VE #201205
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50
Boone County, Kentucky

Value Engineering Study Report

KENTUCKY TRANSPORTATION CABINET

Study Dates: June 25-29, 2012
Final Report Date: September 2012

Kentucky Transportation Cabinet
Division of Highway Design
200 Mero Street
Frankfort, KY 40622

Contact: Renee L. Hoekstra, CVS
(623) 266-3943

June 2012

"Partnering, Public Information & Value Specialists"

September 17, 2012

Mr. Brent Sweger
Kentucky Transportation Cabinet
Division of Professional Services
200 Mero Street
Frankfort, KY 40622

Re: I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 and #6-14.50
Boone County, Kentucky
Final Value Engineering Study Report

Dear Brent:

Transmitted herewith is the pdf copy of the Final Value Engineering Study Report for the above referenced project. Two hard copies will be delivered to your office.

RHA appreciates your assistance and cooperation. Should you have any questions please telephone me at (623) 266-3943.

Sincerely,

RH & ASSOCIATES, INC.

Renee L. Hoekstra, CVS
President

6677 W. Thunderbird Rd., Suite K-183, Glendale, Arizona 85306
(623) 266-3943 (800) 480-1401 (623) 266-3611 Fax
www.rhpartnering.com

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INTRODUCTION

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Introduction

The value methodology (Synonyms: value analysis, value engineering and value management) is a function-oriented, systematic, team approach to add customer value to a program, facility, system, or service. Improvements like performance, quality, initial and life cycle cost are paramount in the value methodology. The Value Engineering (VE) workshop was conducted in accordance with the methodology as established by SAVE International, the value society, and was structured using the Job Plan as outlined below:

Value Methodology

- **Pre-Study**
  - Identify team members
  - Define workshop location
  - Review project documentation
  - Prepare for the VE study (workshop)
- **Value Study (Workshop) Job Plan**
  - *Information Phase*
    - Gather, organize and analyze data,
    - Define costs and cost models,
    - Define the problem/purpose of the study,
    - Define study scope, define project goals and workshop goals
    - Complete a risk analysis
  - *Function Analysis Phase*
    - Define and evaluate functions
    - Define needs versus wants
  - *Creative Phase*
    - What else will perform the functions?
    - Is this function required?
  - *Evaluation Phase*
    - Rank and rate the ideas to select
    - Refine the best ideas for further development
  - *Development Phase*
    - Develop the best ideas into VE Alternatives with support and justification
  - *Presentation/Implementation*
    - VE team presents results
    - Prepare and issue the report
    - Report implementation ideas
- **Post Study**
  - Implement approved alternatives
  - Monitor status

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Report Content

The report provides the outcomes associated with this VE workshop and includes both projects as a combined approach. The report includes the following sections:

Introduction – This section outlines the VE process and explains the content of the report.

Executive Summary – An overview which includes the VE process, the VE punch list which is to be used during the implementation meeting, a list of the VE study team members and the certification is included.

Project Description – This section describes each of the projects in more detail for the reader to gain a better understanding of the two projects under study. Vicinity maps and photographs, where appropriate, are included showing where each of the projects are located.

VE Recommendations and Design Suggestions – Each completed alternative and design suggestion has a separate workbook. Each workbook contains the following information:

- Baseline Alternative
- Proposed Alternative
- Benefits and Risks/Challenges of the Proposed Alternative
- Discussion and Justification
- Implementation Requirements
- Detailed Cost Estimate
- Life Cycle Cost Analysis, as needed
- Drawings and/or Sketches for the Baseline and the Proposed Alternative, as needed

Appendices

A – Study Participants
B – Pareto Cost Models
C – Function Analysis
D - Creative List and Evaluation
E – Supporting Data
    i. Team Observations
    ii. Risk Registry

EXECUTIVE SUMMARY

Value Engineering Study
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I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
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Executive Summary

Background
A Value Engineering (VE) study was conducted during June 25-29, 2012 for the Kentucky Transportation Cabinet (KYTC) for two projects. These projects included I-75 at KY 536 Interchange and I-75 Auxiliary Lanes, Items #6-14.00 and #6-14.50 respectively, as described below. The decision makers identified the project goals as improving safety, reducing congestion, and facilitating growth in the area.

The workshop objectives were identified at the start of the workshop; to assure the efficient use of funds, both capital and life cycle costs, and to ensure the best value is attained while meeting the project goals and performance attributes. The VE team identified the following goals and opportunities for the workshop:

- Review both projects for impacts and opportunities.
- Evaluate access management issues at intersections on KY536 from the Interchange to US25.
- Design should minimize right-of-way takes.
- Impact to the public should be considered.

Project Constraints
The decision makers/stakeholders identified the project constraints for the VE team at the start of the VE study as:

- The Interchange design is confined to a double crossover diamond (DCD).
- The design cannot change the existing alignment and profile on the mainline.
- Due to soil type and instability, the 3:1 slope design should be the design standard.
- The design must accommodate bicyclists and pedestrians.
- The access point at Biltmore Blvd. is critical to project success.

Project Descriptions
The VE study includes two projects. The overall purpose of these projects is to improve traffic flow by providing a safer and more efficient roadway while enhancing and promoting economic development in the area. The first project, Item #6-14.00, is the I-75 & KY 536 Interchange Reconstruction project being designed by Stantec. The second project, Item #6-14.50, is the I-75 Auxiliary Lanes project being designed by Burgess & Niple.

Access Management Overview
The area around the I-75 and KY536 interchange is rapidly growing in the sectors of residential as well as industrial businesses and employment. This growth is attracting retail and service businesses. Average daily traffic on the east side of I-75 is expected to grow from current 18,800 to 52,000 by 2030. This area needs access management. Without the application of access management strategies the growth in traffic will result in significant congestion. This congestion will hurt growth in residential and business sectors. Congestion, besides causing inconvenience and frustration for motorists, also reduces arterial capacity at a time when it is

needed most. The Federal Highway Administration (FHWA) has produced a brochure, “Access Management is Good for Business” that covers many of these issues in more detail.

Access management is strongly recommended for KY536 to support local retail growth, but more importantly, to support growing employment, industrial traffic, and residential growth.
There is a concern that the frequency of existing and proposed traffic signals on KY536 will create a significant level of congestion during the peak hours. In addition to the existing signals at Biltmore Blvd., Sam Neace Drive and US25, there will be two signals for the Diverging Crossover Diamond (DCD) at the crossovers, Tiburon Drive will need a signal, and another has been proposed for Berberich Drive for a future total of seven in only 1.1 miles. Between Tiburon Drive and Berberich Drive, there will be six signals with an average spacing of only 800 feet. Measuring distances between stop bars, one has a spacing of 550 feet and another has 600 feet. On an arterial, one-half mile spacing is considered optimum for capacity and mobility performance. There is a significant drop in capacity and performance when one-quarter mile signals are used. At only 550-750 foot intervals, there will be several operational problems; low capacity, low progression speeds, congestion, delay, and a higher risk of various traffic queues and signal delays causing backups overlapping to other intersections. Frequent traffic signals and congestion will also result in more frequent crashes.

With very short signal spacing, the level of congestion on KY536 will seriously limit arterial flow and there is no reason to have a high capacity interchange feeding a very low capacity cross arterial. Other than minor improvements, any major investment in the interchange would be wasteful. Improvements will need to emphasize traffic movements to and from the west as this direction will not be congested and has significant volumes.

A high level of congestion will be a disadvantage to all businesses along KY536. The congestion level on the east side of the interchange will also cause significant delay for those travelling to and from businesses and residential areas on and east of US25. Low speeds, high congestion, signal delay, and other congestion impacts will reduce business market area, discourage customers from the area and overall make any visit to or through the area unpleasant. There are other very good ways to design access to businesses without direct, full access from KY536. These alternatives will result in minor to no impacts to drivers going to or coming from those properties, while at the same time providing reduced travel times to the east.
The VE team has made two important suggestions to significantly lower the risk of congestion and improve both speeds and capacity to and from the interchange. First recommendation (MA-01) is to convert the signal at Biltmore Drive to a three-quarter movement. This will allow eastbound traffic to turn left (north) onto Biltmore Blvd. Depending on the volume, this may or may not need a traffic signal. If a signal is needed in the future, it need only be two-phase which would greatly reduce signal system impacts and still allow left turns into an anticipated large retail area.

The second recommendation (MA-3) is to not put a signal at Berberich/Lakeside Drives. Instead, eliminate left turns out of Berberich Drive to east bound KY536; only allow left turns, eastbound KY536 to northbound Berberich Drive. This will eliminate the need for a traffic signal.

These modifications will decrease the convenience of some motorists arriving or departing from retail businesses at these two intersections and decrease the convenience of some local circulation. It will greatly improve the functional performance of KY536 compared to the current proposal.

Summary of Results

The VE team brainstormed a total of 60 ideas. Of those, fourteen (14) ideas were identified for further development into VE proposals, including cost impacts. Twelve (12) Design Suggestions, without any cost impact, were identified with three (3) Design Suggestions written to provide additional information for KYTC and the designer to consider. The description and further discussion of these are included in the VE workbooks section of this report. The following represents the alternatives developed and the cost impact, as necessary. The ideas developed are listed under the following functions or items of work: Avoid Right-of-way (AR), Support Vehicles (SV), Manage Access (MA), Move Traffic (MT), Control Traffic (CT), and Miscellaneous (M). The following table shows the alternatives developed and the cost impacts. The costs shown in parenthesis represent an additional cost to the project. Those shown as positive numbers represent a savings.

Summary of Proposals

No.	Description	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
AR	**Avoid Right-of-way**			
AR-04	On auxiliary lanes, build retaining wall in lieu of slope	$6,236,741	$0	$6,236,741
AR-09	Extend the median on KY536 at Biltmore Blvd.	$92,500	$0	$92,500
SV	**Support Vehicles**			
SV-04	Use concrete in lieu of asphalt at Sam Neace Drive/KY536 intersection	($219,908)	$63,000	($156,908)
MA	**Manage Access**			
MA-01	Restrict left hand turns out at Biltmore Blvd.	$47,000	$0	$47,000
MA-02	Eliminate left turns out at Berberich Drive/Lakeside Drive	($7,800)	$0	($7,800)
MA-03	Incorporate the backage road behind the Shell station and make a new backage road connection from Greenlawn Road to Demia Way	($199,646)	$0	($199,646)
MA-05	Add concrete median from AutoZone to US25	($104,311)	$0	($104,311)

MA-07	Eliminate driveway at Shell, Fifth Third Bank, BP and Kroger	($18,000)	$0	($18,000)
MA-08	Acquire access rights from ramps to Biltmore Blvd.		$0	$0
MA-13	MOU* for access management plan between KYTC, County, MPO** and Planning & Zoning		$0	$0
MT	**Move Traffic**			
MT-01	Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left	($205,680)	$0	($205,680)
MT-04	Add right deceleration lane at Biltmore Blvd., Sam Neace Drive, and Lakeside Drive- eastbound	($378,500)	$0	($378,500)
MT-05	At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection		$0	$0
MT-07	Add roundabout at Tiburon Drive		$0	$0
CT	**Control Traffic**			
CT-03	Install ramp meters on northbound I-75 entrance ramp	($18,190)		($18,190)
CT-07	Add right turn lanes at KY536/US25 from eastbound to southbound	($924,150)	$0	($924,150)
M	**Miscellaneous**			
M-02	Use a 2:1 slope with good material	$5,379,343	$0	$5,379,343
M-05	Establish a formal public information process/plan for construction		$0	$0
M-07	Use more of the existing roadbed on I-75	$442,693	$0	$442,693

*****Memorandum of Understanding
**Metropolitan Planning Organization

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VE Recommendations

The VE team discussed all of the VE proposals completed and have recommended the following two sets that should be considered for implementation. Set 1 represents the preferred recommendation:

Set 1

MT-01	Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left
MT-04	Add right deceleration lane at Biltmore Blvd., Sam Neace Drive, and Lakeside Drive- eastbound
MT-07	Add roundabout at Tiburon Dr. (2 lanes only)
MA-02	Eliminate left turns out at Berberich Drive/Lakeside Drive
MA-03	Incorporate the backage road behind the Shell station and make a new backage road connection from Greenlawn Road to Demia Way
MA-05	Add concrete median from AutoZone to US25
MA-07	Eliminate driveway at Shell, Fifth Third Bank, BP and Kroger
MA-08/ MA-09	Acquire access rights from Tiburon Drive to Biltmore Blvd.
MA-13	MOU for access management plan between KYTC, County, MPO and Planning & Zoning
AR-04 or M-02	On auxiliary lanes, build retaining wall in lieu of slope or M-02 Use a 2:1 slope with good material – this should be considered on a site by site basis
CT-03	Install ramp meters on northbound I-75
AR-09	Close median at Biltmore Blvd.
SV-04	Use concrete in lieu of asphalt at Sam Neace Dr./KY536 intersection

Set 2

Set 2 will include all of the alternatives listed in Set 1, but also included the following:

MT-05	At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection
CT-07	Add right turn lanes at KY536/US25 from eastbound to southbound
MA-01	Restrict left hand turns out at Biltmore Blvd.
M-05	Establish a formal public information process/plan for construction

Design Suggestions

All of the design suggestions presented in this report should be considered regardless of the sets recommended.

Risk Analysis

A formal risk analysis was completed on this project to identify any potential risks that might negatively or positively impact the project. The team then rated and ranked the identified risks. Four (4) risks were identified as Extremely High and six (6) as High, and the team provided ideas to aid in mitigating the risks. A risk registry was completed and is included in Appendix E, the support data section of this report.

Team Observations

Upon completion of the project presentation, the team discussed the various elements of the project including the project information they had reviewed prior to the workshop and the information that was provided during the presentation. These observations can be found in Appendix E.

Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other “improvement” programs. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing the study. The data supporting the function analysis can be found in Appendix C.

The VE team identified the functions using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. The basic function was defined as *Move Traffic*. A Function Analysis Systems Technique (FAST) diagram was completed and is included in Appendix C.

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VE Study Team
Renee Hoekstra, CVS, RH & Associates, Inc. – VE Team Leader
Patrice Miller, AVS, RH & Associates, Inc. – Assistant Team Leader/Technical Recorder
Brent Sweger, P.E., AVS, Kentucky Transportation Cabinet – VE Coordinator
Phil Demosthenes, Transportation Consultant – Access Management Specialist
Glenn Kelly, P.E., Qk4, Inc. – Highway Specialist
Jeremy Lukat, Qk4, Inc. – Traffic Specialist
Kenneth Cox, AEI – Roadway Design Specialist

Certification
This is to verify that the Value Engineering Study was conducted in accordance with standard value engineering principles and practices.

Renee L. Hoekstra, CVS
RH & Associates, Inc.

VALUE ENGINEERING PUNCH LIST

ITEM NO. **6-14.00 & 6-14.50** PROJECT COUNTY: **Boone** DATE OF STUDY: **6/25-6/29/12** **VE # 201205**

VE Alternative Number	VE Team Top Pick	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
Item #6-14.00 & 6-14.50										
AR-04		On auxiliary lanes, build retaining wall in lieu of slope			$7,880,481	$6,236,741	$1,643,740	$0		
AR-09		Close median at Biltmore Blvd.			$100,000	$92,500	$92,500	$0		
SV-04		Use concrete in lieu of asphalt at Sam Neace Drive/KY536 intersection			$318,670	$538,578	($219,908)	$63,000		
MA-01		Restrict left turns out at Biltmore Blvd.			$100,000	$47,000	$53,000	$0		
MA-02		Eliminate left turns outy at Berberich Drive/Lakeside Drive			$0	($7,800)	($7,800)	$0		
MA-03		Incorporate the backage road behind Shell station and make a new backage road connection from Greenlawn Road to Demia Way			$0	($199,646)	($199,646)	$0		
MA-05		Add concrete median from Autozone to US25			$0	$104,311	($104,311)	$0		
MA-07		Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger			$3,660	$21,600	($18,000)	$0		
MT-01		Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left			$3,464,123	$3,668,803	($205,680)	$0		
MT-04		Add right deceleration lane at Biltmore Blvd., Sam Neace Drive, and Lakeside Drive - eastbound			$0	($378,500)	($378,500)	$0		
MT-07		Add roundabout at Tiburon Drive			$0	Not Costed				
CT-03		Install ramp meters on northbound I-75 entrance ramp			$0	($18,190)	($18,190)	$0		
CT-07		Add right turn lanes at KY536/US25 from eastbound to southbound			$0	($924,150)	($924,150)	$0		
M-02		Use a 2:1 slope with good material			$7,880,481	$5,379,150	($2,501,138)	$0		
M-07		Use more of the existing roadbed on I-75			$2,481,199	$2,038,506	$442,693	$0		
Design Suggestions Item #6-14.00 & # 6-14.50										
MA-08		Acquire access rights from ramps to Biltmore Blvd. and from ramps to Tiburon Drive								
MA-13		MOU for access management plan between KYTC, County, MPO and Planning & Zoning								
M-05		Establish a formal public information process/plan for construction								
MT-05		At US 25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection								

Saf 0 Ops 0 Env 0 Con 0 Oth 0

PROJECT DESCRIPTION

Value Engineering Study
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I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
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Introduction

The VE study includes two projects. The overall purpose of these projects is to improve traffic flow by providing a safer and more efficient roadway while enhancing and promoting economic development in the area. The first project, Item #6-14.00, is the I-75 & KY536 Interchange Reconstruction project being designed by Stantec. The second project, Item #6-14.50, is the I-75 Auxiliary Lanes project being designed by Burgess & Niple.

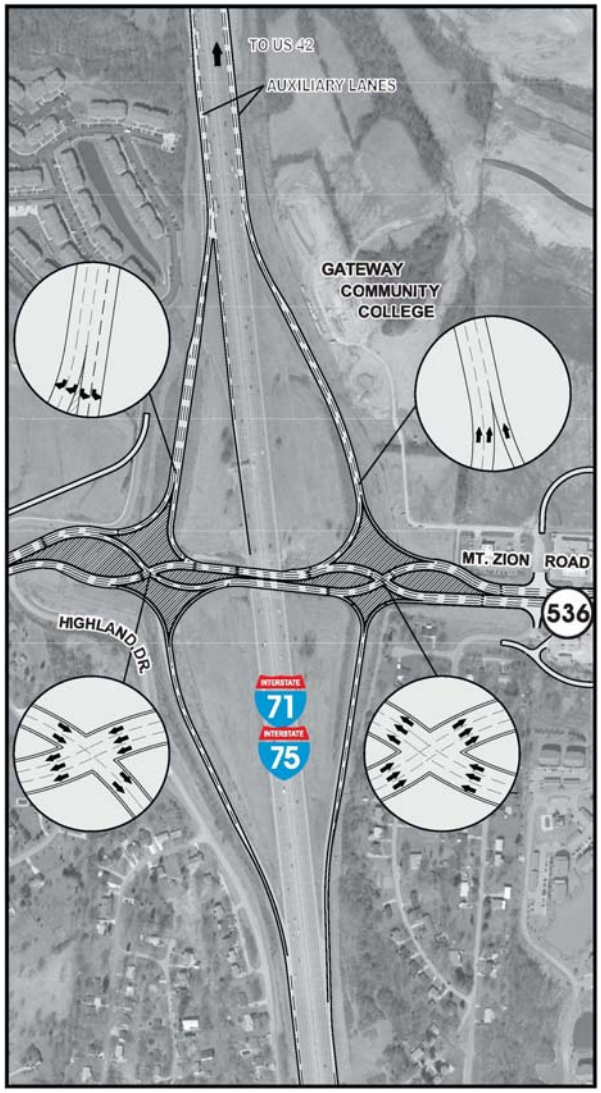
Item # 6-14.00 – I-75 and KY 536 (Mt. Zion Road) Interchange Project

The Mt. Zion Road interchange was designed in 1990 and opened for use in 1994. Since its opening, the area has experienced a dramatic change in land use patterns, resulting in substantially higher traffic volumes. At the time of the original design, local traffic patterns were mainly residential in nature and primarily located west of I-71/I-75.However, extensive commercial and educational development have emerged along US25 (Dixie Highway), with access to I-71/I-75 via the KY536 (Mt. Zion Road) and KY338 (Richwood Road) interchanges. This very active and prosperous area of growth has resulted in insufficient capacity at the interchanges along I-71/I-75 and the intersections along US25 (Dixie Highway) at both KY536 (Mt. Zion Road) and KY338 (Richwood Road).

When the KY536 (Mt. Zion Road) interchange was completed in 1994, average daily traffic (ADT) projections for the interstate in the design year of 2007 were nearly 88,000. Actual numbers began exceeding these future projections within five years of its opening. Although actual ADT volumes for 2007 were not available, KYTC estimates for the year 2006 were 104,000, 18 percent higher than those originally projected for 2007. Furthermore, the 1991 plans for KY536 (Mt. Zion Road), just east of the KY536 (Mt. Zion Road) interchange projected a 2007 ADT of 5,520; however, the actual ADT is 18,800 which is approximately 3.41 times higher than originally projected.

The recommended preferred alternative includes converting the existing I-71/I-75 at KY536 (Mt. Zion Road) diamond interchange to a Double Crossover Diamond Interchange (DCD). A DCD is a diamond interchange which operates in a non-traditional manner by moving through and left turn vehicles between ramp intersections on the left side of the roadway. This eliminates the need for the left turn traffic signal phase. The basic geometric design footprint is very similar to

the traditional diamond interchange. As such, the proposed DCDI is able to utilize the basic alignment of the existing northbound and southbound entrance and exit ramps.



The DCD design will accommodate left-turning movements at the signalized, grade-separated I-71/I-75 interchanges at KY536 (Mt. Zion Road) by crossing traffic to the left side of the roadway at the signalized ramp terminal intersections. Two-phase traffic signals installed at each crossover will operate off one controller. Once on the left side of the arterial roadway, vehicles can turn left onto limited-access entrance ramps without stopping and without conflicting with through traffic.

The DCD will improve traffic flow and safety at the I-71/I75 interchanges with KY536 (Mt. Zion Road) by reducing congestion and conflict points within the interchanges. The two ramp intersections within a DCD operate in concert with one another using two-phased signals with overlap. This means that once a vehicle starts moving through the interchange, it should clear both intersections without stopping, thereby reducing the amount of stops and delay (congestion). The free flow left turns onto I-71/I-75 will further reduce delay and improve traffic operations on KY536. By reducing the number of conflict points and reducing congestion, the rear end, sideswipe, and angle crashes typically associated a congested diamond interchange should be reduced.

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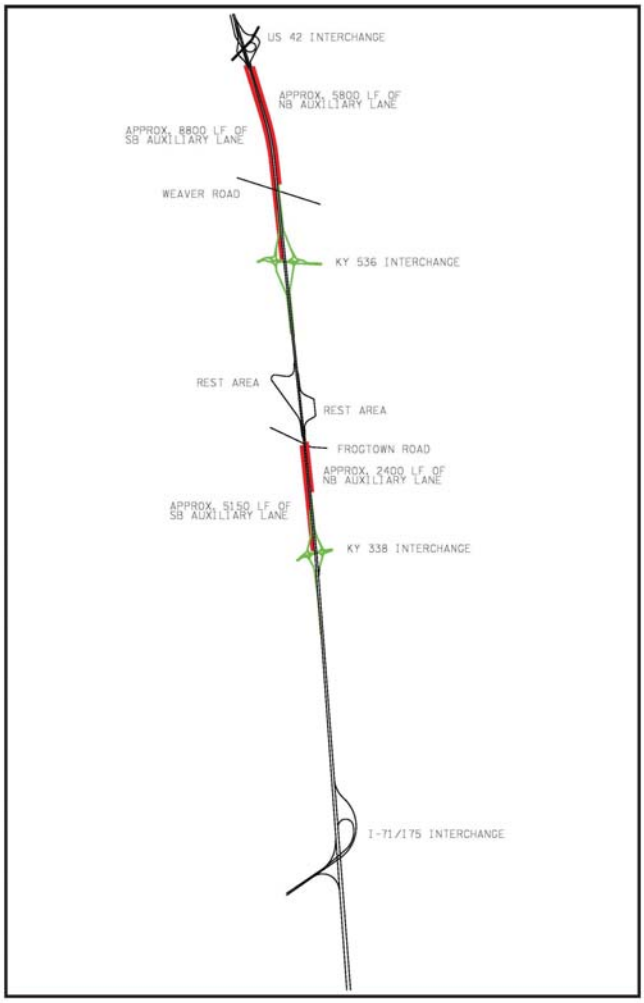
Item # 6-14.50 – I-75 Auxiliary Lanes Project



Once interchange intersections are overcapacity they act as meters for the traffic entering the freeway, neither improving nor degrading main line operations. Construction of the DCD, or otherwise upgrading the interchange intersections, increases the interchange capacity which allows more traffic to enter the interstate. This degrades the main line operations.

As part of the preferred alternative, reconstruction of several ramps and the addition of auxiliary lanes on I-71/I-75 are recommended to increase capacity and improve geometrics to facilitate passenger and truck traffic entering and exiting the I-71/I-75 mainline. Specific recommended modifications include:

- Southbound I-71/I-75 exit ramp to KY536 (Mt. Zion Road) – An auxiliary lane (5th) will be added from the southbound US42 entrance ramp. An additional (6th) lane will be added approximately 1,500 feet north of the ramp in addition to the auxiliary lane to develop a two lane exit ramp. The 6th lane will be an exit only lane, while the adjacent (or 5th) lane will be an option lane where vehicles can choose to continue south on I-71/I-75 or exit to KY536 (Mt. Zion Road). This lane will be dropped within the KY536 interchange, prior to the bridge over KY536 (Mt. Zion Road). The total length of this auxiliary lane (5th lane) is approximately 8,800 linear feet from where it picks up at US42 to the end of the taper within the interchange.

- Northbound I-71/I-75 entrance ramp from KY536 (Mt. Zion Road) – Two lanes will merge with I-71/I-75 northbound. The outside acceleration lane will be dropped approximately 1,500 feet north of the ramp, and the inside lane will continue as an auxiliary lane to US42. The additional northbound auxiliary lane is dropped at the US42 northbound single-lane exit ramp. The total length of this auxiliary lane from the entrance ramp lane drop to US42 is approximately 5,800 linear feet.

