinements

#### Alternative B Refined Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts		Х	
Access Impacts	Х		
Utility Impacts	Х		
Park Impacts		Х	
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts	Х		
Bridges		Х	
Floodway Influence		Х	
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities		Х	
Earthwork		Х	
Retaining Walls		Х	
Construction Feasibility		Х	
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost	Х		

- Property Impacts Some of the alignment for the trail passes through the Thomas Jefferson Memorial Foundation property. This property may be protected from encroachment by conservation easements.
- Park Impacts The connection to Riverside Park would have some impact to the existing park infrastructure.
- Bridges An approximate 500 foot long bridge would be necessary to span the Federal Emergency Management Agency (FEMA) regulated floodway limits for the Rivanna River.
- Floodway Influence Besides the influence on the bridge length, the encroachment on FEMA floodway in the area where the proposed trail crosses under Interstate 64 could prove to be challenging.
- Drainage Structures i.e. Box Culvert, Stormwater Management Facilities At least one major box culvert drainage structure will be necessary. Extensions of existing railroad drainage structures where the trail parallels the tracks will be necessary.
- Earthwork/Terrain Significant site grading will be necessary for the proposed commuter lot.
- Retaining Walls Retaining walls will likely be required as part of the existing and proposed bridge abutments due to the difficult terrain in these areas.
- Construction Feasibility Construction feasibility presents some challenges due to accessibility to the trail route for equipment and material delivery during construction.
- Expected Congestion Relief @ Free Bridge The expected congestion relief on Free Bridge is low in this
  alternative as the Bike & Ped trail will primarily serve local trips.

The concept drawings can be found in Appendix A.



Free Bridge Area Congestion Relief Project Technical Report: Feasibility Analysis and Cost Estimates for Project Alternatives

Cost Estimates

Option	Preliminary Engineering	Right of Way	Construction	Total
Stone Dust Trail	\$1,710,748	\$519,371	\$9,675,231	\$11,905,350
Asphalt Trail	\$1,718,589	\$519,371	\$10,291,315	\$12,529,275

Documentation for the cost estimates can be found in Appendix B.



### Alternative D: Rivanna River Parkway

#### **Original Concept**

Alternative D includes construction of a new road linking Route 20 with Rio Road. This new road would have two vehicle travel lanes with two bike shoulder lanes (similar to the John Warner Parkway). This alternative also includes improvements to Pen Park Lane and widening Rio Road to four lanes from Pen Park Lane to the John Warner Parkway intersection and the Olympia Drive extension.



Alternative D



Darden Towe Park looking south from proposed Rivanna River bridge abutment location



Darden Towe Park looking northwest across the Rivanna River at the bridge abutment location

#### Original Alternative D Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts	Х		
Utility Impacts			Х
Park Impacts			Х
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts		Х	
Bridges			Х
Floodway Influence			Х
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities			Х
Earthwork/Terrain			Х
Retaining Walls			Х
Construction Feasibility		Х	
Expected Congestion Relief @ Free Bridge	Х	Х	
Expected Cost			Х

- Property Impacts The 4-laning of Rio Road between Pen Park and John Warner Parkway will result in at least three residential relocations.
- Utility Impacts Most of the aerial and underground utilities will be impacted by the Rio Road improvements. The water & sewer lines will be in conflict with the proposed bridges. See the Utility Impact Summary in Appendix C for more detail.
- Park Impacts At least two golf holes at Meadow Creek Golf Course will be impacted. The internal roads in Darden Towe Park would need to be re-configured to provide vehicular access to various park amenities such as the boat launch and the Lewis & Clark Exploratory Center. Approximately 1.65 acres of right of way for Alt. D-1 or 2.68 acres of right of way for Alt. D-2 would be needed from Darden Towe Park. However, additional easements for drainage and grading will be needed beyond the right of way limits.
- Maintenance of Traffic Impacts The construction of the Rio Road improvements could be challenging, but would likely be mitigated some by the completion of the John Warner Parkway to McIntire Road.
- Bridges Over 1,000 feet of bridges will be required to span the Rivanna River and its tributary.
- Floodway Influence Bridge locations and overall route alignment through Darden Towe Park are greatly influenced by the Federal Emergency Management Agency (FEMA) regulated floodway limits for the Rivanna River.
- Drainage Structures i.e. Box Culvert, Stormwater Management Facilities A long box culvert will be needed under the extension to Olympia Drive at the intersection with Route 20. Stormwater management facilities will increase property impacts especially on Darden Towe Park due to the limitations pose by the FEMA regulated floodway and other adjacent development.
- Earthwork/Terrain The challenging terrain between the Meadow Creek Golf Course and Olympia Drive will result in significant earthwork.