VE RECOMMENDATIONS & DESIGN SUGGESTIONS

VE Recommendations & Design Suggestions

Introduction

The VE study evaluated the 60 ideas that were brainstormed during the Creative Phase for Items #6-14.00 and #6-14.50. The fourteen (14) completed Alternatives are located in this section of the report. The alternatives developed included, as needed, the following information:

- Baseline Alternative
- Proposed Alternative
- Benefits and Risks/Challenges of the Proposed Alternative
- Discussion and Justification
- Implementation Requirements
- Detailed Cost Estimate
- Life Cycle Cost Analysis
- Drawings and/or Sketches for the Baseline and the Proposed Alternative

Additionally, three (3) Design Suggestions were developed to provide some additional design direction to the design team. These are also included in this section of the report.

Results of the Study

The team developed the following Proposals and Design Suggestions:

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Boone County

Summary of Proposals

No.	Description	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
AR	**Avoid Right-of-way**			
AR-04	On auxiliary lanes, build retaining wall in lieu of slope	$6,236,741	$0	$6,236,741
AR-09	Extend the median on KY536 at Biltmore Blvd.	$92,500	$0	$92,500
SV	**Support Vehicles**			
SV-04	Use concrete in lieu of asphalt at Sam Neace Dr./KY536 intersection	($219,908)	$63,000	($156,908)
MA	**Manage Access**			
MA-01	Restrict left hand turns out at Biltmore Blvd.	$47,000	$0	$47,000
MA-02	Eliminate left turns at Berberich Dr./Lakeside	($7,800)	$0	($7,800)
MA-03	Incorporate the backage road behind the Shell	($199,646)	$0	($199,646)
MA-05	Add concrete median from AutoZone to US25	($112,147)	$0	($112,147)
MA-07	Eliminate driveway at Shell, Fifth Third Bank, BP and Kroger	($18,000)	$0	($18,000)
MT	**Move Traffic**			
MT-01	Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left	($205,680)	$0	($205,680)
MT-04	Add right deceleration lane at Biltmore Blvd., Sam Neace Dr., and Lakeside - eastbound	($378,500)	$0	($378,500)
CT	**Control Traffic**			
CT-03	Install ramp meters on northbound I-75 entrance	($18,190)		($18,190)
CT-07	Add right turn lanes at KY536/US25 from eastbound to southbound	($924,150)	$0	($924,150)
M	**Miscellaneous**			
M-02	Use a 2:1 slope with good material	$5,379,343	$0	$5,379,343
M-07	Use more of the existing roadbed on I-75		$0	$0

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Items #6-14.00 and #6-14.50
Boone County

Design Suggestion (DS* Workbook Prepared)		
No.	**Description**	**Comments**
SV	**Support Vehicles**	
SV-01	Salvage Pavement	DS
MA	**Manage Access**	
MA-08	Acquire access rights from ramps to Biltmore Blvd.	DS*
MA-09	Acquire access rights from ramps to Tiburon Drive	w/MA-08
MA-13	MOU for access management plan between KYTC, County, MPO and Planning & Zoning	DS*
MT	**Move Traffic**	0
MT-05	At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection	DS*
CT	**Control Traffic**	
CT-04	Re-evaluate length of turn lanes on KY536	DS
CT-05	Ensure distance between stop bar and signal head meets standards	DS
MN	**Mitigate Noise**	
MN-02	Use alternative bids to noise walls	DS
AM	**Accommodate Multi-modal**	
AM-02	Continue path to east end of project	DS
AM-04	Add bicycle racks at park and ride	DS
M	**Miscellaneous**	
M-01	Progression should be modeled to determine through-put	DS
M-04	Provide access management data illustrating performance to the traveling public (i.e., access, time frames, wait times)	DS
M-05	Establish a formal public information process/plan for construction	DS*

VALUE ENGINEERING PROPOSAL AR-04
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	On auxiliary lanes, build retaining wall in lieu of slope
FUNCTION:	**Avoid Right-of-Way**

BASELINE ASSUMPTION:

The original design for widening of the I-71/I-75 roadbed to accommodate the auxiliary lanes uses 3:1 minimum fill slopes and 2:1 minimum cut slopes.

PROPOSED ALTERNATIVE:

The VE team recommends that retaining walls be used in this urbanized area to allow construction within the existing right-of-way.

BENEFITS	RISKS/CHALLENGES
• Elimination of right-of-way acquisition	• Stability of retaining walls
• Elimination or reduction in utility relocations	• Potential for additional safety concerns with the installation of guard rail
• Reduction in earthwork	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 7,880,481	$ -	$ 7,880,481
PROPOSED ALTERNATIVE:	$ 1,643,740	$ -	$ 1,643,740
TOTAL (Baseline less Proposed)	$ 6,236,741	$ -	**$ 6,236,741**
			SAVINGS

VALUE ENGINEERING PROPOSAL AR-04

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: On auxiliary lanes, build retaining wall in lieu of slope

DISCUSSION/JUSTIFICATION:

The original design for widening of the I-71/I-75 roadbed to accommodate northbound and southbound auxiliary lanes between the KY536, Mt. Zion Road, interchange and the US42 interchange exit ramp requires additional right-of-way at eleven (11) locations. For the northbound roadbed widening, additional right-of-way is required at six (6) locations, three (3) in cuts and three (3) in fills. Five (5) locations, two (2) in cuts and three (3) in fills will require additional right-of-way for the southbound roadbed widening. The earthwork in areas that require additional right-of-way are generally sliver embankments or excavations. The Plan allocates $6.3 million for right-of-way in FY 2013 for required land purchases. Additionally, the Plan allocates $0.8 million for utility relocations in FY 2013.

The proposed design of retaining walls at these locations will eliminate the need for right-of-way acquisition for advancement of the project to construction. With a common cost on projects in this area of approximately $20 per square foot of takes, significant project cost reduction will result from this proposal. Additionally, relocation of any utility facilities within the new right-of-way will be eliminated. Installation of guardrails at some locations with current safety slopes will also be required.

IMPLEMENTATION CONSIDERATIONS:

None apparent

VALUE ENGINEERING PROPOSAL AR-04

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: On auxiliary lanes, build retaining wall in lieu of slope

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Embankment in-place		CY	107721	6.54	704,495	95700	6.54	625,878
Guardrail steel W beam		LF	4475	16.98	75,986	5675	16.98	96,362
Retaining wall		SF				12025	60.00	721,500
Right-of-Way		LS	1	6,300,000	6,300,000			
Utilities		LS	1	800,000.00	800,000	1	200,000.00	200,000
					7,880,481			**1,643,740**
							(BASELINE LESS PROPOSED)	**6,236,741**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING PROPOSAL AR-04

Kentucky Transportation Cabinet

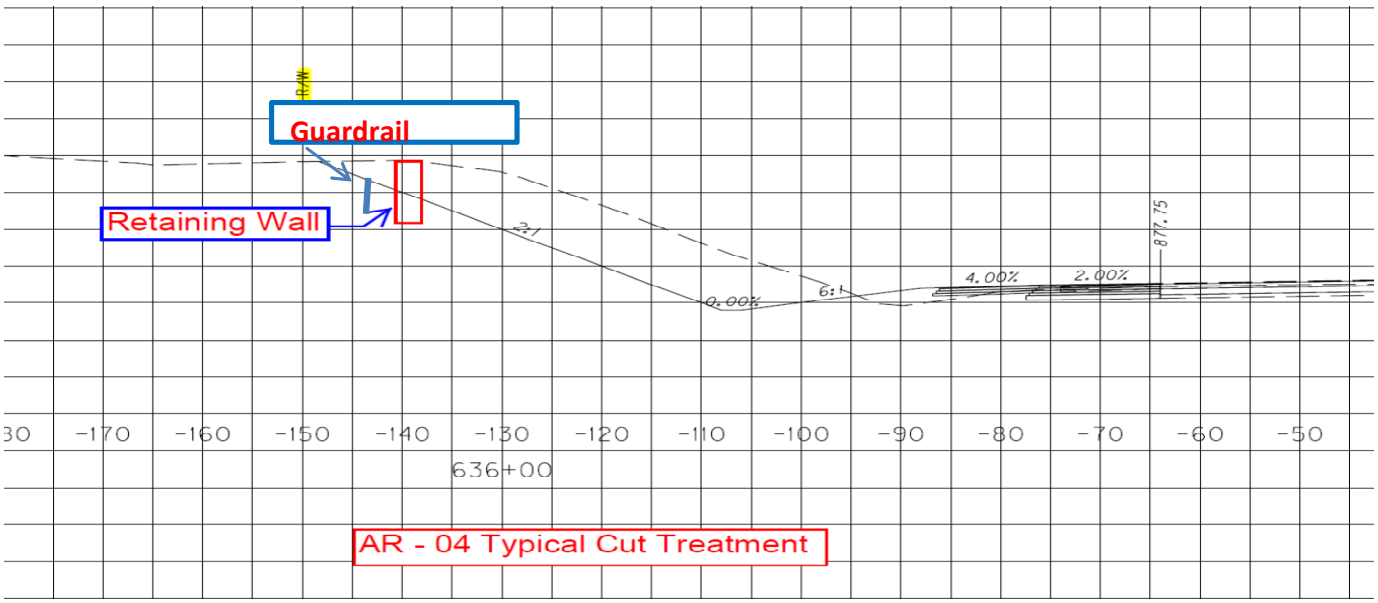
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

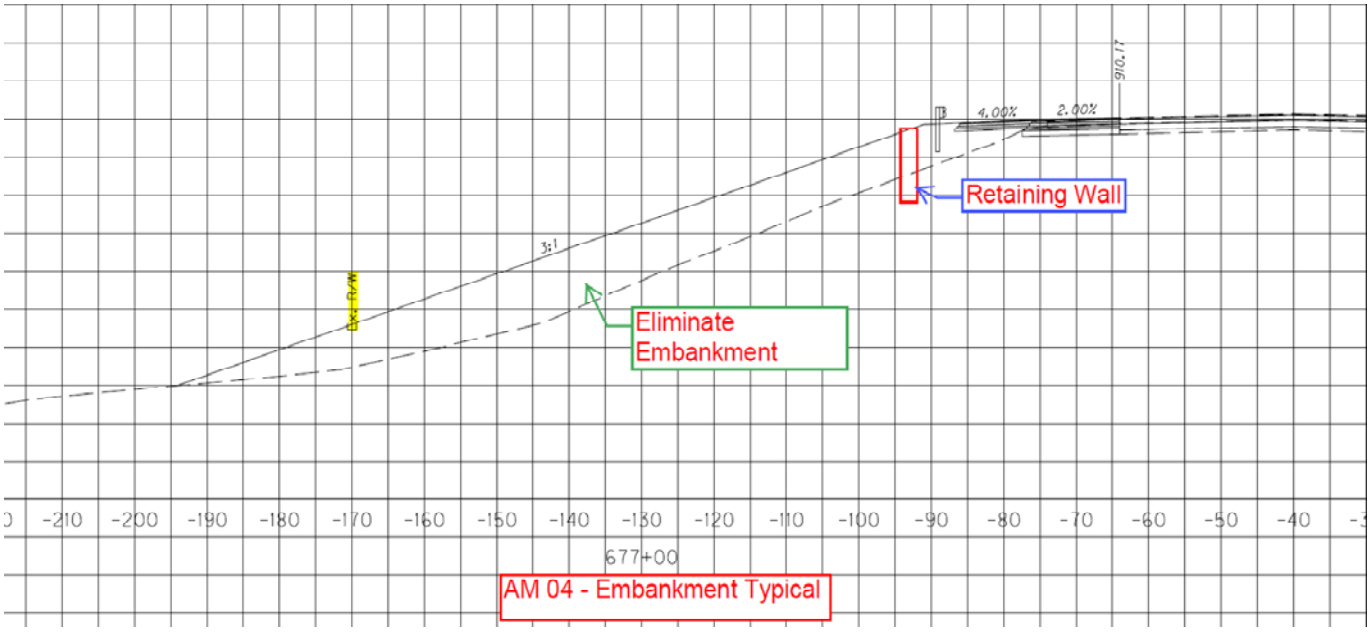
Items #6-14.00 & #6-14.50

Boone County

TITLE: On auxiliary lanes, build retaining wall in lieu of slope

SKETCH OF PROPOSED ALTERNATIVE





VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

FUNCTION: **Avoid Right-of-Way**

BASELINE ASSUMPTION:

The intersection is and would continue as a full movement intersection with traffic signal control. Design includes a dual left turn bay, accommodating eastbound KY536 to northbound Biltmore Blvd.

PROPOSED ALTERNATIVE:

Extend a raised median across the intersection eliminating all left turns at Biltmore Blvd. and do not install a traffic signal.

BENEFITS	RISKS/CHALLENGES
• Increases progression speed on KY536	• May not be acceptable to the property owners
• Increases traffic through-put on KY536 in both directions	• May lower the Level of Service (LOS) at Sam Neace Drive
• Eliminates speed differential in left lane of crossover immediately following the DCD signal	• Requires the 'backage' road behind the Shell station
• Reduce conflict points on KY536	• Requires that Sam Neace Drive be widened to handle more traffic volume
• Improves safety	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 100,000	$ -	$ 100,000
PROPOSED ALTERNATIVE:	$ 7,500	$ -	$ 7,500
TOTAL (Baseline less Proposed)	$ 92,500	$ -	**$ 92,500**
			SAVINGS

VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

DISCUSSION/JUSTIFICATION:
The left lane is immediately adjacent to the easterly DCD signal. Biltmore Blvd. is about 700 feet from the easterly DCD signal (stop bar to stop bar). At only 700 feet downstream from the easterly DCD signal, a signal at Biltmore Blvd. represents significant risks to the operation of KY 536 and the DCD. Progression speeds must be very low for two-way progression on KY 536. The short distance between the DCD signal and Biltmore Blvd., about 650 feet, allows only about 475 feet of left turn storage.

The distance from the Biltmore Blvd. intersection to Sam Neace Drive is only about 630 feet, allowing only about 400 feet of left turn storage to northbound Sam Neace Drive. Retaining a traffic signal at Biltmore Blvd. will be a commitment to retain a crash history associated with traffic signals and other limitations caused by close signal spacing. Additionally, with the back of the storage queue near the DCD signal, there is a risk that the queue will back into the interchange operation signal during peak hours.

It is proposed that the median would be raised from the easterly DCD signal to Sam Neace Drive. The left turn bay for Sam Neace Drive would be made longer, extending further to the west. Biltmore Blvd. on the north side and Biltmore Blvd. on the south side would remain connected as right turns only. On the south side, an east-west local connector road would be built south of the Shell station connecting to Sherwood Lakes Drive.

Several national documents and research papers recommend, especially on major arterials, that there also be a deceleration length prior to storage. National signal progression guidance for high volume arterials recommends one half mile (2,640 feet) spacing of traffic signals to achieve 35 mph progression. A minimum spacing should be no less than one-quarter mile spacing for ramps to the first signal (1,360 feet) to achieve 25 mph progression. The short spacings of these three intersections (DCD, Biltmore Blvd., Sam Neace Drive) can be made to work at very low travel speeds and result in lower capacity, longer travel times, more congestion, and more total delay. However, this being a major arterial with major volumes predicted at 52,000, the roadway design and intersection spacing should not compromise safety and other performance factors. Spacing of signals has a direct effect on roadway efficiency. A 1985 study concluded that 1⁄2-mile signal spacing could reduce vehicle-hours of delay by over 60% and vehicle-hours of travel by over 50%, compared with signals at 1⁄4-mile intervals with full median openings between signals. The travel time on a segment with four signals per mile is about 16% greater than on a segment with two signals per mile.

Absent the left in and out at Biltmore Blvd. north, a landscaped center median can be added along with a retail monument sign.

IMPLEMENTATION CONSIDERATIONS:
Closing the Biltmore Blvd. full movement allows the left turn queue of Sam Neace Blvd. to be extended to the east for more capacity and longer deceleration distances. There is an option that KY 536 be about 12 feet narrower from DCD to Sam Neace Drive with the reduction of dual left turn lanes at Biltmore Blvd.

To accommodate left turn demand from the residential area on Biltmore Blvd. south, a local street link would be needed south of the Shell station. It is estimated to cost about $142,000. This cost is already in the original project budget, however it is not shown in the most current plan update.

VALUE ENGINEERING PROPOSAL AR-09

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE:	Extend median across Biltmore Blvd. (right-in and right-out only)							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Raised median section		FT				300	25.00	7,500
Signal		EA	1	100,000	100,000			
					100,000			**7,500**
							(BASELINE LESS PROPOSED)	**92,500**

*Note: Costs are rounded to nearest thousand dollars.

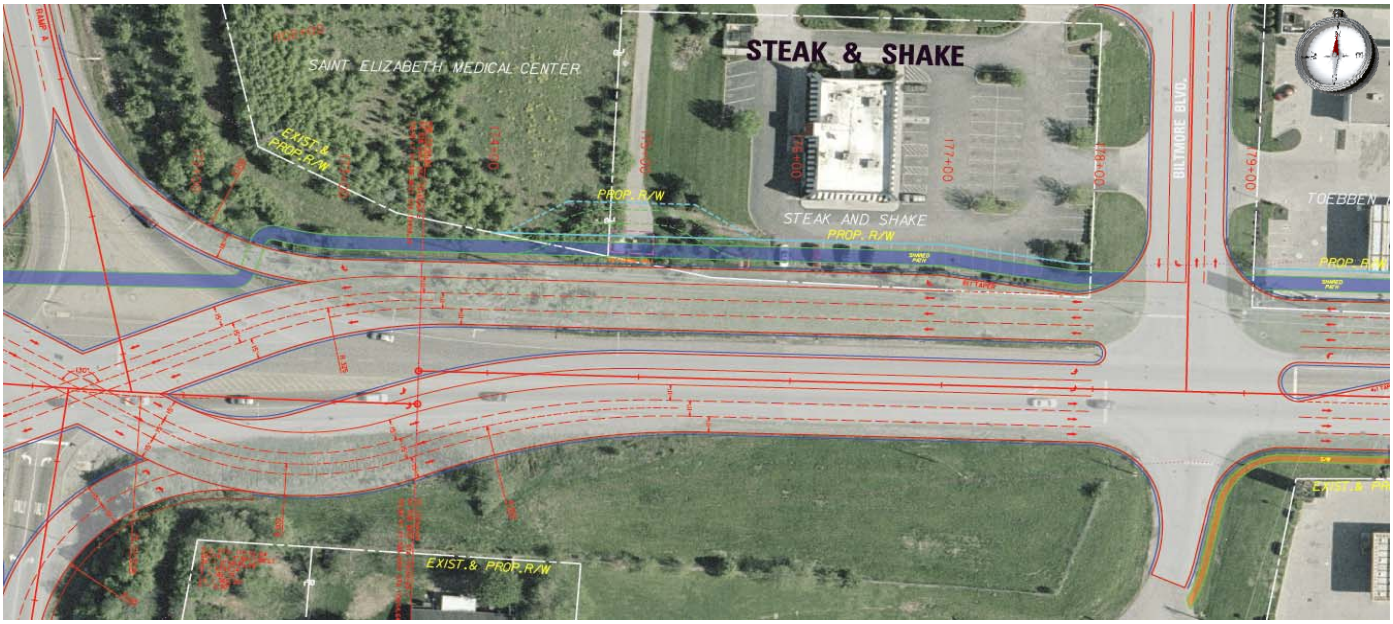
SAVINGS

VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

SKETCH OF BASELINE ASSUMPTION



TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

SKETCH OF PROPOSED ALTERNATIVE: the median extended across the opening at Biltmore

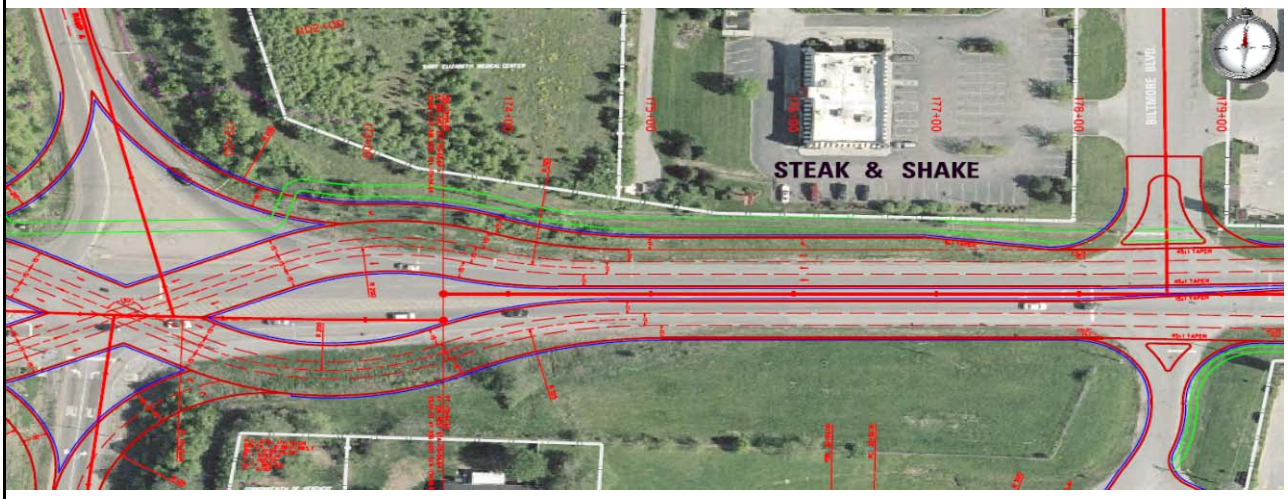


TABLE 9-2 Progression Speed as a Function of Signal Spacing and Cycle Length

Cycle Length (s)	Spacing			
	1/8 mi (660 ft)	1/4 mi (1,320 ft)	1/3 mi (1,760 ft)	1/2 mi (2,640 ft)
	Progression Speed (mph)			
60	15	30	40	60
70	13	26	34	51
80	11	22	30	45
90	10	20	27	40
100	9	18	24	36
110	8	16	22	33
120	7.5	15	20	30

VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

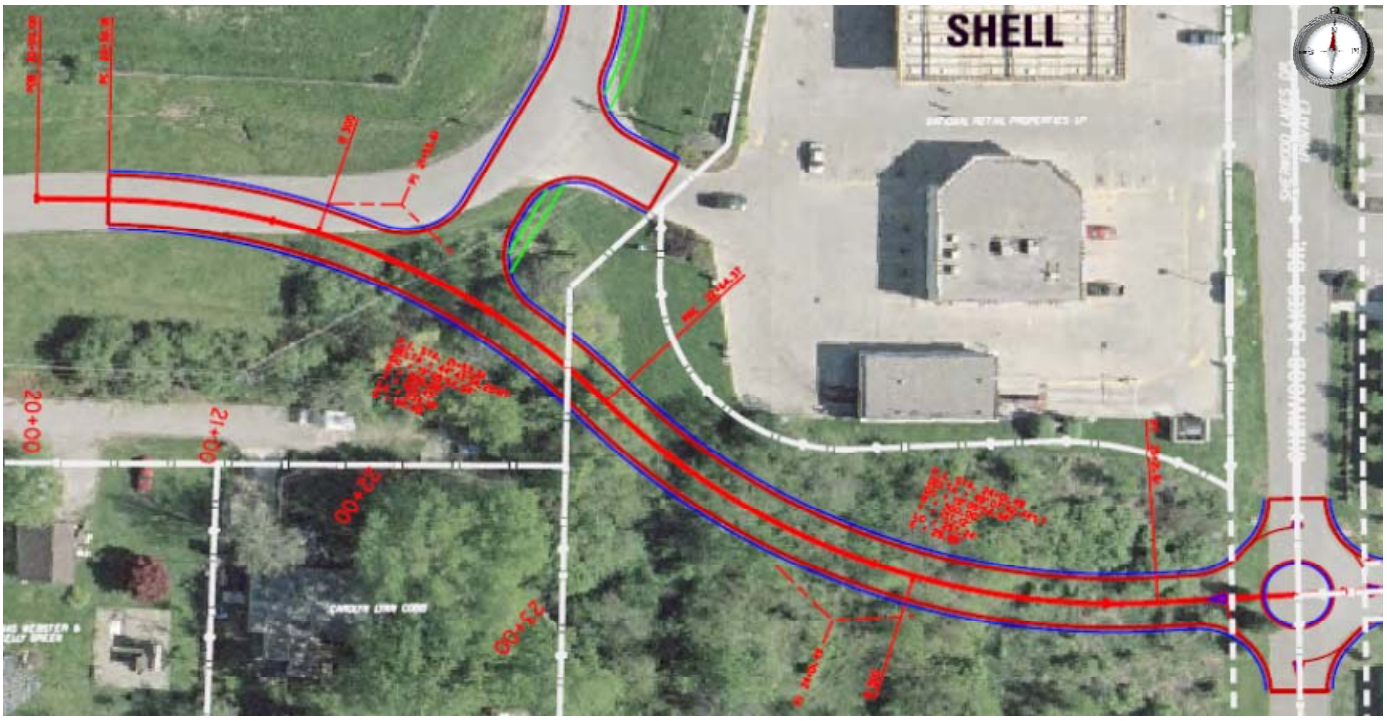
Example of an aterial (60,000 ADT) with commercial development, 1/2 mile signal spacing, and backage road.

VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

Eliminating the left out at Biltmore requires the local connection road, 24 ft, to Sherwood

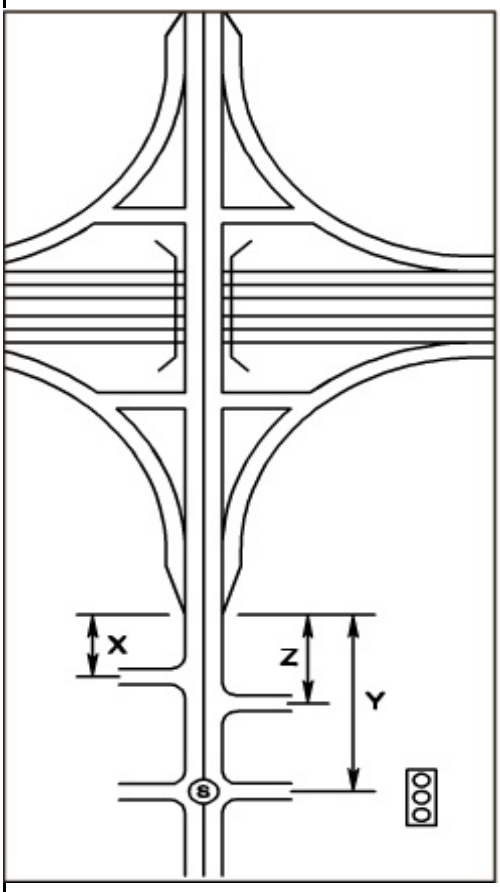


VALUE ENGINEERING PROPOSAL AR-09
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Extend median across Biltmore Blvd. (right-in and right-out only)

A standard national diagram for access control at an interchange (this one from Virginia DOT) 'Y" is 1,320 ft and 'Z' is 750 to 1,320 ft. Photo is from Tennessee



VALUE ENGINEERING PROPOSAL SV-04
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Use concrete in lieu of asphalt at Sam Neace Drive and KY536 intersection
FUNCTION:	**Support Vehicles**

BASELINE ASSUMPTION:

The current project uses asphalt pavement at the intersection of Sam Neace Drive and KY536.

PROPOSED ALTERNATIVE:

Use concrete pavement on the intersection, approach and exits at Sam Neace Drive and KY536.

BENEFITS	RISKS/CHALLENGES
• Prevents pavement from rolling and rutting due to heavy truck traffic	• Increases initial construction costs
• Longer life cycle of the pavement	• Maintenance of traffic issues during construction
• Less maintenance cost	•
• Less disruption to travelers due to fewer repair cycles	•
• Reduced liability exposure for repairs under traffic	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 318,670	$ 63,000	$ 381,670
PROPOSED ALTERNATIVE:	$ 538,578	$ -	$ 538,578
TOTAL (Baseline less Proposed)	$ (219,908)	$ 63,000	**$ (156,908)**

COST

VALUE ENGINEERING PROPOSAL SV-04
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Use concrete in lieu of asphalt at Sam Neace Drive and KY536 intersection

DISCUSSION/JUSTIFICATION:

Sam Neace Drive currently connects the industrial area from the north to KY536. Many heavy trucks will be using this road and the Sam Neace Drive intersection to access the interstate. As trucks approach the intersection, they will require braking to stop for the signal before pulling in and out of Sam Neace Drive and KY536. As trucks make these stops and turns, horizontal loads and stress will be put on the pavement. All of this activity, over time, from traffic and heavy trucks will tend to roll and rut the asphalt pavement much quicker than the average automobile. Concrete pavement at this intersection will prevent rolling and rutting of the pavement.

IMPLEMENTATION CONSIDERATIONS:

Maintenance of traffic will need to be addressed during construction of the concrete pavement at this intersection. The existing asphalt pavement at the intersection will need to be removed to construct the concrete pavement. An existing local street, Berberich Drive, can be used as a detour to close a section of Sam Neace Drive to construct the concrete pavement. This work should be accomplished at low traffic volume hours such as night time with time limitations on closures. It is recommended that the concrete pavement be constructed at least 175 feet north on Sam Neace Drive from the edge of KY536. The KY536 intersection and the legs can be constructed by part-width construction. While traffic is maintained on the existing roadway, the three proposed lanes to the north can be constructed through the intersection. It is recommended that the concrete pavement be constructed at least 300 feet from the intersection on the west leg of KY536 and 250 feet on the east leg of KY536. This work should also be accomplished during low traffic volume hours. After the three lanes to the north are completed, the KY536 traffic can be shifted to these lanes and the remaining lanes to the south can then be completed. Investment Way can be closed similar to the Sam Neace Road closure and traffic detoured using the local street system while this construction is completed.

VALUE ENGINEERING PROPOSAL SV-04

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Use concrete in lieu of asphalt at Sam Neace Drive and KY536 intersection							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Remove existing asphalt pavement		SY				3,550	5.05	17,928
Construct concrete pavement		SY				7,750	63.00	488,250
DGA		TON		18		1,800	18.00	32,400
Asphalt surface		TON	600	70	42,000			
Asphalt base		TON	3,400	45	153,000			
Drainage blanket		TON	1,700	35	59,500			
DGA		TON	3,565	18	64,170			
					318,670			**538,578**
							(BASELINE LESS PROPOSED)	**(219,908)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING PROPOSAL SV-04

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Use concrete in lieu of asphalt at Sam Neace Drive and KY536 intersection

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alterative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Resurface intersection	10	85,000	63,248		
2						
3						
4						
5						
Total Salvage & Replacement Costs			**85,000**	**63,248**		

Annual Costs (pres worth calculated over 20 yrs)		**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs					

SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth)	63,000	
RESULTS (Proposed less baseline)		

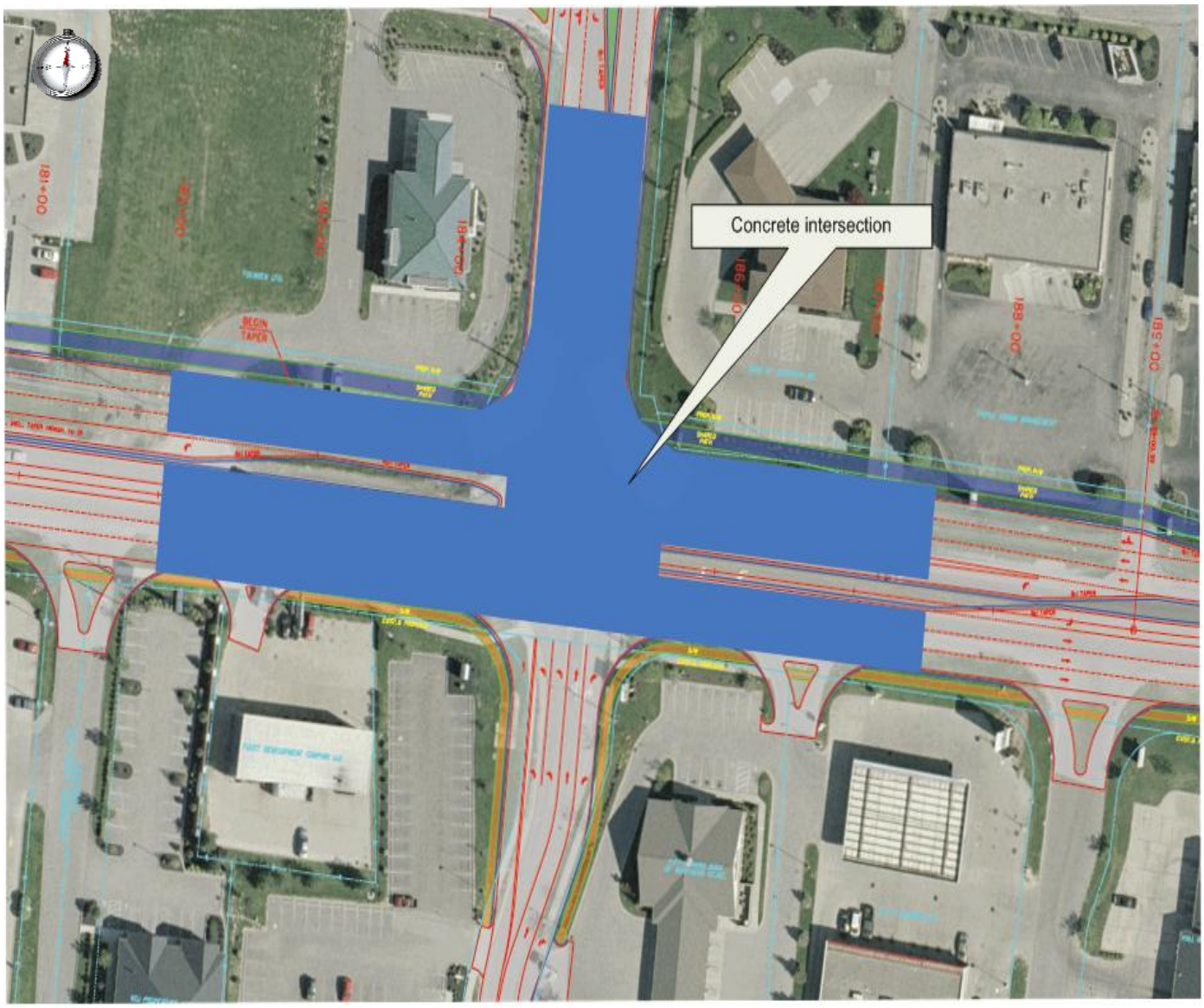
Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

VALUE ENGINEERING PROPOSAL SV-04

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Use concrete in lieu of asphalt at Sam Neace Drive and KY536 intersection

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MA-01
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Restrict left turns out at Biltmore Blvd.

FUNCTION: **Manage Access**

BASELINE ASSUMPTION:

The intersection is and will be a full movement intersection with traffic signal control. A dual left turn bay, accommodating eastbound to northbound to Biltmore Blvd. is provided. The left lane is immediately adjacent to the easterly DCD signal. Biltmore Blvd. is about 650 feet from the easterly DCD signal (stop bar to stop bar).

PROPOSED ALTERNATIVE:

Change the design of the median to create a three-quarter movement intersection, prohibiting left turns out from Biltmore Blvd. to eastbound KY536.

BENEFITS	RISKS/CHALLENGES
• Allows left turns eastbound from the interchange to northbound Biltmore Blvd.	• There is a risk that the left turn queue would back up into the east side DCD signal intersection.
• Reduces left turn volumes at Sam Neace	• The two phase traffic signal will result in a crash history
• Reduces the traffic signal impacts at Biltmore Blvd., allowing more green time westbound into the interchange	• Will cause some increased delay and travel time for westbound KY 536 into the interchange
• Reduces cost of the traffic signal at the intersection	• Speed differential conflicts at the entry point into the left turn bay
• Reduces crash frequency at the Biltmore Blvd. intersection by eliminating the left out movements	•
• Improve through traffic operations for KY536 at the intersection	•
• Unrestricted eastbound traffic flow on KY536	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 100,000	$ -	$ 100,000
PROPOSED ALTERNATIVE:	$ 53,000	$ -	$ 53,000
TOTAL (Baseline less Proposed)	$ 47,000	$ -	**$ 47,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL MA-01

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Restrict left turns out at Biltmore Blvd.

DISCUSSION/JUSTIFICATION:

At only about 700 feet downstream from the easterly DCD signal, a full stop light signal at Biltmore Blvd., stopping eastbound traffic, represents significant risks to the operation of KY536 and the DCD. Progression speeds must be very low for two-way progression on KY536 easterly.

The proposal, allowing a left turn eastbound to northbound Biltmore Blvd., with the turn volumes anticipated, would require a traffic signal for the westbound traffic. Traffic eastbound from the interchange would not need to stop at Biltmore Blvd. The left turn reduces turning movements at Sam Neace Drive. The signal controlled left also allows an easy U-turn from eastbound to westbound for passenger cars and short trucks. This would eliminate the warrants for a multi-phase traffic signal. There would be a two-phase traffic signal to stop westbound traffic to allow left turns into Biltmore Blvd. This would however, stop westbound through traffic according to the signal cycle timing,

For signals, signal progression guidance recommends 1/2-mile to achieve 35 mph progression (2,640 feet) spacing of traffic spacing on arterials. A minimum spacing of 1,360 feet is recommended from ramps to the first intersection, about a 25 mph progression. The short spacings of these three intersections (DCD, Biltmore Blvd., Sam Neace Dr.) can be made to work at very low travel speeds and result in lower capacity, longer travel times, more congestion, and more total delay. Progression speeds are estimated between 8 and 10 mph. However, this being a major arterial with major volumes (52,000 ADT) the roadway design and intersection spacing should not compromise on performance factors. At 1/2 mile spacing off-peak, progression speed is about 45 mph. With 1/8 mile spacing off-peak progression speed is between 8 and 11 mph.

Spacing of signals has a direct effect on roadway efficiency. A 1985 study concluded that 1/2-mile signal spacing could reduce vehicle-hours of delay by over 60% and vehicle-hours of travel by over 50%, compared with signals at 1/4-mile intervals with full median openings between signals. The travel time on a segment with four signals per mile is about 16% greater than on a segment with two signals per mile. (TRB Access Manual 2003).

IMPLEMENTATION CONSIDERATIONS:

To accommodate left turn demand from the residential area on Biltmore Blvd. south, a local street link would be needed south of the Shell station. It is estimated to cost about $142,000. This cost is already in the original project budget, however it is not in the current drawing.

VALUE ENGINEERING PROPOSAL MA-01

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Restrict left turns out at Biltmore Blvd.

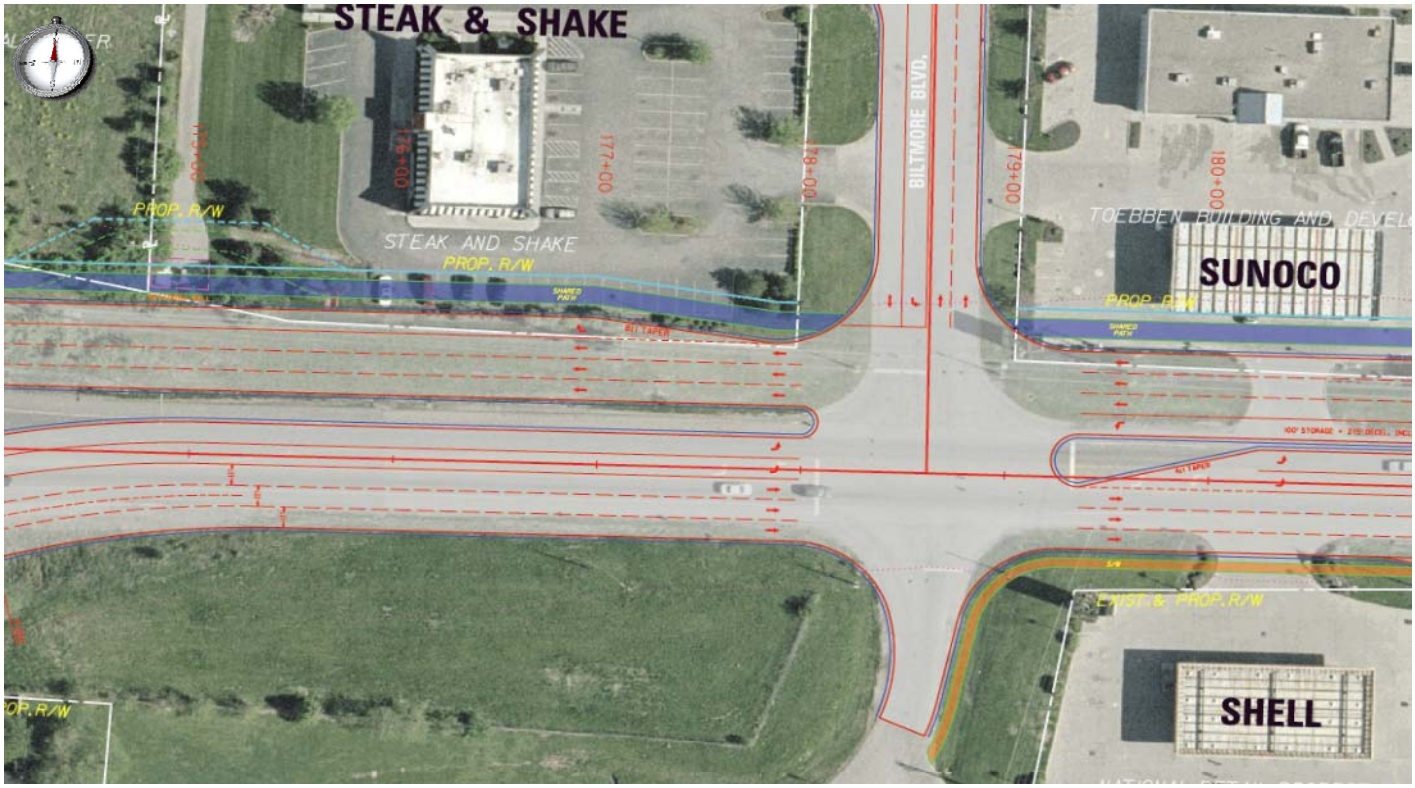
DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Signal		EA	1	100,000	100,000	1	50,000	50,000
Median extension		EA				1	3,000	3,000
					100,000			**53,000**
							(BASELINE LESS PROPOSED)	**47,000**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

TITLE: Restrict left turns out at Biltmore Blvd.

BASELINE SKETCH
KY 536 at Biltmore Blvd. with full intersection and traffic signal



TITLE: Restrict left turns out at Biltmore Blvd.

PROPOSED SKETCH
Example of dual left turn in with traffic signal controlling approach traffic. Hurstbourne Lane near I 64 in Louisville. No left turns or through movements are permitted from entrance.

TITLE: Restrict left turns out at Biltmore Blvd.

Restricting left out from the south side will reqire a local connection to Sherwood Lakes Drive.

TABLE 9-2 Progression Speed as a Function of Signal Spacing and Cycle Length

Cycle Length (s)	Spacing			
	1/8 mi (660 ft)	1/4 mi (1,320 ft)	1/3 mi (1,760 ft)	1/2 mi (2,640 ft)
	Progression Speed (mph)			
60	15	30	40	60
70	13	26	34	51
80	11	22	30	45
90	10	20	27	40
100	9	18	24	36
110	8	16	22	33
120	7.5	15	20	30

VALUE ENGINEERING PROPOSAL MA-02
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Eliminate left turns out at Berberich Drive/Lakeside Drive
FUNCTION:	**Manage Access**

BASELINE ASSUMPTION:

This is a non-signal full movement intersection at this time with a possibility for a future signal.

PROPOSED ALTERNATIVE:

Change the intersection to a three-fourths intersection in both directions by extending the raised median.

BENEFITS	RISKS/CHALLENGES
• No need for a traffic signal at this location	• An increase of traffic on Sam Neace Drive
• Improves public safety and improves KY536 performance - capacity	• Ingress and egress is potentially more restricted for drivers
• Reduces travel time	• Local property owner may prefer leaving all left turns
• Allows left-in and right-in to businesses on the north and the trailer park on the south	• Left turns previously out of Lakeside Drive, must now travel through the US25 intersection
• Added costs would be very low	•
• Allows U-turns in both directions on KY536	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 7,800	$ -	$ 7,800
TOTAL (Baseline less Proposed)	$ (7,800)	$ -	**$ (7,800)**
			COST

VALUE ENGINEERING PROPOSAL MA-02
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Eliminate left turns out at Berberich Drive/Lakeside Drive

DISCUSSION/JUSTIFICATION:
Currently, there is a raised median in each direction from the intersection. On the south side the street name is Lakeside Drive and serves a trailer park. On the north side is Berberich Drive that goes north and connects to Sam Neace Drive. Eastbound KY536 will become two lanes eastbound and westbound will have three through lanes. This eliminates left turns out for both Lakeside Drive and Berberich Drive. North side motorists seeking left-out must travel to Sam Neace Drive. Motorists in the Greenlawn trailer park seeking to use a left-out to travel east, will need to exit onto US25 then go west on KY536. This also creates a desire to connect the trailer park to Demia Way (Workbook MA-03 and MA-06). The primary reason for eliminating left turns is to prevent the need for a traffic signal, while still accommodating all movements, except the left-out. Left turnouts without a signal will be difficult over six lanes and therefore an increase in crashes is anticipated.

The current road has a total width of three lanes. A left turn out onto a 3-lane, 45 mph arterial is not always an easy movement. The motorists cross the first through lane, the median lane and they are then in their travel lane. Under the proposed baseline design the left-out southbound to eastbound must cross three through westbound lanes then the median lane and merge into eastbound lanes. Crossing more lanes increases the difficulty of the left turnout.

It is likely that the intersection will reach signal warrants in the future based on left turn-out delay. Adding a signal only 680 feet east of Sam Neace Drive will make signal progression more difficult, reduce capacity on KY536, increase vehicle delay, increase crashes, reduce travel speeds, and increase travel time in the corridor.

Additionally, the three-quarter turn allows for U-turns in each direction.

IMPLEMENTATION CONSIDERATIONS:
None apparent

VALUE ENGINEERING PROPOSAL MA-02
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Eliminate left turns out at Berberich Drive/Lakeside Drive							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Additional center median		FT				300	26	7,800
								7,800
							(BASELINE LESS PROPOSED)	**(7,800)**

*Note: Costs are rounded to nearest thousand dollars.

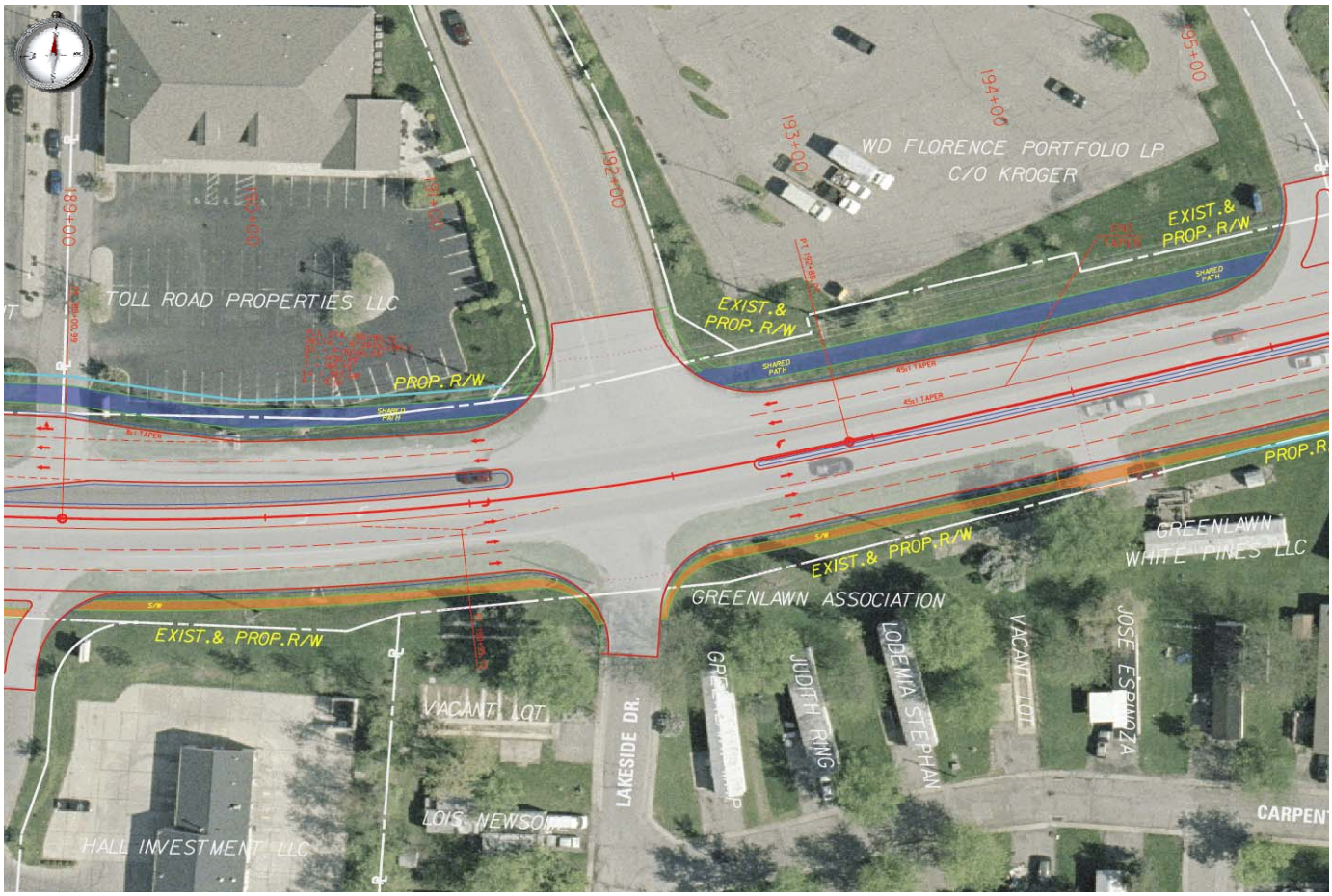
COST

VALUE ENGINEERING PROPOSAL MA-02
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Eliminate left turns out at Berberich Drive/Lakeside Drive

SKETCH OF BASELINE ASSUMPTION. open median at Berberich Drive and Lakeside Drive



VALUE ENGINEERING PROPOSAL MA-02
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Eliminate left turns out at Berberich Drive/Lakeside Drive

PROPOSED SKETCH
Example of restricting left turns out onto 7 lanes

VALUE ENGINEERING PROPOSAL MA-03
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Incorporate the backage road behind Shell and make a new backage road connection from Greenlawn Road to Demia Way
FUNCTION:	**Manage Access**

BASELINE ASSUMPTION:

The previous plan from the design team included a backage road behind the Shell station to connect Biltmore Blvd. and Sherwood Lakes Drive. The updated plan that was provided at the beginning of the study does not include this connection and does not include a connection between the Greenlawn trailer park and Demia Way.

PROPOSED ALTERNATIVE:

Provide the backage road behind the Shell station to connect Biltmore Blvd. and Sherwood Lakes Drive as proposed in the original plan. Additionally, construct a new backage road to connect Greenlawn Road in the trailer park to Demia Way.

BENEFITS	RISKS/CHALLENGES
• Improves access to residential properties	• Increases right-of-way and construction costs
• Improves connectivity to businesses located around Investment Way	• May require utility relocations
• Gives more properties access to traffic signals	•
• Reduces traffic volume and conflicts on KY536 between Biltmore Blvd. and US25 by keeping local traffic on local roads	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 199,646	$ -	$ 199,646
TOTAL (Baseline less Proposed)	$ (199,646)	$ -	**$ (199,646)**

COST

VALUE ENGINEERING PROPOSAL MA-03

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE:	Incorporate the backage road behind Shell and make a new backage road connection from Greenlawn Road to Demia Way

DISCUSSION/JUSTIFICATION:

The addition of the backage roads will improve the ingress/egress for the communities to the south of KY536. It will provide them access to the current businesses located around Investment Way and provide additional access to the signal at Investment Way which improves connectivity. These connections will help reduce traffic and conflicts on KY536 between Biltmore Blvd. and US25. This will also allow an opportunity to close all access to Biltmore Blvd. at KY 536. This will also reduce conflict points thus providing a safer road.