- Retaining Walls The proposed bridge abutments and other areas near the Rivanna River will likely require
  retaining walls to avoid impacts the FEMA regulated floodway. Other retaining walls will be likely to avoid
  impacts to the FEMA regulated floodway and the proposed Riverside Village development.
- Construction Feasibility This project can be constructed, but not without its challenges, primarily due to the proximity of the FEMA regulated floodway.
- Expected Congestion Relief @ Free Bridge The expected congestion relief for Free Bridge is low to moderate for this alternative as it will route neighborhood traffic through the proposed two-lane road linking Route 20 with Rio Road with some improvements along Rio Road. Additional improvements at the Route 250/Town & Country Lane Intersection could enhance the attractiveness of this route as an alternative to using Free Bridge.

#### Traffic Operations Assessment

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional (local plus trips outside the MPO) and the neighborhood traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, traffic volumes generated by the developments in the neighborhood or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd.. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

- The 2010 SPS database indicates the projected (2035) daily traffic volume along Stony Point Road to be 19,500 vpd. If the proposed two-lane road diverts 20,000 vehicles off Free Lane Bridge, about 50,000 vehicles are still expected to use the four-lane bridge daily in this alternative. According to HCM (2010), the capacity of a four-lane urban street ranges between 28,200 vpd to 34,099 vpd to operate at LOS D, therefore, even with the proposed two-lane roadway there would will be insufficient capacity for 30% to 40% of the daily trips using Free Bridge.
- The two-lane street between Route 20 and Rio Road may not be adequate to operate at LOS D for the future traffic conditions. According to HCM (2010), the capacity of a two-lane urban street range between 13,800 vpd to 17,899 vpd at LOS D. If the projected traffic volumes on the proposed two-lane street exceed the thresholds defined in HCM, the roadway will operate at LOS E or F.



#### Alternative D Refinements

Alternative D was split into two alternatives, D-1 and D-2. The original concept is Alternative D-1. Alternative D-2 is the same as D-1 except for its intersection with Route 20. Alternative D-2 improves Elk Drive through Darden Towe Park rather than constructing a road west of the Elks Lodge and the slated development for the land parcel south of the Lodge.



Alternative D-2

The refinement to Alternative D did not affect the original feasibility assessment. The concept drawings can be found in Appendix A.

#### **Cost Estimates**

Alternative	Preliminary Engineering	Right of Way	Construction	Total
D-1: Aligning with Olympia Drive Extension	\$6,950,000	\$9,646,828	\$53,424,076	\$70,020,904
D-2: Following Elk Drive	\$6,750,000	\$9,386,604	\$51,905,393	\$68,041,997

Documentation for the cost estimates can be found in Appendix B.



### Alternative F: Increased Lane Capacity on Free Bridge

#### Original Concept

Alternative F includes an additional east/west vehicle travel lane on the US 250 Free Bridge crossing the Rivanna River. This lane would be reversible/high occupancy vehicle restricted and extends from the Route 20 intersection through the High Street intersection. The addition of this lane avoids reconstruction of the bridge by removing a sidewalk and reducing lane widths.



Alternative F



Existing Free Bridge looking west



#### Original Alternative F Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts	Х		
Access Impacts	Х		
Utility Impacts	Х		
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts			Х
Bridges	Х		
Floodway Influence	Х		
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls	Х		
Construction Feasibility		Х	
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost	Х		

#### Alternative F Refinements

The refinement of Alternative F eliminates the HOV/reversible lane option and increases the number of through traffic lanes between High Street and Route 20 to three lanes in each direction. Increasing the number of lanes requires removal of existing sidewalks on Free Bridge and relocating them to a dedicated bike and pedestrian crossing immediately down river of the existing span.



Alternative F Refined



#### Alternative F Refined Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts	Х		
Utility Impacts		Х	
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts		Х	
Bridges			Х
Floodway Influence	Х		
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls	Х		
Construction Feasibility		Х	
Expected Congestion Relief @ Free Bridge		Х	Х
Expected Cost		Х	

- Property Impacts Significant impacts can be expected to businesses along the north side of Route 250 due to loss of parking. Impacts also include the relocations of The All American Car Wash and the business at the corner of Free Bridge Lane.
- Utility Impacts This alternative would impact the aerial utilities along Route 250. See the Utility Impact Summary in Appendix C for more detail.
- Maintenance of Traffic Impacts The high volumes of traffic on Route 250 will limit when lane closures and construction can occur.
- Bridges The sidewalks on existing Free Bridge will have to be removed to accommodate the additional travel lanes. A new bicycle and pedestrian bridge approximately 450 feet long will be constructed downstream of the Free Bridge.
- Construction Feasibility Since temporary lane closures will be required, construction will be limited to non-peak hours and perhaps at night.
- Expected Congestion Relief @ Free Bridge The expected congestion relief for Free Bridge is moderate to high in this alternative.