The costs for the backage road (approximately $160,000) at the Shell station are included in the original preliminary cost estimate, since this was in the original concept. The costs shown in this proposal relate to the new backage road from Greenlawn Road to Demia Way.

IMPLEMENTATION CONSIDERATIONS:

These backage roads are all new construction and will require right-of-way acquisition and possibly utility relocation. Currently there is no connection for these roadways.

VALUE ENGINEERING PROPOSAL MA-03
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Incorporate the backage road behind Shell and make a new backage road connection from Greenlawn Road to Demia Way							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Asphalt surface		TON		70		90	70	6,300
Asphalt base		TON		50		230	50	11,500
DGA		TON		18		485	18	8,730
Standard curb & gutter		LF		15		700	15	10,500
Sidewalk		SY		40		300	40	12,000
Curb box inlets		EA				2	2,000	4,000
15" culvert pipe		LF				52	63	3,276
Double 36" culvert pipe		LF				136	90	12,240
Clearing & Grubbing		LS				1	2,000	2,000
Earthwork		CY				2500	5	12,500
Misc construction 20%		LS				1	16,600	16,600
Right-of-Way - Greenlawn		LS				1	100,000	100,000
								199,646
							(BASELINE LESS PROPOSED)	**(199,646)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING PROPOSAL MA-03

Kentucky Transportation Cabinet

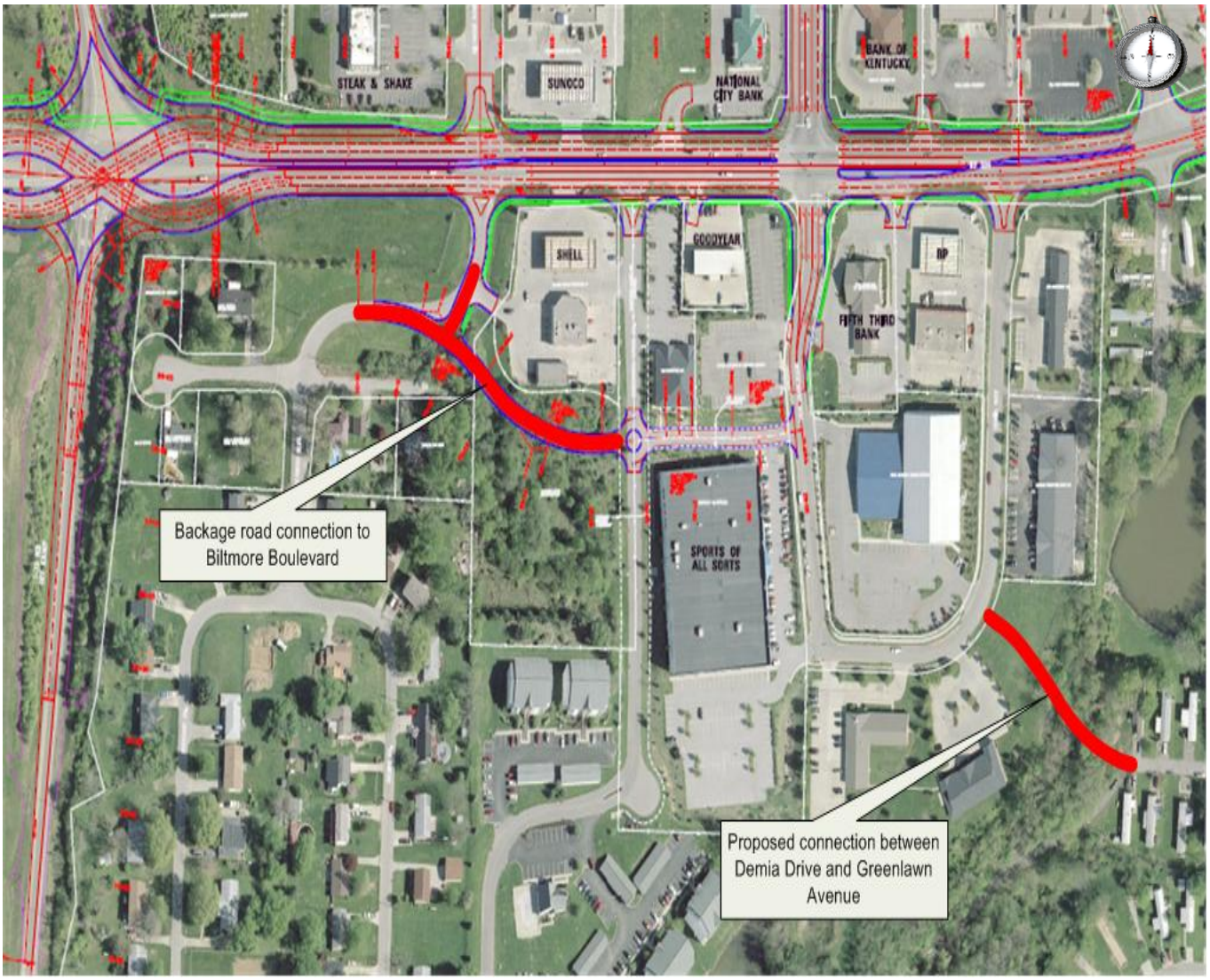
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE:	Incorporate the backage road behind Shell and make a new backage road connection from Greenlawn Road to Demia Way

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MA-05
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Project
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Add concrete median from AutoZone to US25
FUNCTION:	**Manage Access**

BASELINE ASSUMPTION:

The current design calls for dual left turn lanes on KY536 approaching US25 from the west turning left onto northbound US25. There is no proposed separation between these turn lanes and the through westbound lanes on KY536, only a stripe line between lanes.

PROPOSED ALTERNATIVE:

Extend the proposed concrete raised median from the west end of the project to the new section from Berberich Drive to US25, approximate Station 200+75 to 208+25. The raised median will be 4-foot wide with a 2-foot offset on each side.

BENEFITS	RISKS/CHALLENGES
• Improves channelization of lanes approaching intersection	• Increases construction cost
• Improves safety	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 104,311	$ -	$ 104,311
TOTAL (Baseline less Proposed)	$ (104,311)	$ -	**$ (104,311)**

COST

VALUE ENGINEERING PROPOSAL MA-05
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Project
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add concrete median from AutoZone to US25

DISCUSSION/JUSTIFICATION:

The most recent plan shows that many of the entrances in this portion of the project are being removed. However, there is no enforceable access control presently on KY 536. If entrances are permitted in the future, this idea will prohibit left turns to and from these entrances onto KY 536 eastbound, which will provide a safer roadway for drivers and pedestrians/bicycles. The raised median also provides a physical barrier between the dual left turn lanes and the through westbound lanes which provides a safer situation than being separated by only a striped line.

IMPLEMENTATION CONSIDERATIONS:

The roadway will need to be widened 8 feet to provide space for the raised concrete median and offset. There appears to be sufficient existing right-of-way available for the necessary widening.

VALUE ENGINEERING PROPOSAL MA-05

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Project
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add concrete median from AutoZone to US25

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Additional concrete raised median		SY				333	37	12,414
Additional pavement: ASPH SURF		TON		70		55	70	3,850
Additional pavement: ASPH BASE		TON		45		293	45	13,185
Additional pavement: DGA base		TON		18		307	18	5,526
Additional pavement: Drainage blanket		TON		35		132	35	4,620
Drop box inlet for median drainage		EA		2,000		4	2,000	8,000
15" storm sewer pipe		LF		50		650	50	32,500
Sloped box outlet Type 1		EA				1	1,500	1,500
Miscellaneous construction @ 20%		LS		1		1	17,886	17,886
Mobilization (3%)		LS		1		1	3,220	3,220
Demobilization (1.5%)		LS		1		1	1,610	1,610
								104,311
							(BASELINE LESS PROPOSED)	**(104,311)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING PROPOSAL MA-05

Kentucky Transportation Cabinet

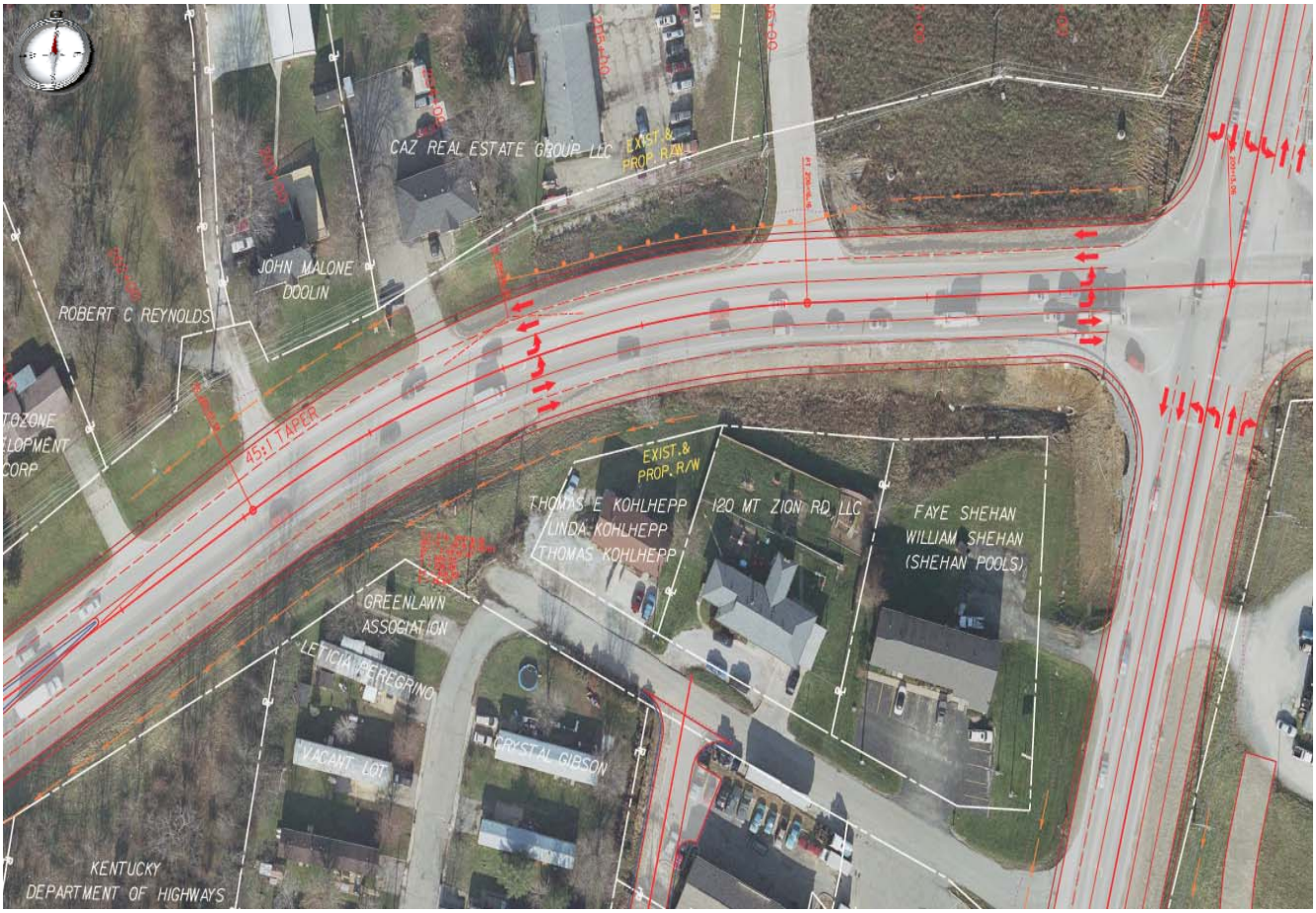
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Project

Items #6-14.00 & #6-14.50

Boone County

TITLE: Add concrete median from AutoZone to US25

SKETCH OF BASELINE ASSUMPTION

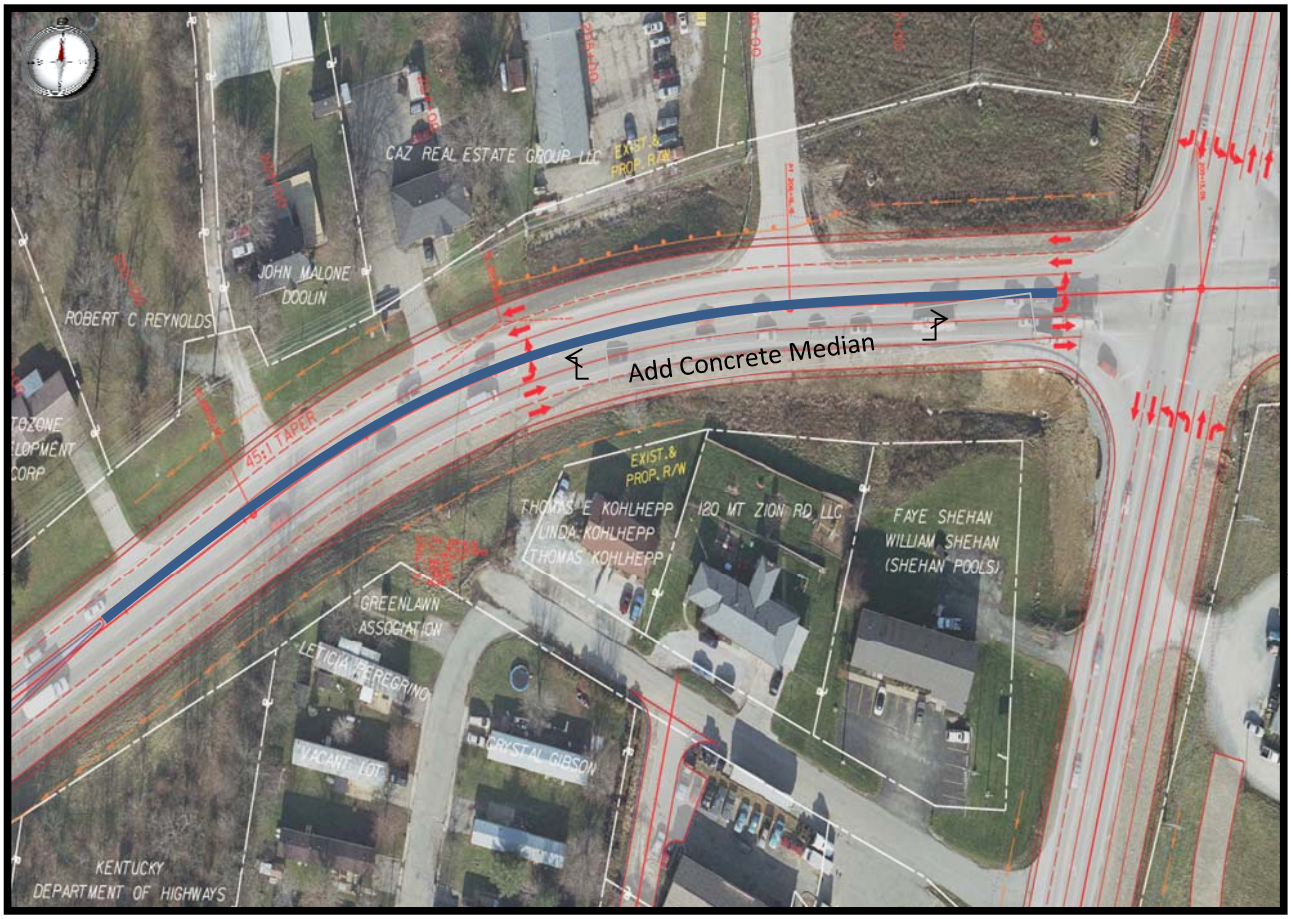


VALUE ENGINEERING PROPOSAL MA-05

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Project
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add concrete median from AutoZone to US25

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MA-07
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger
FUNCTION:	**Manage Access**

BASELINE ASSUMPTION:

Right-in / Right-out turns only allowed at subject driveways from KY536.

PROPOSED ALTERNATIVE:

Subject driveways would be closed from KY536. Motorists would use other connections to gain access to KY536.

BENEFITS	RISKS/CHALLENGES
• Reduces conflict points along the corridor	• Drivers would have to take circuitous routes to access KY536 without direct access
• Reduces crash potential	•
• Slower traffic turning to and from KY536 would not hinder progression	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 3,600	$ -	$ 3,600
PROPOSED ALTERNATIVE:	$ 21,600	$ -	$ 21,600
TOTAL (Baseline less Proposed)	$ (18,000)	$ -	**$ (18,000)**
			COST

VALUE ENGINEERING PROPOSAL MA-07
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger

DISCUSSION/JUSTIFICATION:
These driveways could be eliminated and still leave ingress/egress to all properties currently served by KY536. Traffic turning into and out of driveways tends to have a negative impact on traffic speeds on arterials. Reducing the number of driveways along the corridor would increase safety by lowering the number of conflict points associated with the original design.

Drivers entering or exiting the Shell station would have the option of using either Biltmore Blvd. or Investment Way for access.

Drivers entering or exiting the BP Station and Fifth Third Bank would have the option of using Investment Way or Demia Way for access.

Drivers entering or exiting the Kroger store would have the option of using either Berberich Drive or Sam Neace Drive for access.

IMPLEMENTATION CONSIDERATIONS:
None apparent

VALUE ENGINEERING PROPOSAL MA-07
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Sidewalks		SY	25	60	1,500	80	60	4,800
Remove pavement		CY				650	5	3,250
Concrete (right-in/right-out) medians		SY	35	60	2,100			
Curb & gutter		LF				340	20	6,800
Miscellaneous		EA				1	3,750	3,750
Sod		SY				600	5	3,000
					3,600			**21,600**
							(BASELINE LESS PROPOSED)	**(18,000)**

*Note: Costs are rounded to nearest thousand dollars.

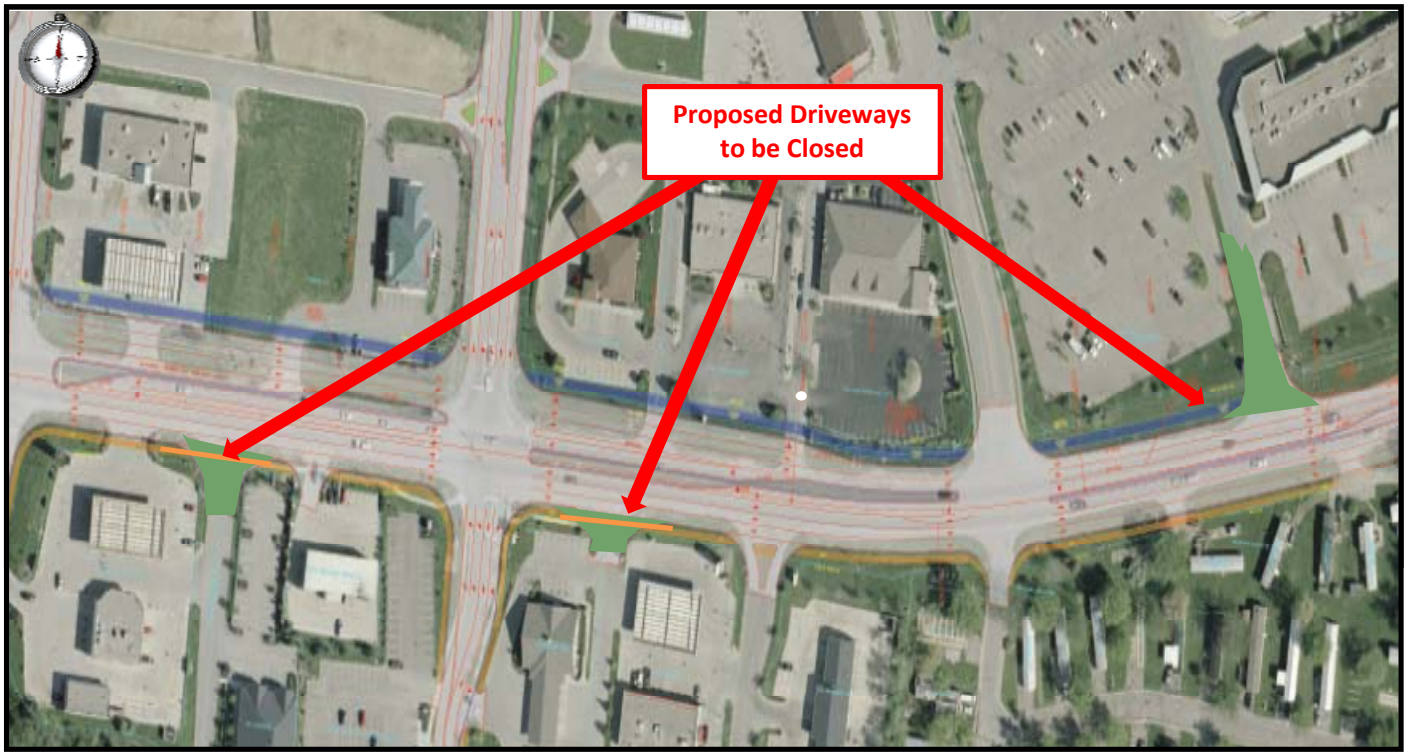
COST

TITLE: Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger

SKETCH OF BASELINE ASSUMPTION

TITLE: Eliminate driveways at Shell, Fifth Third Bank, BP and Kroger

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MA-08DS
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxilliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Acquire access rights from Tiburon Drive to Biltmore Blvd.
FUNCTION:	**Manage Access**
BASELINE ASSUMPTION:	
The limits of where access rights will be purchased is not specified in the current design.	
PROPOSED ALTERNATIVE:	
Purchase the access rights from Tiburon Drive to Biltmore Blvd.	

BENEFITS	RISKS/CHALLENGES
• Ensures good traffic operations and safety within the interchange area	• None apparent
• Plans for appropriate future signal locations and avoids unwanted locations	•
• Maximizes safety and traffic flow through well-planned access locations	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL MA-08DS
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxilliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Acquire access rights from Tiburon Drive to Biltmore Blvd.

DISCUSSION/JUSTIFICATION:

One of the main reasons for doing this project is to make the interchange functionally operate in the long term, which will also improve the safety along the KY 536 corridor. In addition to a quality design that manages access and creating an MOU, acquiring access rights is another tool to ensure that the integrity of operation and safety are maintained. It would be beneficial to acquire rights throughout the corridor; however, the most critical will be within the area of the first major intersection on each side of the interchange.

IMPLEMENTATION CONSIDERATIONS:

The formal process for obtaining access rights will need to be completed.

VALUE ENGINEERING PROPOSAL MA-13DS
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Develop Access Management Plan and MOU
FUNCTION:	**Manage Access**
BASELINE ASSUMPTION:	
The current design implements access management design measures but does not account for future access decisions.	
PROPOSED ALTERNATIVE:	
Develop an access management plan that identifies current and future allowable access points and potential signalized intersections. Enter into a MOU between KYTC and local government.	

BENEFITS	RISKS/CHALLENGES
• Maximizes safety and traffic flow through well-planned access locations	• Consistency in future implementation of the access management plan and MOU
• Plans for appropriate future signal locations and avoids unwanted locations	•
• Encourages coordination between local Planning & Zoning and KYTC permitting staff	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

TITLE: Develop Access Management Plan and MOU

DISCUSSION/JUSTIFICATION:

The current design does not implement any spacing or design standards to be used for future access decisions. Without additional measures, future access decisions could degrade the function of the road in terms of traffic flow and safety, including additional signals that might be added at locations with poor spacing and the inability to coordinate timing with adjacent signals. Developing an access management plan that is adopted by both KYTC, Boone County, OKI, and Boone County Planning Commission will ensure that good, coordinated decisions are made in the development review process and access permitting process. An access management plan would designate current and future allowable locations for both driveway access and signal locations.

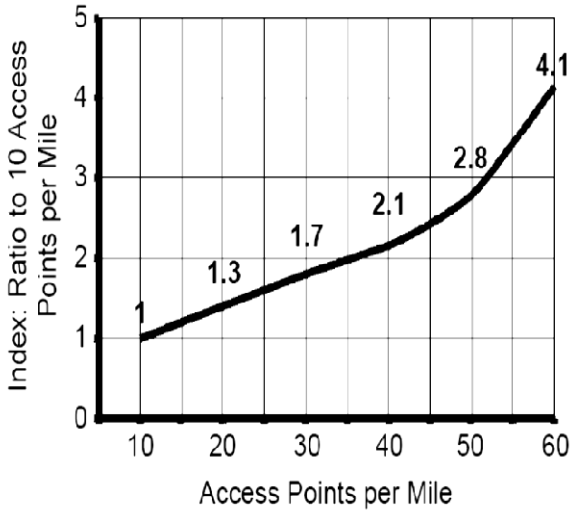


FIGURE 2-1 Composite crash rate indices (*1*).

TABLE 2-2 Representative Accident Rates (Crashes per Million Vehicle-Miles Traveled) by Type of Median—Urban and Suburban Areas (*1*)

Total Access Points per Mile[a]	Median Type		
	Undivided	Two-Way Left-Turn Lane	Non-Traversable Median
≤ 20	3.8	3.4	2.9
20.01-40	7.3	5.9	5.1
40.01-60	9.4	7.9	6.8
> 60	10.6	9.2	8.2
All	9.0	6.9	5.6

[a] Includes both signalized and unsignalized access points.

VALUE ENGINEERING PROPOSAL MT-01
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left
FUNCTION:	~~**Miscellaneous**~~

BASELINE ASSUMPTION:

The original design for the I-71/I-75 DCD at KY536 includes a single lane ramp for the eastbound KY536 to northbound I-71/I-75 movement.

PROPOSED ALTERNATIVE:

The VE team recommends reconstruction of the north spill-through of the I-71/I-75 bridge (similar to the 2007 +/- reconfiguration of the south side spill-through) for additional width to accommodate a 2-lane eastbound KY 536 ramp to northbound I-71/I-75. The recommendation would also relocate the shared path currently shown in a reconstructed north spill-through to the median area of the DCD.

BENEFITS	RISKS/CHALLENGES
• Increase through-put with 2 lanes for the eastbound KY536 movement to northbound I-71/I-75	• Potential additional driver confusion
• All shared path crossing of ramps and roadways located at traffic signals	•
• Increases the lanewidth for all KY536 westbound movement	•
• Improves LOS of eastbound to northbound movement	•
• Reduces backup and boittleneck conflicts	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 3,464,123	$ -	$ 3,464,123
PROPOSED ALTERNATIVE:	$ 3,669,803	$ -	$ 3,669,803
TOTAL (Baseline less Proposed)	$ (205,680)	$ -	**$ (205,680)**

COST

VALUE ENGINEERING PROPOSAL MT-01
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

DISCUSSION/JUSTIFICATION:

The original design for the I-71/I-75 DCD at KY536 includes a single lane ramp for the eastbound KY536 to northbound I-71/I-75 movement. The 1,510 vehicles per hour projected to utilize this ramp are more than 50% greater than the next highest ramp lane volume in the interchange (this will likely be the first location to breakdown in the original design). The approved Interchange Justification Study (IJS) shows this movement as a 2-lane ramp feeding from a single lane under the adjacent I-71/I-75 bridge. If growth continues at the levels experienced over the past two decades, this ramp will likely exceed capacity before the project design year.

The VE team recommends reconstruction of the north spill-through of the I-71/I-75 bridge (similar to the 2007 +/- reconfiguration of the south side spill-through) using a vertical wall for additional width to accommodate a 2-lane eastbound KY536 ramp to northbound I-71/I-75. This will provide for an exit from eastbound KY536 before the bridge.

This recommendation also requires relocation of the shared-use path currently shown in a reconstructed north spill through to the median area of the DCD. Current design for the shared-use path requires crossing the eastbound KY536 to the northbound I-71/I-75 free flow ramp - if this ramp were widened to two lanes, signalization for the pedestrian movement would be required.

IMPLEMENTATION CONSIDERATIONS:

Possible addendum to approved IJS.

VALUE ENGINEERING PROPOSAL MT-01
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
DGA		TON	56,351	18	1,014,318	56791	18	1,022,238
Drainage Blanket-Type II-asphalt		TON	12,411	35	434,385	12631	35	442,085
Class 3 asphalt base		TON	10,923	50	546,150	11363	50	568,150
Class 3 asphalt surface		TON	6,411	70	448,770	6494	70	454,580
Curb and gutter		LF	24,700	15	370,500	26450	15	396,750
Drainage		LS	1	650,000	650,000	1	696,000	696,000
Barrier wall		LF				1500	60	90,000

					3,464,123			**3,669,803**
							(BASELINE LESS PROPOSED)	**(205,680)**

*Note: Costs are rounded to nearest thousand dollars.

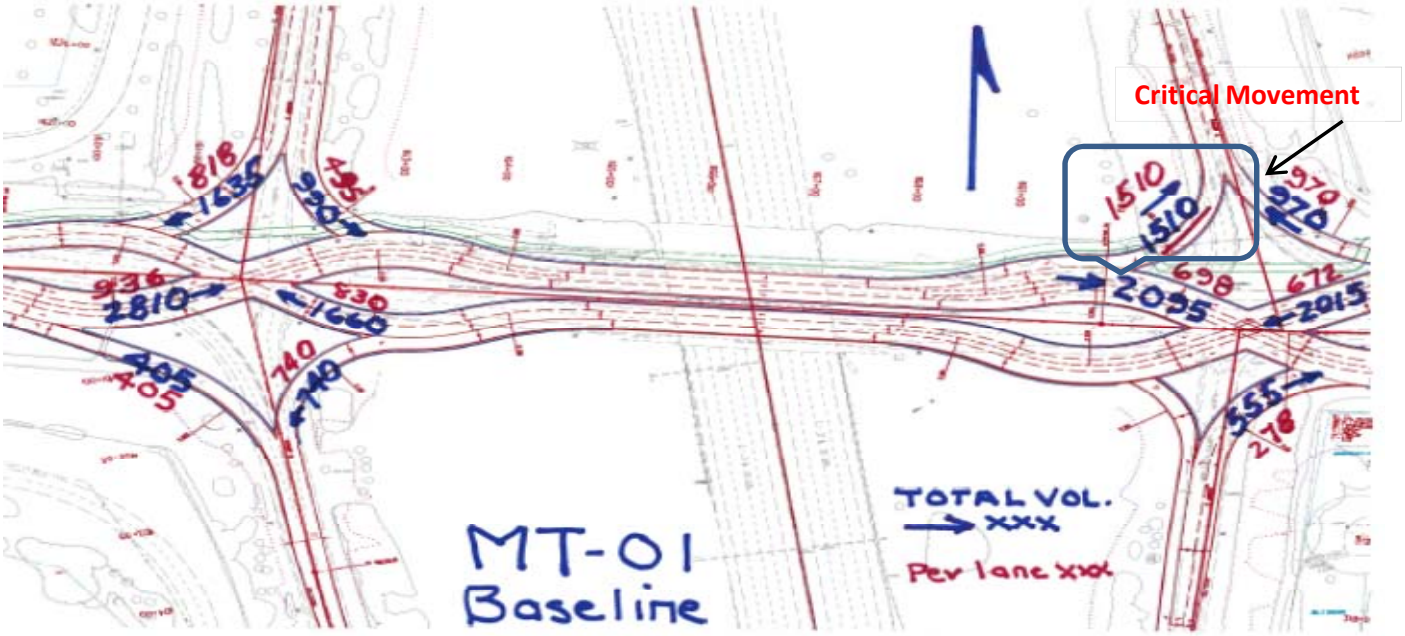
COST

VALUE ENGINEERING PROPOSAL MT-01

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

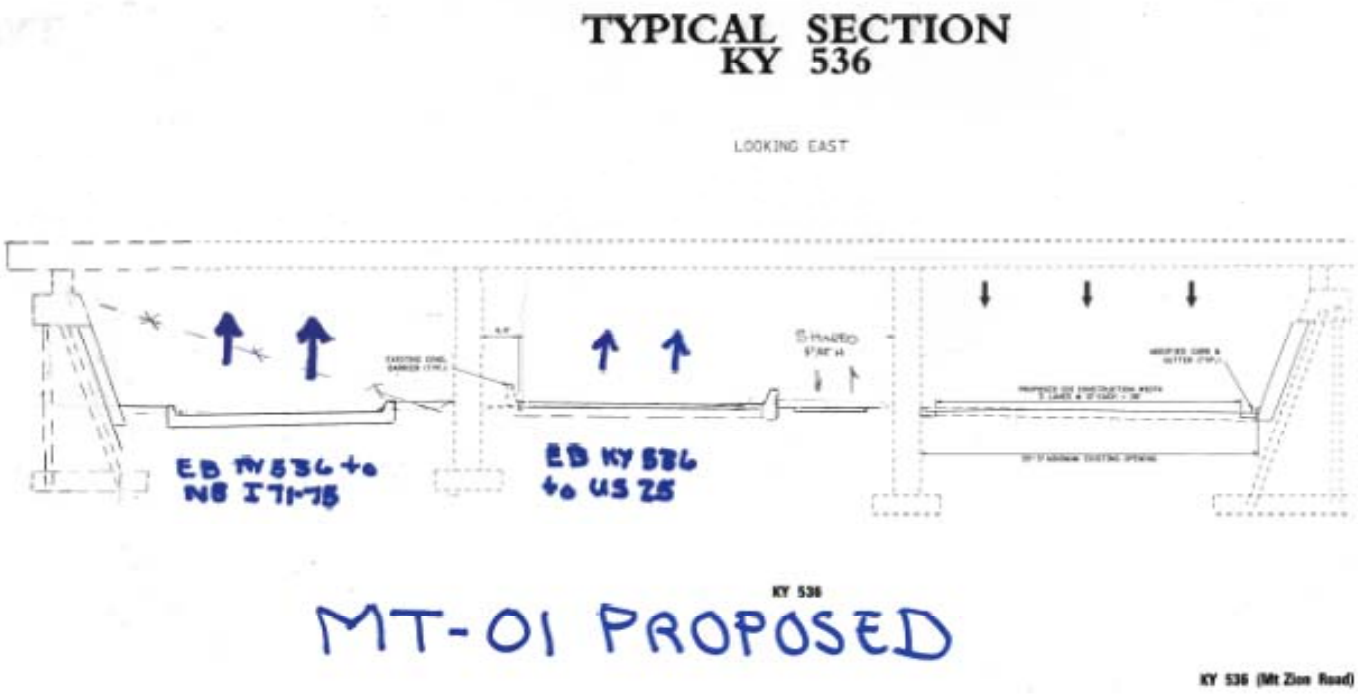
TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

SKETCH OF BASELINE ASSUMPTION



TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

SKETCH OF PROPOSED ASSUMPTION



VALUE ENGINEERING PROPOSAL MT-01

Kentucky Transportation Cabinet

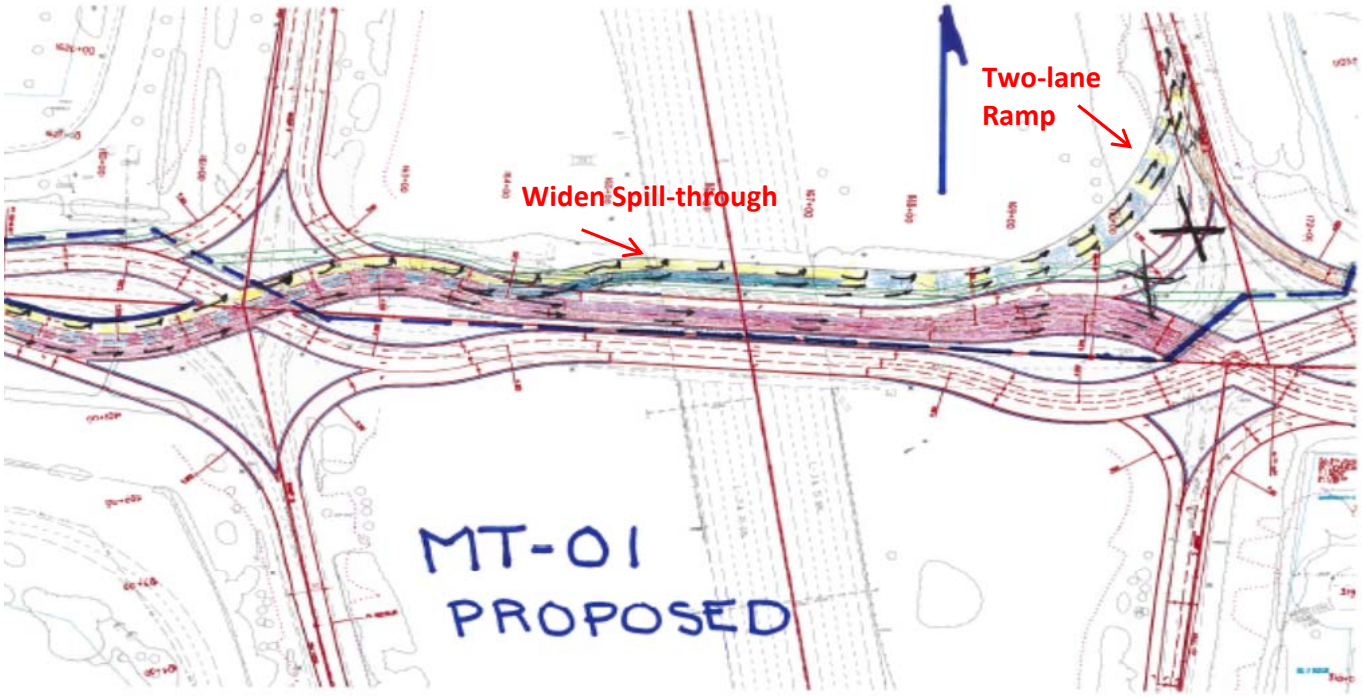
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

SKETCH OF PROPOSED ALTERNATIVE

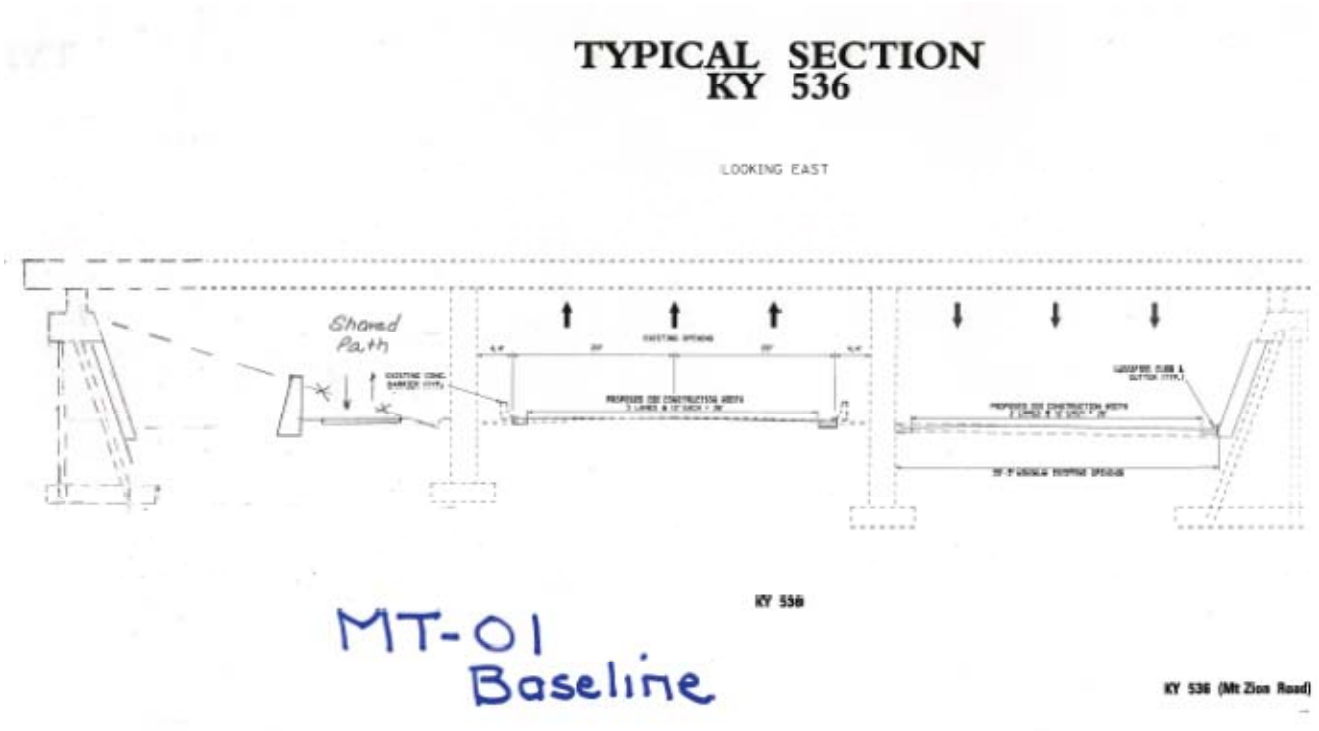


VALUE ENGINEERING PROPOSAL MT-01
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MT-04
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Add right deceleration lane at Biltmore Blvd., Sam Neace Drive and Lakeside Drive - eastbound
FUNCTION:	**Move Traffic**

BASELINE ASSUMPTION:

The outside lane is a shared through/right lane for all intersections in the study area.

PROPOSED ALTERNATIVE:

Add exclusive right lanes for eastbound KY536 at its intersections with Biltmore Blvd. and Lakeside Drive.

BENEFITS	RISKS/CHALLENGES
• Improves through movement operations along KY356	• Added construction and maintenance costs
• Gives right turning vehicles a location to decelerate before making the turns from KY536	•
• Improves safety	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 378,500	$ -	$ 378,500
TOTAL (Baseline less Proposed)	$ (378,500)	$ -	**$ (378,500)**
			COST

VALUE ENGINEERING PROPOSAL MT-04
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add right deceleration lane at Biltmore Blvd., Sam Neace Drive and Lakeside Drive - eastbound

DISCUSSION/JUSTIFICATION:
This improves through movement by separating right turns and eliminating delays caused by right turn vehicles slowing down to turn. Separating turning vehicles also removes the conflicts with through vehicles, reducing the potential for rear end collisions. Both right turns lanes are warranted based on the Kentucky Transportation Cabinet's right turn auxiliary lane warrants. Following is a summary of right turning and advancing volumes for both turn lanes in the AM and PM peak hours.

Eastbound KY 536 @ Biltmore AM
Right Turns: 125
Advancing Volume: 2,135

Eastbound KY 536 @ Biltmore PM
Right Turns: 150
Advancing Volume: 2,335

Eastbound KY 536 @ Lakeside AM
Right Turns: 30
Advancing Volume: 1,650

Eastbound KY 536 @ Lakeside PM
Right Turns: 130
Advancing Volume: 1,890

The intersections were analyzed using projected 2030 AM and PM traffic volumes with both the existing and proposed intersection layouts.

KY 536 & Biltmore Blvd.
During the AM peak hours, the added turn lanes reduced the total intersection delay by 2.8 seconds per vehicle. During the PM peak hours, the added turn lanes reduced the total intersection delay by 12.3 seconds per vehicle. The overall level of service would remain the same during the AM peak hours, but would be improved from a LOS F to an E during the PM peak hours.

KY 536 & Lakeside Drive/Berberich Drive
During the AM peak hours, the added turn lanes reduced the total intersection delay by 1.7 seconds per vehicle. During the PM peak hours, the added turn lanes reduced the total intersection delay by 1.3 seconds per vehicle. The overall level of service would remain the same for both existing and proposed scenarios during both peak hours.

IMPLEMENTATION CONSIDERATIONS:
Right-of-Way would need to be purchased for the Lakeside Drive turn lane.

Utility poles would be impacted with both turn lanes. The Lakeside Drive turn lane would cause the relocation of two large utility poles. The Biltmore Blvd. turn lane would cause the relocation of one strain pole and a small utility pole.

Several other right turn lanes were considered along KY 536 but were not pursued further because of low turn volumes or major ight-of-way impacts.

VALUE ENGINEERING PROPOSAL MT-04

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

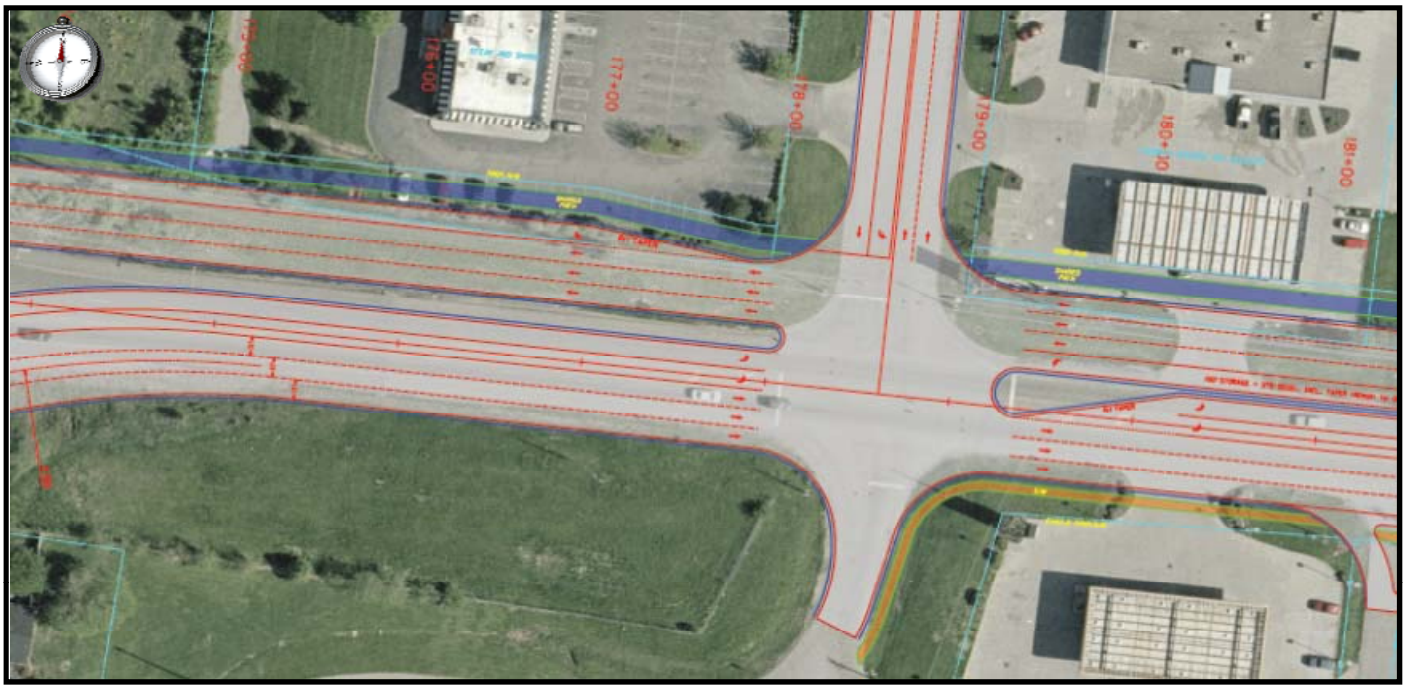
TITLE:	Add right deceleration lane at Biltmore Blvd., Sam Neace Drive and Lakeside Drive - eastbound							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Pavement - outside of existing design		SY				680	60	40,800
Right-of-Way		SF				2,000	20	40,000
Miscellaneous		EA				1	37,700	37,700
Utilities relocation		EA				1	150,000	150,000
Excavation		CY				1,100	100	110,000
								378,500
							(BASELINE LESS PROPOSED)	**(378,500)**

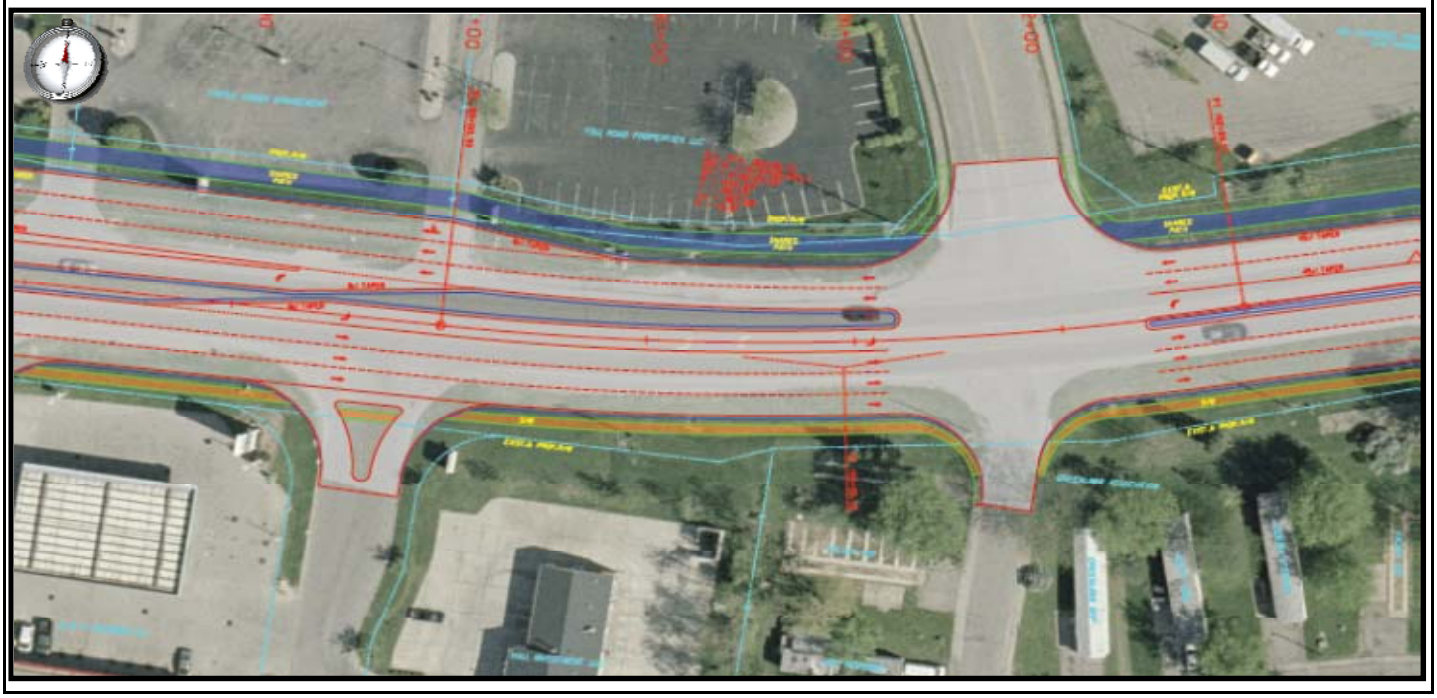
*Note: Costs are rounded to nearest thousand dollars.