#### Traffic Operations and Safety Assessment

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional (local plus trips outside the MPO) and the neighborhood traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, traffic volumes generated by the developments in the neighborhood or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

- According to HCM (2010), the capacity of a six-lane urban street ranges from 41,800 vpd to 48,899 vpd to
  operate at LOS D which is 20,000 vpd less than the daily traffic demand expected to travel on Free Bridge in
  2040. Therefore, even with the six-lane bridge, there is insufficient capacity for 29% of the daily trips crossing
  Free Bridge.
- There will be an overall improvement in traffic and safety operation along the study corridor.

The concept drawings can be found in Appendix A.

#### Cost Estimate

Preliminary Engineering	Right of Way	Construction	Total
\$1,850,000	\$7,820,216	\$10,874,119	\$20,544,335

Documentation for the cost estimates can be found in Appendix B.



### Alternative G: South Pantops Drive Connector Bridge

#### **Original Concept**

Alternative G includes a new bridge connection between New House Drive/South Pantops Drive and East High Street. The bridge would be a two-lane urban style bridge with appropriate bike and pedestrian facility accommodations.



Alternative G



Looking southwest from the S. Pantops Dr./New House Dr. intersection



#### Original Alternative G Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts		Х	
Utility Impacts	Х		
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts	Х		
Bridges		Х	
Floodway Influence		Х	
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls		Х	
Construction Feasibility			Х
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost		Х	

#### Alternative G Refinements

Alternative G was refined to re-align the new intersection at High Street with Willow Drive, add a roundabout at the New House Drive/South Pantops Drive intersection, and improve South Pantops Drive through the shopping center.



Alternative G Refined



#### Alternative G Refined Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts			Х
Access Impacts		Х	
Utility Impacts	Х		
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts		Х	
Bridges		Х	
Floodway Influence		Х	
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls		Х	
Construction Feasibility			Х
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost		Х	

- Property Impacts Three commercial properties would be impacted and require relocation: University Tire & Auto, Charlie's Restaurant, and Fire Protection Services. Many of the parking spaces for the Pantops Shopping Center will be eliminated.
- Access Impacts Access to the Pantops Shopping Center will be changed as well as the access to Medexpress, Jiffy Lube, Taco Bell, and Burger King.
- Maintenance of Traffic The construction of the two roundabouts and improvements to South Pantops Drive while maintaining access to all businesses will present a challenge.
- Bridges The bridge over the Rivanna River at this location would be approximately 600 feet long to span the Federal Emergency Management Agency (FEMA) regulated floodway limits for the Rivanna River.
- Floodway Influence The floodway influence is limited to the impacts on the proposed bridge.
- Retaining Walls The proximity to the FEMA regulated floodway will require additional retaining wall at the bridge abutments.
- Construction Feasibility Constructability is reasonable for this alternative.
- Expected Congestion Relief @ Free Bridge The expected congestion relief for Free Bridge is low in this
  alternative. The new bridge construction between New House Drive/South Pantops Drive and East High Street
  is likely to reduce local traffic from northbound E. High Point Street, however the overall impact is low. If S.
  Pantops Drive was improved as a public street through the shopping center, traffic travelling west to High Street
  would likely increase along this new route and result in more congestion relief at Free Bridge.



#### Traffic Operations and Safety Assessment

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional (local plus trips outside the MPO) and the neighborhood traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, traffic volumes generated by the developments in the neighborhood or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

• Traffic operation and safety at the US 250 and E. High Point Street will improve as the traffic volume will reduce.

The concept drawings can be found in Appendix A.

Cost Estimate			
Preliminary Engineering	Right of Way	Construction	Total
\$2,740,000	\$6,098,514	\$18,267,565	\$27,106,079

Documentation for the cost estimates can be found in the Appendix B.



### Alternative I: Intersection Improvements at US 250/ Rte. 20 & High St.

#### Original Concept

Alternative I consisted of intersection improvements to add a right turn lane from US 250 Westbound onto Route 20. Additional improvements were desired to improve the weave on Free Bridge for vehicles traveling from High Street to Route 20. The improvements to the weave would largely be achieved if this alternative were combined with the Free Bridge Overpass/Expressway option (Alternative A). Refinements to the original concept were made prior to presenting the Stakeholders. These refinements included adding side street lanes to Riverside Drive and High Street to allow the implementation of split phase light timing. These improvements have the potential to reduce collisions and improve intersection efficiency.