COST

TITLE: Add right deceleration lane at Biltmore Blvd., Sam Neace Drive and Lakeside Drive - eastbound

SKETCH OF BASELINE ASSUMPTION





VALUE ENGINEERING PROPOSAL MT-04

Kentucky Transportation Cabinet

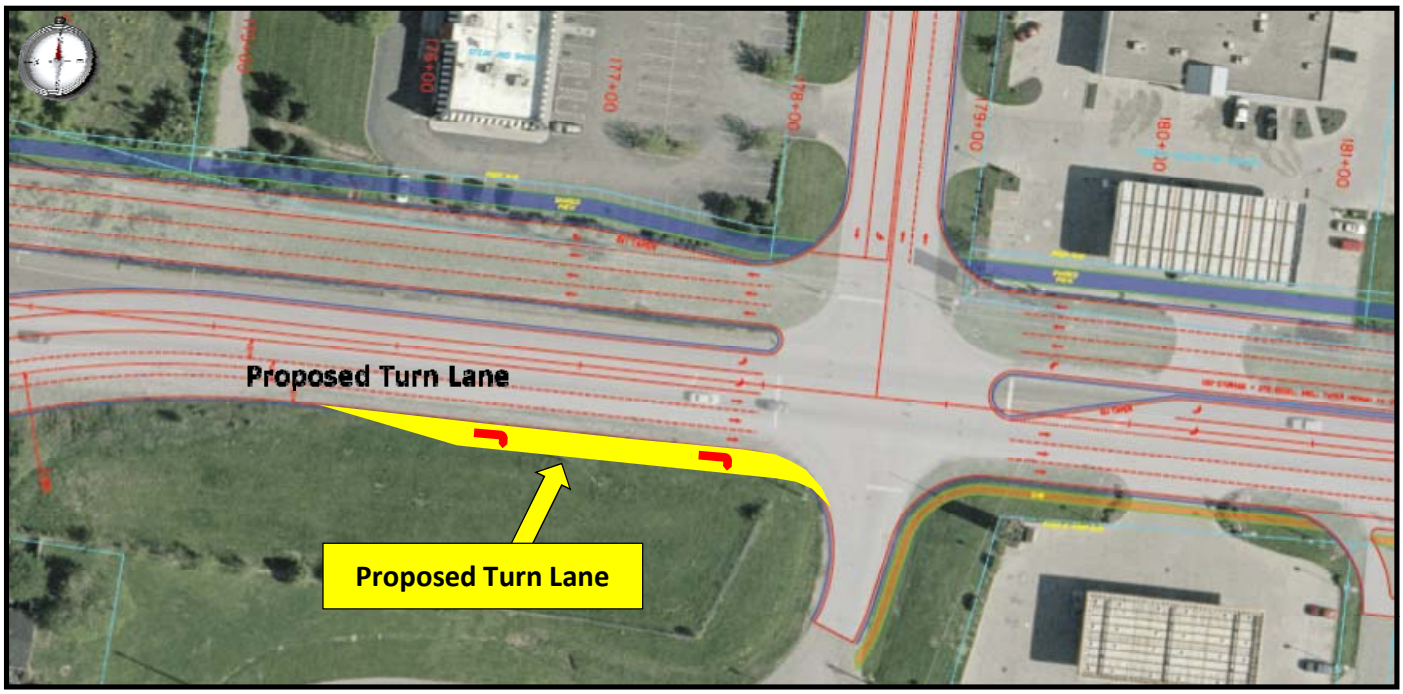
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

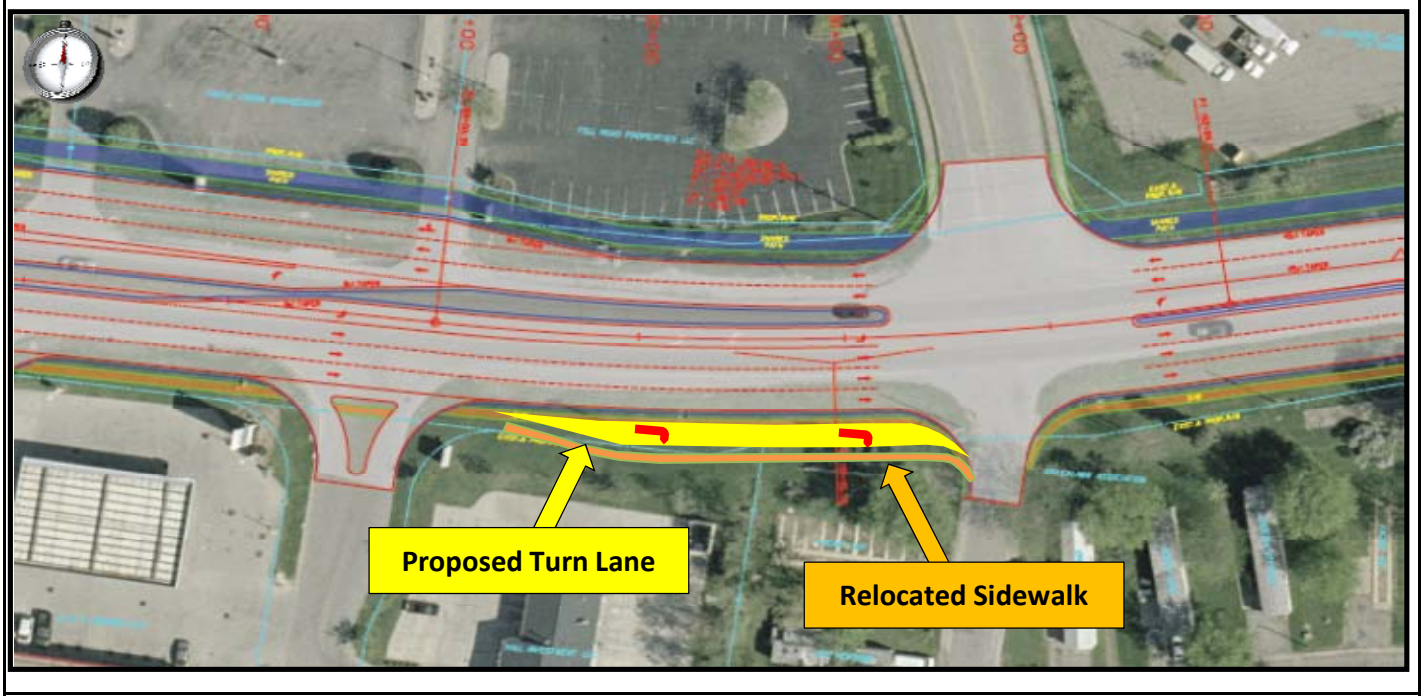
Items #6-14.00 & #6-14.50

Boone County

TITLE: Add right deceleration lane at Biltmore Blvd., Sam Neace Drive and Lakeside Drive - eastbound

SKETCH OF PROPOSED ALTERNATIVE





VALUE ENGINEERING PROPOSAL MT-05DS
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection
FUNCTION:	**Move Traffic**
BASELINE ASSUMPTION:	
There is a conventional signalized intersection at US25.	
PROPOSED ALTERNATIVE:	
Build a continuous flow intersection (CFI), displaced left-turn intersection (DLT) at US25.	

BENEFITS	RISKS/CHALLENGES
• Improves operations	• Additional right-of-way costs
•	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL MT-05DS

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE: At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection

DISCUSSION/JUSTIFICATION:

A cursory review shows that a CFI will operate significantly better than the conventional signal for the US 25 intersection. Using the TRB Intersection Tool, the critical volume for the intersection types are as follows:

CFI 1,495 vehicles per hour
Conventional 1,720 vehicles per hour

The saturation value for the critical lane volume sum is 1,600; therefore, the conventional design is much higher, whereas the CFI is below the level.

The assumed CFI design is for the displaced left turns to be on the east and west legs, not on the north and south. With this approach, the CFI design may be feasible without major right-of-way impacts.

IMPLEMENTATION CONSIDERATIONS:

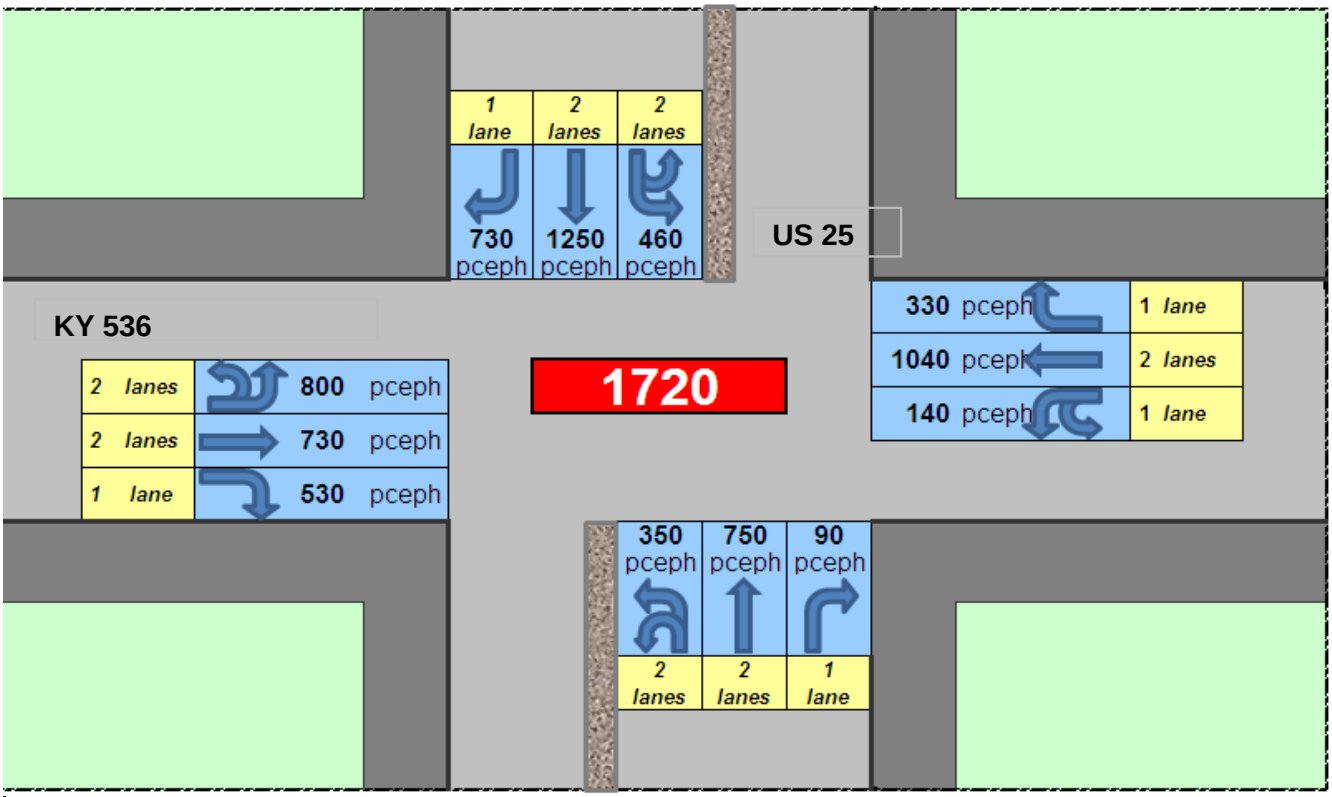
TITLE: At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection

SKETCH OF BASELINE ASSUMPTION

Conventional Intersection

< 1200	1200 -1400
1400 -1600	> 1600

Critical lane volume sum

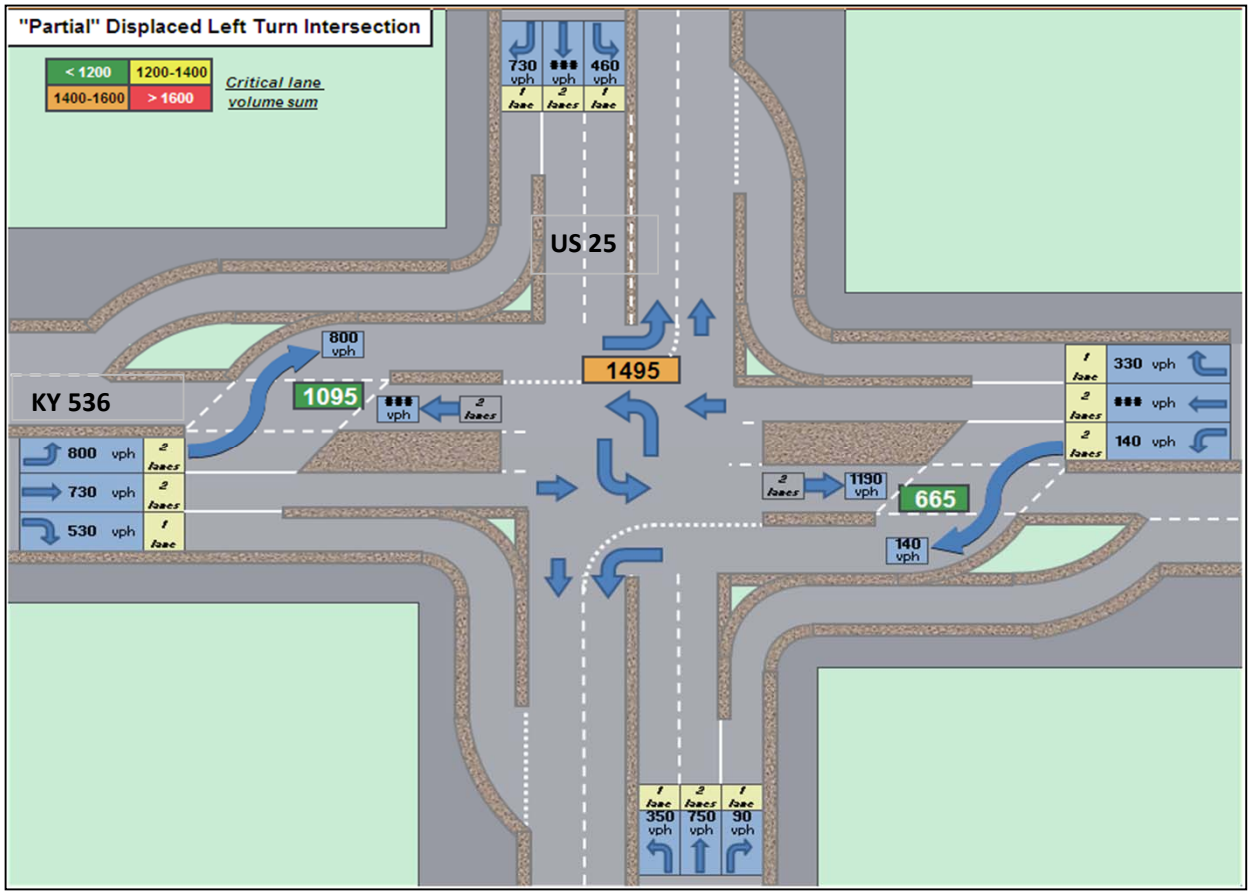


VALUE ENGINEERING PROPOSAL MT-05DS

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection

SKETCH OF PROPOSED ALTERNATIVE



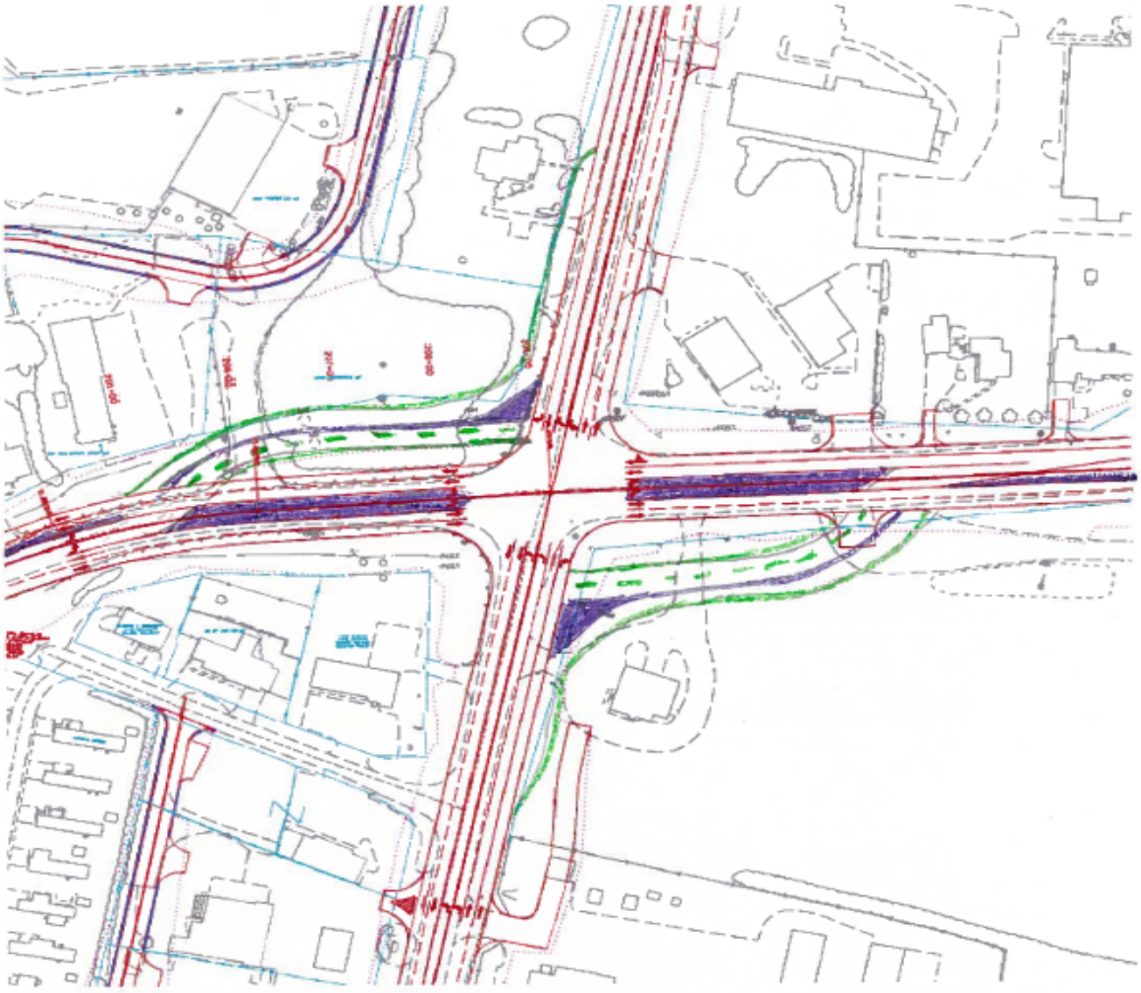
VALUE ENGINEERING PROPOSAL MT-05DS

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection

SKETCH OF PROPOSED ALTERNATIVE



DISPLACED LEFT TURNS
(AKA CFI)
KY536/US25

VALUE ENGINEERING PROPOSAL MT-07
Kentucky Transportation Cabinet

I-75 at KY 536 and I-75 Auxiliary Lanes Items #6-14.00 & #6-14.50
Boone County

TITLE:	Add roundabout at Tiburon Drive
LOCATION:	**Move Traffic**

BASELINE ASSUMPTION:

The project calls for a standard four leg intersection at KY536 and Tiburon Drive. Traffic estimates indicate warrants for a traffic signal will be met. The current budget covers intersection improvements but the signal would be future work.

PROPOSED ALTERNATIVE:

Improve the intersection to a roundabout design so a traffic signal is not necessary in the future.

BENEFITS	RISKS/CHALLENGES
• One less signal to fit into the signal progression timing	• Public acceptance
• Roundabouts have fewer crashes and injuries compared to traffic signals	• Arterial traffic volumes
• Roundabouts are 'green' and sustainable solutions	• Traffic growth will require widening the roundabout in the future
• Traffic calming prior to entering the residential area to west	•
• Will not need to spend $100,000 to install traffic signal in the future	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ -	$ -	**$** -

NO CHANGE

VALUE ENGINEERING PROPOSAL MT-07
Kentucky Transportation Cabinet

I-75 at KY 536 and I-75 Auxiliary Lanes Items #6-14.00 & #6-14.50
Boone County

TITLE: Add roundabout at Tiburon Drive

DISCUSSION/JUSTIFICATION:
To avoid the need to fit another traffic signal into the signal progression scheme, use a roundabout instead of a traffic signal. In this situtation, higher volumes on KY 536 and low side street volumes on both sides, a roundabout will provide good capacity for the main road. A roundabout would have a lower crash rate than a signalized intersection. This would have all the benefits frequently associated with roundabouts.

IMPLEMENTATION CONSIDERATIONS:
Installing a roundabout at the time of roadway reconstruction will only cost slighty more than installing the improved new intersection shown on the plans. There will be some increased cost to develop a good roundabout design as compared to a standard intersection design.

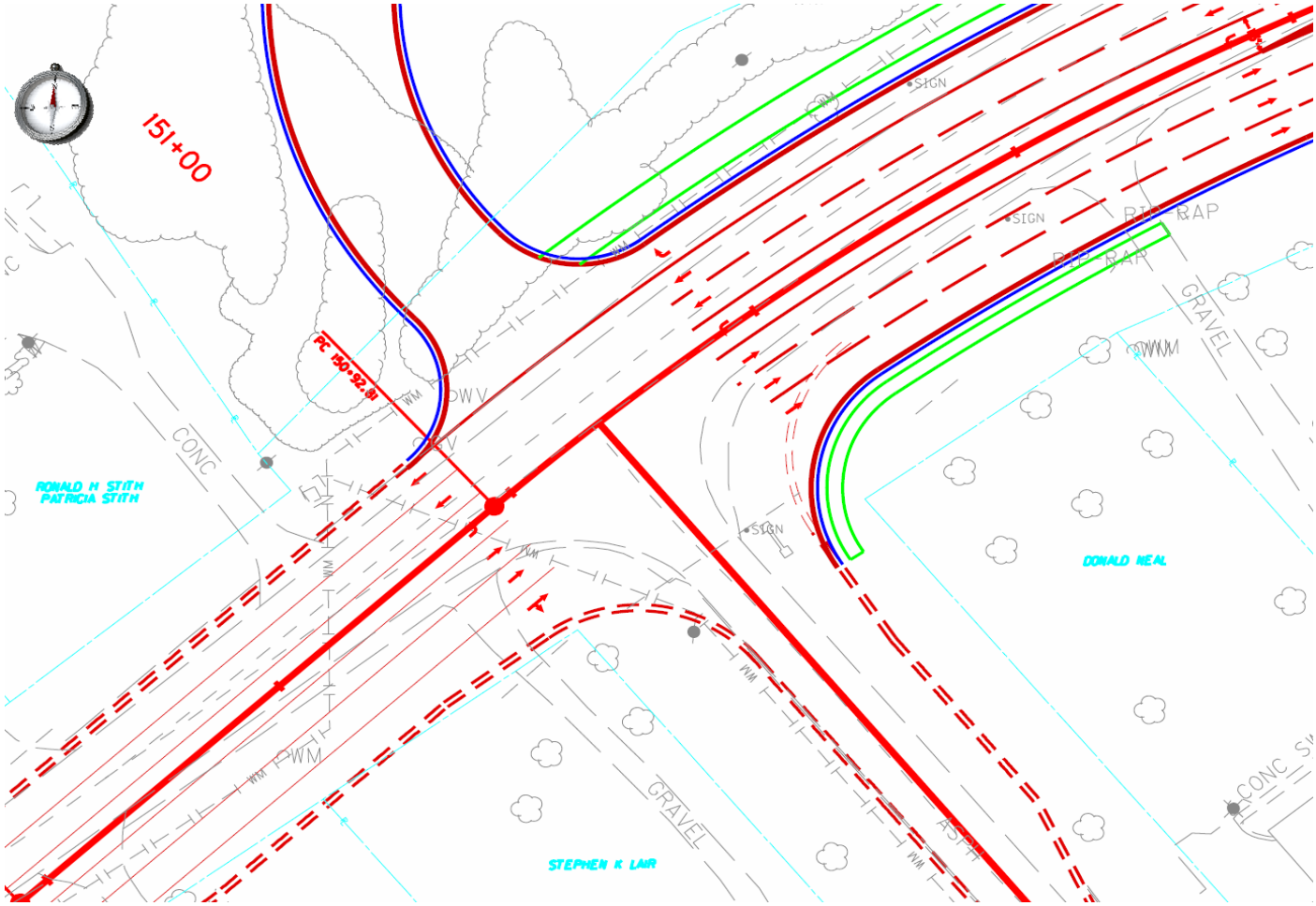
It will be necessary to perform a detailed analysis of the volume for the design using a software such ar RODEL to determine the design and number of lanes.

Given the current volumes, a single lane roundabout is needed and in the future a two/one lane roundabout will be needed. Given the estimated high hourly volumes in 2030 (about 5,500 vph entering), it may be necessary to increase to a two/three lane roundabout near 2030. There is an option to phase the roundabout and incorporate phasing into the design, so as not to have an overbuilt roundabout (2-lane) when only a one-lane roundabout is needed, or overbuilding to a three-lane many years before a three lane is necessary. Single-lane roundabouts work more efficiently and have a better safety record than multi-lane roundabouts and always should be used when possible.

No costs were given to the selection of the roundabout alternative. If installed at the time of roadway reconstruction the costs should be similar to the original budget.

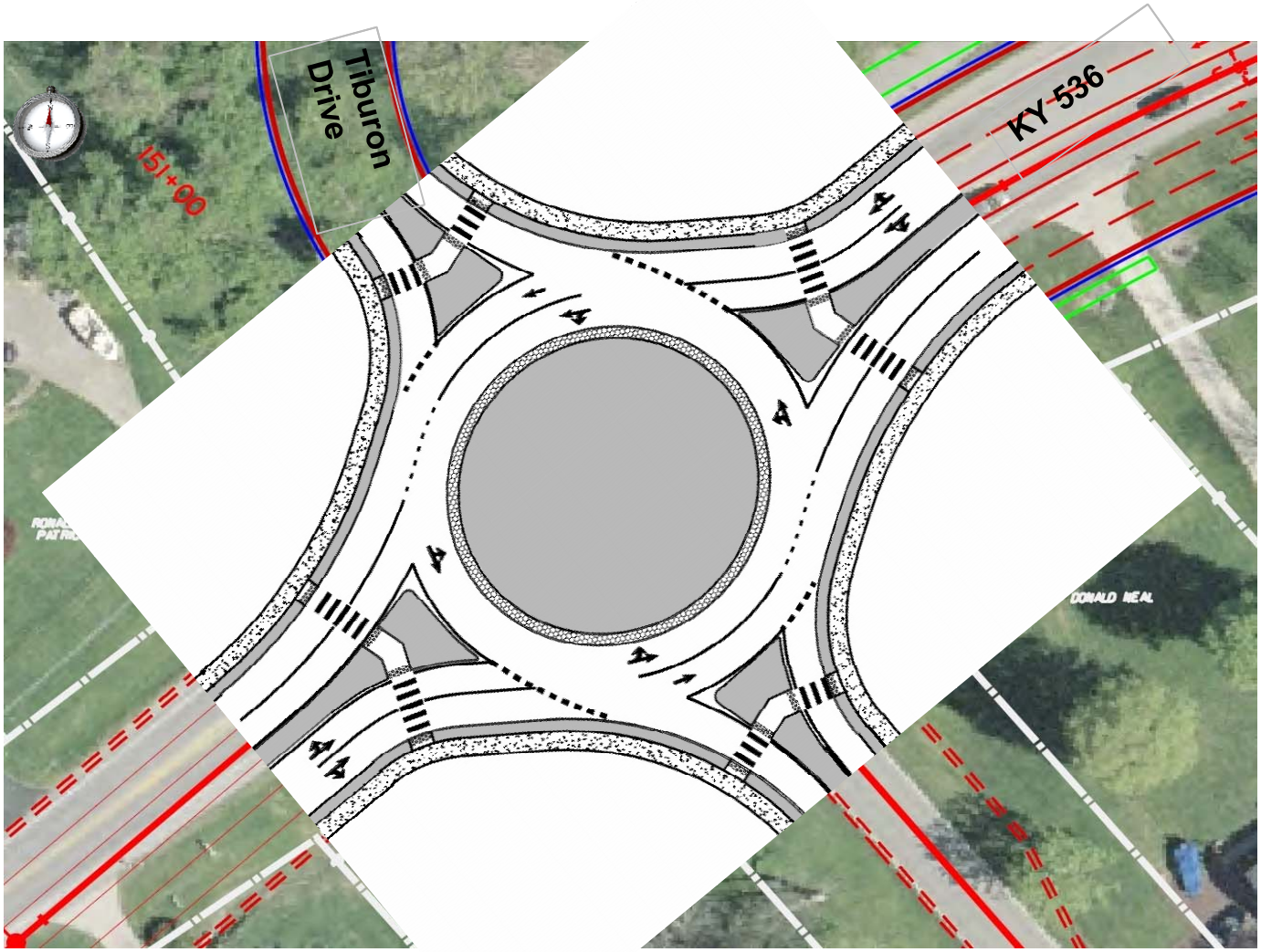
TITLE: Add roundabout at Tiburon Drive

SKETCH OF BASELINE ASSUMPTION. Unsignalized
4 leg intersection



TITLE: Add roundabout at Tiburon Drive

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL CT-03
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Install ramp meters on northbound I-75 entrance ramp
FUNCTION:	**Control Traffic**

BASELINE ASSUMPTION:

The current design does not regulate flow of traffic onto the interstate ramp.

PROPOSED ALTERNATIVE:

Install ramp meters on the northbound I-75 entrance ramp.

BENEFITS	RISKS/CHALLENGES
• Breaks platoons entering the interstate	• New concept in Kentucky
• Eliminates interruptions in flow on mainline I-75	• Need to educate drivers about how to use ramp meters and their purpose
• Improves capacity on I-75 northbound right lane	• Need to work with law enforcement to ensure drivers abide by signals properly
• Improves safety on I-75 northbound right lane	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 18,190	$ -	$ 18,190
TOTAL (Baseline less Proposed)	$ (18,190)	$ -	**$ (18,190)**

COST

VALUE ENGINEERING PROPOSAL CT-03
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Install ramp meters on northbound I-75 entrance ramp

DISCUSSION/JUSTIFICATION:
The new design of the interchange, as proposed, allows for a greater number of vehicles to enter the northbound ramp per hour. The 2008 baseline from the traffic forecast shows there are 1,290 vehicles on the northbound ramp in the AM peak hour. The 2030 forecast shows a large increase, with 2,480 vehicles (41 vehicles per minute or 1.5 second headways) on that ramp. This volume must merge from two ramp lanes to one ramp lane and then onto the interstate mainline. This large volume entering in platoons has the potential to cause major interruption (turbulence) into mainline flow and capacity during the peak hours.

Arizona's Ramp Metering Manual contains various warrants for ramp metering at an interchange. The seventh warrant category is the total volume which is the total mainline plus total ramp volumes categorized by number of lanes. For this project, ramp meters would be warranted if the total volume exceeds 5,850 vph. The 2010 data shows that the mainline volume is approximately 5,000 vph (based on a 106,000 ADT count), making the total 6,300 vph, indicating a ramp meter would be warranted under current conditions.

Ramp metering is the use of a traffic signal(s) deployed on a ramp to control the rate at which vehicles enter a freeway facility. By controlling the rate at which vehicles are allowed to enter a freeway, the flow of traffic onto the freeway facility becomes more consistent, smoothing the flow of traffic on the mainline and allowing more efficient use of existing freeway capacity. Ramp meters are self adjusting during peak hours to help manage and monitor the flow into the mainline. Ramp metering can be an effective tool to address congestion and safety concerns that occur at a specific point or along a stretch of freeway.

IMPLEMENTATION CONSIDERATIONS:
The amount of storage capacity on the ramp will need to be determined. Hours of operation would also be determined as well. The I-74 ramp metering project in Cincinnati operates only in the morning rush hour, the times where they were having capacity and safety problems. All other times the system remains dark.

There also may be an opportunity to allow for transit bypass so that TANK buses can avoid the queue. Also, an area should be designed for enforcement officers to park their vehicles close to the signal.

VALUE ENGINEERING PROPOSAL CT-03

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE:	Install ramp meters on northbound I-75 entrance ramp							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Signal heads						2	120	240
Controller						1	1,200	1,200
Loops						9	150	1,350
Base and pole cabinet						2	3,700	7,400
Enforcement area pavement						1	8,000	8,000
								18,190
							(BASELINE LESS PROPOSED)	**(18,190)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING PROPOSAL CT-03

Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE: Install ramp meters on northbound I-75 entrance ramp

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL CT-03

Kentucky Transportation Cabinet

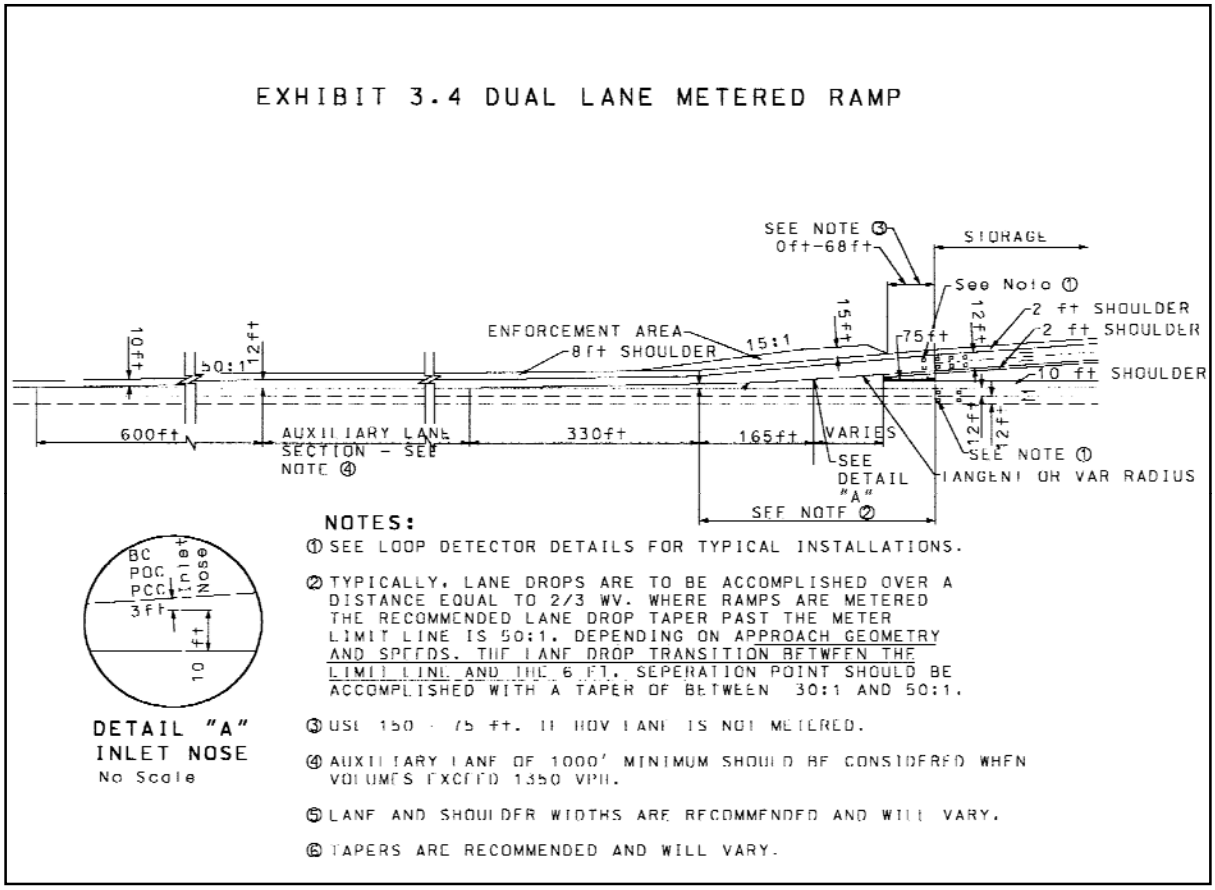
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE: Install ramp meters on northbound I-75 entrance ramp

Layout sheet of dual lane ramp meter from Arizona DOT's Ramp Meter Design Guidelines



VALUE ENGINEERING PROPOSAL CT-07
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Add right turn lanes at KY536/US25 from eastbound to southbound
FUNCTION:	**Control Traffic**

BASELINE ASSUMPTION:

Shared through/right lanes for Eastbound and Westbound KY 536 approaches at the US 25 intersection.

PROPOSED ALTERNATIVE:

Add exclusive right lanes for the Eastbound and Westbound approaches at the US 25 intersection.

BENEFITS	RISKS/CHALLENGES
• Improves through movement operations along KY536 by separating right turns	• Added construction and maintenance costs associated with the construction of right turn lanes
• Gives right turning vehicles a location to decelerate before making the turn onto US 25	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 924,150	$ -	$ 924,150
TOTAL (Baseline less Proposed)	$ (924,150)	$ -	**$ (924,150)**

COST

VALUE ENGINEERING PROPOSAL CT-07

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add right turn lanes at KY536/US25 from eastbound to southbound

DISCUSSION/JUSTIFICATION:

Both right turns lanes are warranted based on the Kentucky Transportation Cabinet's right turn auxiliary lane warrants. Following is a summary of right turning and advancing volumes for both east and westbound approaches in the AM and PM peak hours.

Eastbound Approach AM	**Eastbound Approach PM**
Right Turns: 170	Right Turns: 530
Advancing Volume:790	Advancing Volume: 1,530

Westbound Approach AM	**Westbound Approach PM**
Right Turns: 460	Right Turns: 330
Advancing Volume:790	Advancing Volume: 1,370

The intersection was analyzed using 2008 and projected 2030 AM and PM traffic volumes with both the existing and proposed intersection layout. The intersection operates at a LOS F during both the AM and PM peak hours existing and would continue to operate at a LOS F with the right turn lanes added to the intersection. However, during the AM peak hour the added turn lanes reduced the total intersection delay by 55 seconds. During the PM peak hour the added turn lanes reduced the total intersection delay by 62 seconds.

This will also meet KYTC criteria for right-turn lane requirements.

IMPLEMENTATION CONSIDERATIONS:

The Kentucky Transportation Cabinet's auxiliary lane policy recommends a minimum length of 615 feet for the eastbound, right turn lane and minimum of 540 feet for the westbound, right turn lane. Two strain poles from the existing signal and the existing signal controller would need to be moved to accommodate the added turn lanes. Eastbound right turn lane would need to be built over substantial fill. Additionally, a retaining wall would be needed. If a retaining wall is not used, there would be impacts to the right-of-way. Existing guardrail would need to be removed and then replaced.

The westbound right turn lane would possibly need a retaining wall to avoid right-of-way impacts. Two large utility poles would need to be moved to accommodate the turn lane.

VALUE ENGINEERING PROPOSAL CT-07

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add right turn lanes at KY536/US25 from eastbound to southbound

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Pavement - outside of existing design		SY				1,540	60	92,400
Miscellaneous/utility relocation - 25%		EA				1	260,000	260,000
Move signal equipment		EA				1	10,000	10,000
Remove & replace guardrail		LF				750	17	12,750
Retaining wall		SF				9,150	60	549,000
								924,150
							(BASELINE LESS PROPOSED)	**(924,150)**

*Note: Costs are rounded to nearest thousand dollars.

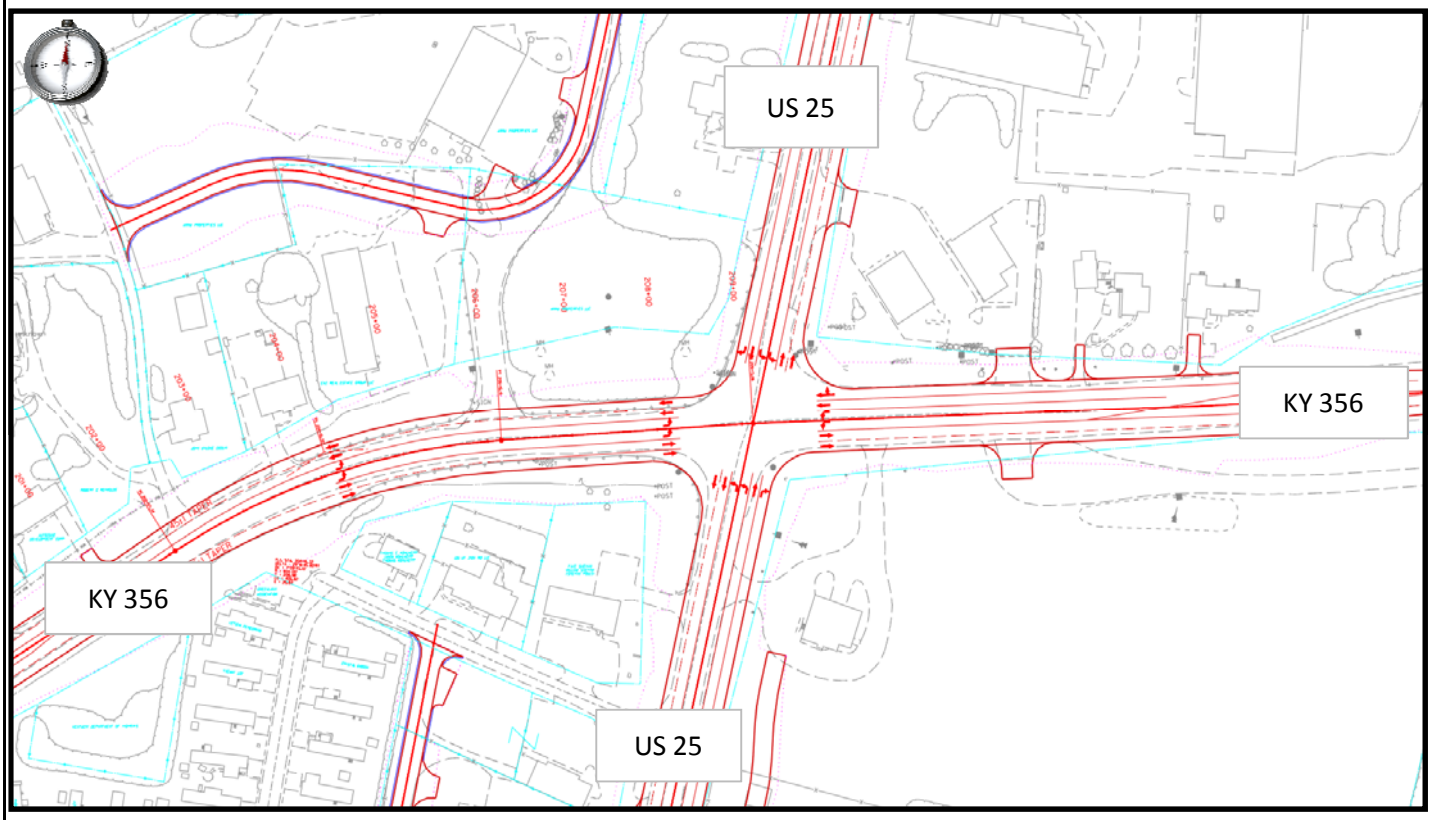
COST

VALUE ENGINEERING PROPOSAL CT-07

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add right turn lanes at KY536/US25 from eastbound to southbound

SKETCH OF BASELINE ASSUMPTION

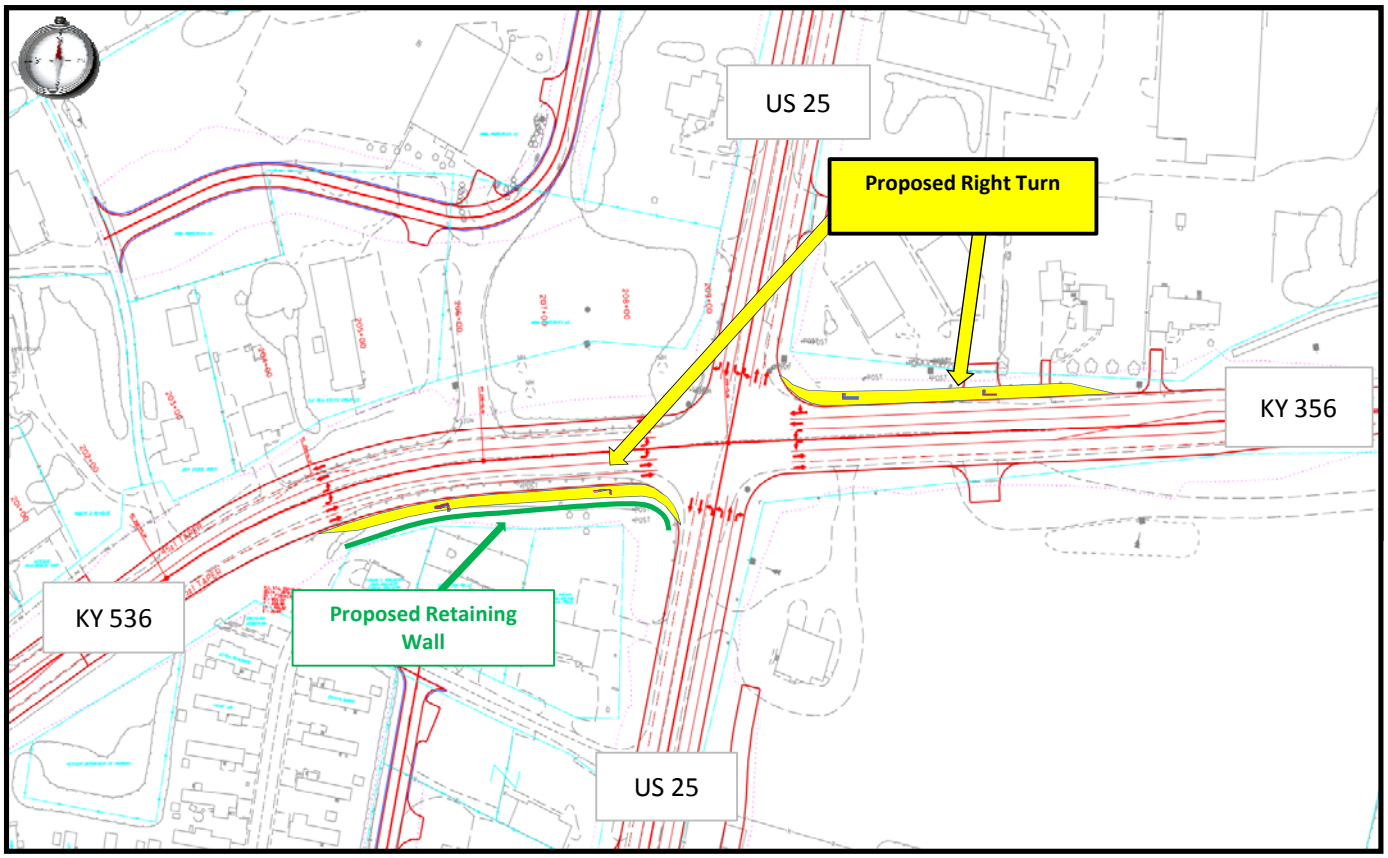


VALUE ENGINEERING PROPOSAL CT-07
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Add right turn lanes at KY536/US25 from eastbound to southbound

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL M-02
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Use a 2:1 slope with good material

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The original design for widening of the I-71/I-75 roadbed to accommodate the auxiliary lanes utilizes 3:1 minimum fill slopes.

PROPOSED ALTERNATIVE:

The VE team recommends that 2:1 embankment slopes, using special materials in this urbanized area to reduce right-of-way requirements.

BENEFITS	RISKS/CHALLENGES
• Substantial reduction in right-of-way requirements	• Slope stability
• Potential reduction in utility relocations	• Potential introduction of additional safety hazards with adding guard rail
• Reduction in earthwork	•
• Reduction in maintenance efforts	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 7,880,481	$ -	$ 7,880,481
PROPOSED ALTERNATIVE:	$ 2,501,138	$ -	$ 2,501,138
TOTAL (Baseline less Proposed)	$ 5,379,343	$ -	**$ 5,379,343**
			SAVINGS

VALUE ENGINEERING PROPOSAL M-02

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Use a 2:1 slope with good material

DISCUSSION/JUSTIFICATION:

The original design for widening of the I-75/I-71 roadbed to accommodate northbound and southbound auxiliary lanes between the KY 536, Mt. Zion Road, interchange and the US 42 interchange exit ramp, requires additional right-of-way at eleven locations. For the northbound roadbed widening, additional right-of-way is required at six locations, three of which are in fills. Five locations, three in fills, will require additional right-of-way for the southbound roadbed widening. The earthwork in fill areas, that require additional right-of-way are generally narrow slivers. Kentucky's FT2012 - FY2018 Highway Plan allocates $6.3 million for right-of-way in FY 2013 for required land purchases. Additionally, the Plan allocates $0.8 million for Utility Relocations in FY 2013.

The proposed design of steepening slopes with special materials at embankment locations requiring additional right-of-way, will likely significantly reduce the time frame for advancement of the project to construction. With a common cost on projects in this area of some $20 per square foot for right-of-way takes, substantial project cost reduction will result from this proposal. Additionally, relocation of any utility facilities within the new right-of-way will be reduced. Installation of guardrail at some locations with current safety slopes will also be required.

Special materials will be required for the embankment material in order to provide adequate material to reduce the potential for slope failure. Special materials may include borrow material, geo-grid, mechanically stabilized, etc. The current estimate for embankment is estimated at $6.54/CY and this proposal accounts for the special material, adding an estimated cost of $40.00/CY.

IMPLEMENTATION CONSIDERATIONS:

None apparent

VALUE ENGINEERING PROPOSAL M-02

Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Use a 2:1 slope with good material

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Embankment in Place		CY	107,721	7	704,495	77,183	7	504,777
Guardrail Steel W Beam		LF	4,475	17	75,986	5,675	17	96,362
Special Embankment		CY				12,000	40	480,000
Right-of-Way		LS	1	6,300,000	6,300,000	1	1,260,000	1,260,000
Utilities		LS	1	800,000	800,000	1	160,000	160,000
					7,880,481			**2,501,138**
							(BASELINE LESS PROPOSED)	**5,379,343**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING PROPOSAL M-02

Kentucky Transportation Cabinet

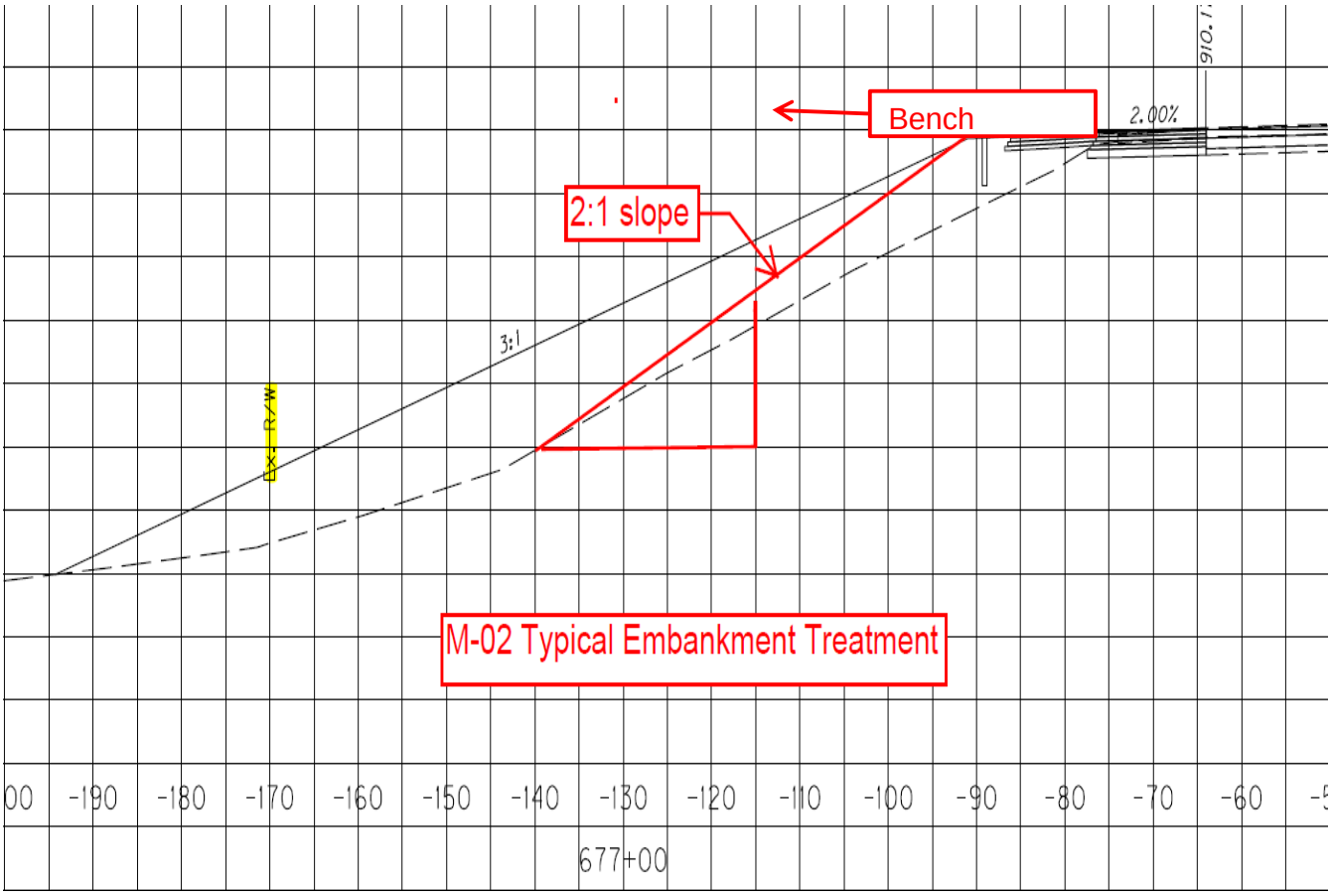
I-75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.50

Boone County

TITLE: Use a 2:1 slope with good material

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL M-05DS
Kentucky Transportation Cabinet
I-75 at KY536 Interchange and I-75 Auxilliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE:	Establish a formal public information process/plan for construction
FUNCTION:	**Miscellaneous**
BASELINE ASSUMPTION:	
It is not known whether a formal plan will be developed to work with the public and stakeholders during construction.	
PROPOSED ALTERNATIVE:	
Establish a formal public information plan to keep the public aware of construction elements throughout the project.	