Alternative I



#### Original Alternative I Feasibility Assessment

	LOW	MODERATE	HIGH
Property Impacts		Х	
Access Impacts	Х		
Utility Impacts		Х	
Park Impacts	Х		
Trail Impacts	Х		
Railroad Impacts	Х		
Maintenance of Traffic Impacts	Х		
Bridges	Х		
Floodway Influence	Х		
Drainage Structures i.e. Box Culvert, Stormwater Management Facilities	Х		
Earthwork/Terrain	Х		
Retaining Walls		Х	
Construction Feasibility			Х
Expected Congestion Relief @ Free Bridge	Х		
Expected Cost	Х		

- Property Impacts Property damages to the car dealership can be expected due to loss of parking. Additional property impacts/damages can be expected with the property at the SW corner of the High Street intersection.
- Utility Impacts This alternative would impact the aerial utilities along Route 250 in the area of the turn lane. See the Utility Impact Summary in Appendix C for more detail.
- Retaining Walls The existing retaining walls along the property at the SW corner of the High Street intersection will need to removed and potentially replaced.
- Construction Feasibility The construction proposed with this alternative is fairly routine.
- The expected congestion relief for Free Bridge is low in this alternative depending on the northbound/southbound left turning volumes from E. High Street/River Road and Stony Point Road and Riverbend Drive.

#### **Traffic Operations and Safety Assessment**

The MPO's travel demand model estimates the projected traffic volumes on Free Bridge to be 70,000 vehicles per day (vpd) by 2040. This traffic volume includes both the regional and local traffic. According to the 2010 Statewide Planning System (SPS) database forecast for 2035, the local traffic volumes generated by the local developments or areas adjacent to Free Bridge is expected to be between 20,000 to 30,000 vpd and the regional traffic is expected to be between 50,000 to 60,000 vpd. The following assessments are based on this information and sound engineering judgment, but may require additional traffic analysis to validate:

 Increasing the capacity of the northbound and southbound approaches at the US 250 intersections with E. High Street and Stony Point Road and eliminating split phase is likely to improve traffic and safety operations at both intersections. With the elimination of the split phase for the side streets, green time for the mainline movement can be extended to relieve congestion on Free Bridge. However, the overall impact will be low.



#### Alternative I Refinements

The Stakeholders accepted the refinements presented with the original concept with no further changes.

The concept drawings can be found in Appendix A.

#### Cost Estimate

Preliminary Engineering	Right of Way	Construction	Total
\$1,063,712	\$942,437	\$5,414,294	\$7,420,443

Documentation for the cost estimates can be found in Appendix B.



### Summaries

#### Construction Feasibility Summary

	LOW	MODERATE	HIGH
Alternative A-1	Х		
Alternative A-2			Х
Alternative B		Х	
Alternative D		Х	
Alternative F		Х	
Alternative G			Х
Alternative I			Х

#### Expected Congestion Relief Summary

	LOW	MODERATE	HIGH
Alternative A-1			Х
Alternative A-2	Х		
Alternative B	Х		
Alternative D	Х	Х	
Alternative F		Х	Х
Alternative G	Х		
Alternative I	Х		



Cost Summary

	Preliminary Engineering	Right of Way	Construction	Total
Alternative A-1	\$13,791,000	\$7,000,344	\$120,453,482	\$141,244,826
Alternative D-1	\$6,950,000	\$9,646,828	\$53,424,076	\$70,020,904
Alternative D-2	\$6,750,000	\$9,386,604	\$51,905,393	\$68,041,997
Alternative G	\$2,740,000	\$6,098,514	\$18,267,565	\$27,106,079
Alternative F	\$1,850,000	\$7,820,216	\$10,874,119	\$20,544,335
Alternative B – Paved	\$1,461,401	\$487,226	\$8,265,033	\$10,213,660
Alternative B – Stone Dust	\$1,337,635	\$487,226	\$7,565,070	\$9,389,931
Alternative A-2	\$823,855	\$4,508,527	\$3,744,793	\$9,077,175
Alternative I	\$1,063,712	\$942,437	\$5,414,294	\$7,420,443

#### Construction Feasibility vs. Cost

	Construction Feasibility	Cost
Alternative A-1	LOW	HIGH
Alternative A-2	HIGH	LOW
Alternative B	MOD	LOW
Alternative D	MOD	HIGH
Alternative F	MOD	MOD
Alternative G	HIGH	MOD
Alternative I	HIGH	LOW





### Appendix A – Concept Drawings

Appendix B – Cost Estimates

Appendix C – Utility Impact Summaries



Appendix A – Concept Drawings







### Appendix C – Utility Impact Summaries