BENEFITS	RISKS/CHALLENGES
• Helps to avoid public and stakeholder frustration	• Additional cost for a formal approach
• Opens lines of communication and provides an avenue for sharing information	•
• Ensures appropriate signage for business access during construction	•
• Engages the appropriate individuals on the project team	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL M-05DS
Kentucky Transportation Cabinet

I-75 at KY536 Interchange and I-75 Auxilliary Lanes Projects
Items #6-14.00 & #6-14.50
Boone County

TITLE: Establish a formal public information process/plan for construction

DISCUSSION/JUSTIFICATION:

Construction on a busy roadway is very frustrating for not only the traveling public, but especially the business owners. When small business owners are impacted, it can mean the difference between remaining viable during construction or closing their doors. It is very important to help the public/stakeholders understand that their concerns are important and for them to stay abreast of construction work that might impact their business activities including patrons and deliveries being able to access their facilities. The VE team suggests that a formal public information plan be developed that helps to outline how and when to include the public/stakeholders, types of notifications, when notifications should be used, the timing of those notifications, local business signage, etc. , during the different stages of construction.

Other opportunities and approaches can be included into this plan to help the businesses during this very hectic and stressful time. When construction is occurring, sometimes people will avoid using KY536 which will potentially impact those businesses. KYTC may want to consider some other types of programs such as developing coupon books for the local businesses, providing special temporary access and business signage, encouraging the construction team to use the local facilities, etc.

A sample plan is included.

IMPLEMENTATION CONSIDERATIONS:

If not already planned for the construction project, include with the specifications to have the contractor involved with the process. KYTC can also, if it so desires, write a special specification to have the contractor be responsible for these elements and provide a specified bid item which requires the contractor to lead this effort by hiring a specialized public outreach firm, approved by KYTC. KYTC could also take the lead but within the specification, outline the contractors involvement during the process.

Public Information Plan Light Rail Line Section 1 Project

Project ID#LRT-04-020-LS1

1. INTRODUCTION

The Public Information Plan represents the overall approach to public information for the Light Rail Line Section 1 Project. Specific milestones of the public information process for the project have been developed into this Plan. The Public Information Plan addresses: (1) the number and types of public meetings and outreach; (2) the use and frequency of communiqués such as flyers, web sites and news releases; (3) the development of a mailing list and list of key constituencies; and (4) the methods for the public to provide input and comments.

2. PROJECT DESCRIPTION

Line Section 1 includes the section consists of a portion of the Central Phoenix/East Valley Light Rail Transit System within the City of Phoenix. This line section from Bethany Home to Camelback / Central Avenue includes the following major elements:

- Signals and communications network and equipment
- Installation of embedded double track for an approximate total of 3.0 miles
- Passenger station foundations and related work for the Montebello/19th Avenue Station, 19th Avenue/ Camelback Station, and 7th Avenue/ Camelback Station
- Sidewalks, landscaping and urban design treatment
- Roadway and track drainage
- Traffic signals (temporary and permanent)
- Street lighting
- Overhead Contact System (OCS) pole foundations
- Retaining walls
- Traffic control
- Relocation of utility facilities
- Roadway paving, curb, and gutter
- Demolition of existing improvements

3. KEY PROJECT CONTACTS

3.1 Valley Metro Rail

Project Engineer- Alvin Livingston
Email-alivingstone@valleymetro.org
Phone-602-744-5583

Resident Engineer-Bill Blaine
Email-wblaine@valleymetro.org
Phone-602-374-9319

Community Outreach Coordinator
Christina Lenko
Email-clenko@valleymetro.org
Phone-602-744-5565/ 602-908-0901

Public Involvement Manager
Howard Steere
Email-hsteere@valleymetro.org
Phone-602-322-4476/602-799-6610

Business Outreach Coordinator
Ruben Landa
Email-rlanda@valleymetro.org
Phone-602-292-8230/602-292-1493

CAB Specialist
Lisa Procknow
Email-lprocknow@valleymetro.org
Phone-602-322-4481/602-750-8953

3.2 Contractor-Kiewit Western Co.
Project Manager-Dennis Onstott
Email-denniso@pksphx.com
Phone-602-437-7768/602-757-1373

Project Business Manager
Chad Heath
Email-chad.heath@phoenix.kiewit.com
Phone-602-437-7766

Assistant Project Business Manager
Kendra Meek
Email-kendra.meek@phoenix.kiewit.com
Phone-602-437-7731

Community Relations Manager
RH & Associates, Inc.
Debra Davis-Allen
Email-ddavis-allen@rhpartnering.com
Phone-623-266-3943/602-538-2159

3.3 Communications Manager
Daina Mann
Phone-602-744-5592/602-291-7245

3.4 City of Phoenix
City Light Rail Liaison-Maria Hyatt
Email-maria.hyatt@phoenix.gov
Phone-602-261-8897

4. PUBLIC MEETINGS

Public meetings will be conducted throughout the Project. These public meetings will consist of "open house" public information meetings, and individual one-on-one meetings with businesses and groups. The Metro Community Outreach Coordinator will be responsible to organize and conduct all formal public meetings with RHA and Kiewit providing support.

4.1 Construction Kick-off Meeting and Progress Meetings

A preconstruction open house public information meeting will be held. These meetings will be scheduled prior to the start of construction and may occur at various milestones in the project.

4.1.1 Meeting Purpose

The purpose of the meeting is to educate the public about the overall project, present a preliminary schedule, have the public meet the project team, and provide an opportunity for the public to ask questions or express concerns about the project.

4.1.2 Meeting Locations

Meeting will be held at various locations along the project route and easily accessible to the impacted construction areas. The Metro Community Outreach Coordinator will be responsible for providing locations for "open house" public meeting.

4.2 One-on-One Meetings

As construction progresses, one-on-one meetings will be held with the businesses immediately along the route that will be impacted by construction. These meetings will occur 72 hours prior to the construction impact and will be led by RHA and Kiewit staff.

4.2.1 Meeting Purpose

The purpose of the one-on-one meetings with the businesses is to help to develop and maintain strong ties to the community and a working relationship with the contractor. It is important that the business owners know their concerns are shared with the entire team. These meetings also provide an opportunity to discuss access, delivery, parking issues.

4.3 Project Progress Meetings

The project weekly meetings will provide an opportunity for the public information items to be discussed on a weekly basis with the project team. This will include a discussion of stakeholder contacts, public issues and concerns, and VMR will provide updates to contact lists.

5. COMMUNIQUES

The Line Section 1 public information/ relations program will develop and use various communiqués to share general information and provide updates for construction issues.

5.1 Project Identity

It is important that the information provided to the public be consistent, accurate and at a level readily understood by the layperson. A consistent format and identity will be developed for the entire rail program and will be adopted by the Line Section 1 project.

5.1.2 Preconstruction Letter

A preconstruction letter will be developed and distributed by RHA with input and approval by the Public Involvement Area Coordinator. The area for distribution will include all facilities within ¼-mile of the project site. The information in the letter will include the name of the contractor, VMR 24-hour hotline number, a brief description of the project, names of the contractor's project manager and project superintendent, name of the project engineer, construction schedule including anticipated work hours and traffic control items including lane restrictions.

5.1.3 Line Section Area Update

VMR will provide a monthly

5.1.4 Construction Activity Newsletters

RHA, in conjunction with VMR, will develop and distribute advance notification newsletters to the impacted stakeholders in the work zone.

5.1.4.1 Purpose of Notifications

The purpose of the notifications is to provide advanced information 1 week in advance of the work to be accomplished. One-on-one delivery will occur to the businesses that are immediately impacted by the work. Written notifications will be bilingual, as needed.

5.5 Monthly Construction Newsletters

RHA will distribute monthly updates within a ¼-mile area of the project to keep residents and businesses informed of the work in progress as well as identify any major safety concerns, traffic control changes, etc.

5.6 24-Hour Hotline

A 24-hour emergency hotline will be maintained throughout the length of this project. The hotline will be managed by VMR to handle stakeholder emergency calls.

5.6.1 Hotline Number

The 24-hour number is 602-254-RAIL.

5.8 Website and Email

A program-wide website is maintained by VMR and will include overall information as well as information about Line 1 Section. VMR will be responsible for updating the website. The public can also contact VMR by using their email at **rail@valleymetro.org.**

6. COMMUNITY ADVISORY BOARD

A key component of VMR's Construction Outreach Plan is the formation of a citizen board to serve as the voice for the community during construction. The board will be comprised of resident and business representatives adjacent to Line Section 1.

6.1 *Community Advisory Board Role*

The role of the CAB will be to serve as the voice of the community with the construction team and VMR. The CAB will participate in regular construction review meetings and will help identify issues related to the contractor's interaction with the community and offer input on solutions. The CAB will evaluate the contractor's public information processes and interactions to determine incentives that the contractor may qualify for during the review period.

6.2 Meetings

CAB meetings will occur on a monthly basis. The contractor rating will occur within this meeting.

6.3 *Members*

Abrams Realty
Dan Abrams
Phone-602-264-6464

Medlock Place NA
Sandra Bonderud
Phone-602-266-1654
Email-sbonderud@cox.net

Pasadena Neighborhood Association
James Brown
Phone-602-279-9226

Osco Drug Store
Brandon Carlson
Phone-602-242-0203

Pierson Place NA
Emily Chang
Phone-602-445-8266
AZ Laser, Electrolysis & Skin Care
Angelo De Nicola
Phone-602-705-1400

Niles Neighborhood Association
Ardyce Edstrom
Phone-602-433-2636

Charlie's Bar
John King
Phone-602-265-0224

Simpson Neighborhood Association
Richard Klitzke
Phone-602-433-0933

AmeriSchools Academy
Gary LeBlanc
Phone-602-222-9369

Chaunt Maeukian
Phone-602-249-7645

Osborn Middle School
Marty Makar
Phone-602-707-2400

7. PUBLIC NOTIFICATION

Several techniques will be employed to notify the public of construction progress, impacts, safety issues and upcoming meetings. Direct mail and door hangers will be used to notify the affected residents and businesses.

7.1 *Mailing List*

As concerned stakeholders are identified throughout the project, they will be added to the existing mailing list. The mailing list will be provided and maintained by VMR.

7.2 Direct Mail

Direct mail will be used to reach the community at-large, within ¼-mile of the project construction limits.

7.3 Public Advertisements

To be Determined

7.4 Public Notices

Public notices will be developed and posted throughout the construction site. The notices will indicate the time and location of all community meetings. A list of notice locations will be developed in a coordinated effort the VMR Public Involvement Area Coordinator. RHA and Kiewit will be responsible for posting all notices.

8. MEDIA RELATIONS

8.1 Media Relations

VMR will provide all contacts and information to the media through the Communications manager. The agency has the primary responsibility for interfacing with the media and the general public. Kiewit shall provide an individual responsible for providing interviews for the project.
(NEED INPUT FROM VMR)

9. CRISIS COMMUNICATION PLAN

VMR has developed a Crisis Communication Plan to be used in case of an emergency situation. An emergency is defined as a situation in which serious injury to persons or significant damage to property has taken place, serious injury or significant damage to persons or property that is threatened or imminent, or any other situation in which the lack of immediate action could result in damage to the reputation of the Agency or legal action against the Agency.

10. SIGNAGE

10.1 Project Signage

The contractor will be required to provide project signage at each end of the project, per standards and specifications.

10.2 Local Business Access Signage

Special signage, as per specifications, will be provided for each business to show access to each business.

11. SPECIALTY BUSINESS PROGRAMS

Depending on the impacts to the various businesses, consideration may be made to develop specialty programs to aid the businesses during construction. This may include:

- Coupon Books
- Construction Discount Signs
- Media Aid

VALUE ENGINEERING PROPOSAL M-07
Kentucky Transportation Cabinet
I 75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.5
Boone County

TITLE:	Reduce the footprint (typical section) of I-75 by utilizing part of the median shoulder for the driving lane
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The current plan calls for leaving the existing roadway typical section and adding a 12-foot auxiliary lane on the outside. This would put the outside shoulder point 88 feet from the centerline of I-75.

PROPOSED ALTERNATIVE:

Reduce the inside shoulder width to 12 feet (10 ft. + 2 foot offset to barrier). The driving lanes would shift 2.66 feet toward the median. This would put the outside shoulder point 85.34 feet from the centerline of I-75.

BENEFITS	RISKS/CHALLENGES
• Reduces construction cost	• 2.67 foot lane shift for I-71/I-75
•	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 2,481,199	$ -	$ 2,481,199
PROPOSED ALTERNATIVE:	$ 2,038,506	$ -	$ 2,038,506
TOTAL (Baseline less Proposed)	$ 442,693	$ -	**$ 442,693**

SAVINGS

VALUE ENGINEERING PROPOSAL M-07
Kentucky Transportation Cabinet

I 75 at KY536 Interchange and I-75 Auxiliary Lanes Projects
Items #6-14.00 & #6-14.5
Boone County

TITLE:	Reduce the footprint (typical section) of I-75 by utilizing part of the median shoulder for the driving lane

DISCUSSION/JUSTIFICATION:

By reducing the required width (typical section) of the interstate a cost savings in construction will be realized. A Policy on Design Standards Interstate System allows the use of a 10 foot paved inside shoulder.

IMPLEMENTATION CONSIDERATIONS:

The lanes will need to be shifted 2.66 feet toward the median. This will move the crown point and may require milling the existing pavement with leveling, wedging and overlaying to shift crown location. If the state requires this work then the team does not recommend following through with this alternative. Also, new striping and pavement markers will be required to shift lanes. This additional work would use up most of the savings identified in this proposal.

VALUE ENGINEERING PROPOSAL M-07

Kentucky Transportation Cabinet

I 75 at KY536 Interchange and I-75 Auxiliary Lanes Projects

Items #6-14.00 & #6-14.5

Boone County

TITLE:	Reduce the footprint (typical section) of I-75 by utilizing part of the median shoulder for the driving lane							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Asphalt surface		TON	1,477	79.64	117,628	1091	79.64	86,887
Asphalt base 76-22		TON	3,978	73.34	291,747	2948	73.34	216,206
Asphalt base 64-22		TON	8,284	46	383,466	6,224	46	288,109
Drainage blanket		TON	4,306	41	176,417	3,276	41	134,218
DGA		TON	39,274	17	660,981	37,120	17	624,730
15" pipe		LF	21	38	804	18	38	689
18" pipe		LF	725	62	44,820	722	62	44,634
24" pipe		LF	34	90	3,067	31	90	2,797
30" pipe		LF	11	126	1,389	8	126	1,010
48" pipe		LF	62	143	8,846	59	143	8,418
12 x 6 RCBC		LS			59,350	1	55,789	55,789
5 x 4 RCBC		LS			28,189	1	27,484	27,484
Embankment in Place		CY	107,721	7	704,495	83,721	7	547,535
					2,481,199			**2,038,506**
							BASELINE LESS PROPOSED	**442,693**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

APPENDICES

APPENDIX A
Study Participants

Appendix A – Study Participants

The following pages include the sign in sheets for the workshop study, including participants from the kick-off meeting and the VE study presentation.

VE STUDY ATTENDEES
I-75 and KY536 (Mt. Zion Road) Interchange and I-75 Auxiliary Lanes
Items #6-14.00 & #6-14.50
Boone County

June 2012					NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
25	26	27	28	29				E-MAIL			
X	X	X	X	X	Renee Hoekstra	RH & Associates, Inc.	Team Leader	623	266-3943	623	764-7490
								rhpartnering@earthlink.net			
X	X	X	X	X	Patrice Miller	RH & Associates, Inc.	Assistant Team Leader	602	889-4448	480	773-8533
								pmiller@entellus.com			
X				X	Boday Borres	KYTC	Transportation Engineering Branch Manager	502	564-3280	502	229-5737
								boday.borres@ky.gov			
X	X	X	X	X	Brent Sweger	KYTC	VE Coordinator	502	564-9900	410	693-5822
								brent.sweger@ky.gov			
X	X	X	X	X	Phil Demosthenes	Consultant	Access Management Team Member	303	349-9497	303	349-9497
								phil@pdemos.com			
X	X	X	X	X	Kenneth Cox	AEI	Roadway Design Team Member	270	651-7220	270	282-3271
								kcox@aei.com			
X	X	X	X	X	Jeremy Lukat	Qk4	Traffic Team Member	502	797-7555		
								jlukat@qk4.com			
X	X	X	X	X	Glenn Kelly	Qk4	Highway Team Member	502	585-2222		
								gkelly@qk4.com			
X				X	Glenn Haudin	Stantec	KY 536/I75-I71 Project	859	233-2100	859	227-4461
								glenn.haudin@stantec.com			
X				X	Brian Aldridge	Stantec	KY 536/I75-I71 Project	502	212-5000	859	559-1416
								brian.aldridge@stantec.com			

VE STUDY ATTENDEES
I-75 and KY536 (Mt. Zion Road) Interchange and I-75 Auxiliary Lanes
Items #6-14.00 & #6-14.50
Boone County

June 2012					NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
25	26	27	28	29				E-MAIL			
X				X	Mike Bezold	KYTC D-6	District 6 Design Supervisor	859	341-2700		
								mike.bezold@ky.gov			
X				X	Carol Callan-Ramler	KYTC D-6	District 6 Project Manager	859	341-2700		
								carol.callan-ramler@ky.gov			
X					Ray Robison, Jr.	Burgess & Niple	Project Manager	502	254-2344		
								ray.robison@burgessniple.com			
X				X	Michael Robison	Burgess & Niple	Assistant Project Manager	502	254-2344		
								michael.robison@burgessniple.com			
X				X	Erica Barefield	KYTC QAB	Scholar	502	564-3280		
				X	Mary Murray	FHWA	Transportation Engineer	502	223-6745		
								mary.murray@dot.gov			
				X	James Simpson	C.O. Highway Design	Location Engineer	502	564-3280		
				X	JR Ham	KYTC	Planner				
								james.hann@ky.gov			
				X	Jeff Jasper	KYTC	Highway Design				
								jeff.jasper@ky.gov			
				X	Steve Waddle	KYTC	S.H.E.				

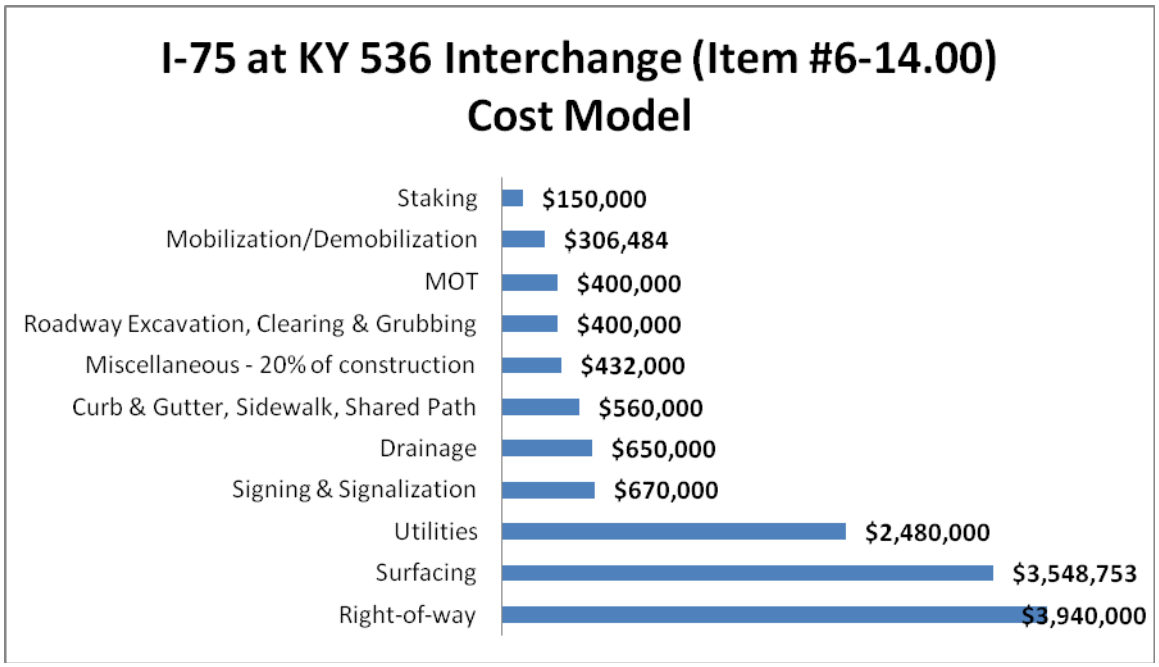
VE STUDY ATTENDEES
I-75 and KY536 (Mt. Zion Road) Interchange and I-75 Auxiliary Lanes
Items #6-14.00 & #6-14.50
Boone County

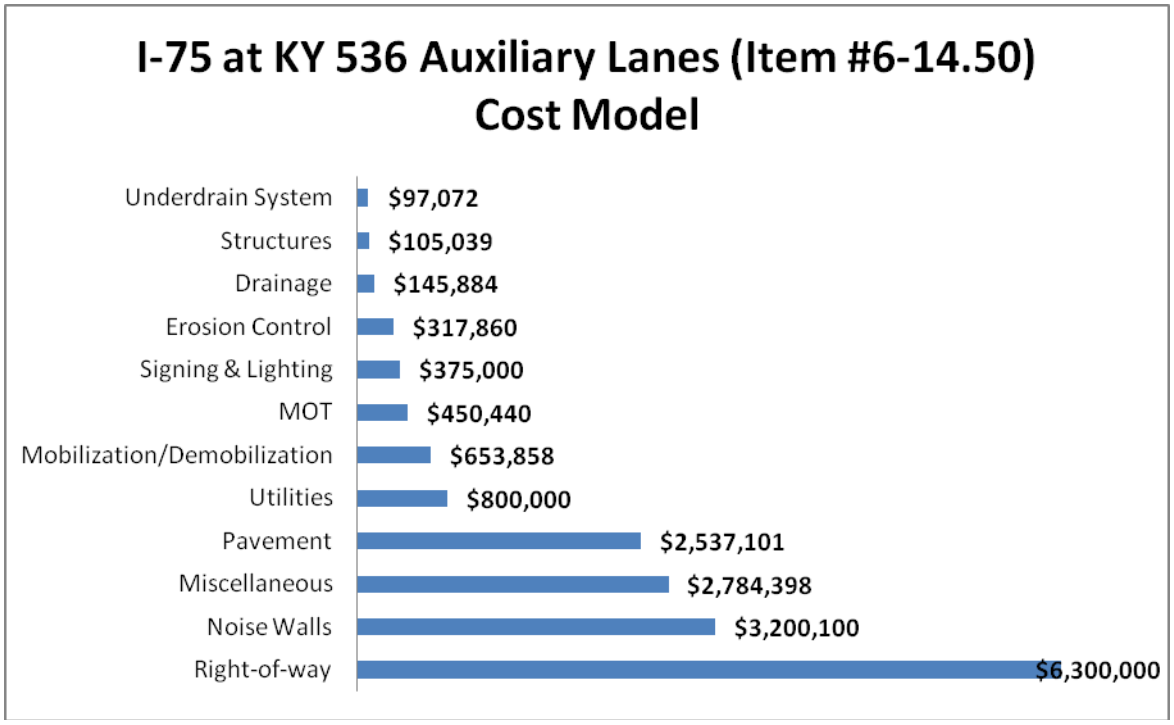
June 2012					NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
25	26	27	28	29				E-MAIL			
				X	Brad Eldridge	KYTC	Roadway Design Branch Manager	502	564-3280		
								brad.eldridge@ky.gov			
				X	Kevin Damron	KYTC	DSHE Project Development	502	564-3730		
								kevin.damron@ky.gov			

APPENDIX B
Pareto Cost Models

Appendix B – Pareto Cost Models

The team studied two projects; however, these were reviewed as a single project. Both projects have separate cost models that were completed. These are shown below:





Cost Estimate Comments

The following comments are based on preliminary cost estimates that were provided to the study team prior to the VE workshop:

- Update the cost estimate to include the east portion of the project, from Berberich Drive to US25.
- The cost estimate did not include the proposed soil nail wall.
- The cost of noise walls from the preliminary information are shown at $3.2 million; based on the analysis that was completed by KYTC, the approved noise walls are estimated at $2.5 million.
- The borrow required on the auxiliary lanes project is not represented in the cost estimate. Additionally, if detention basins are to be used, the soil from the excavation should be shown as impacts to the borrow needs as identified.
- Right-of-Way costs provided are very preliminary and it was suggested that the estimates costs need to be updated and re-evaluated.
- There were no costs provided for the median barrier on KY536. The costs shown are for installation of curb, gutter and sidewalk. Median barrier installation costs are very different.

APPENDIX C
Function Analysis

Appendix C – Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" programs. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing study.

The VE team identified the functions of the projects based on the entire corridor using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project.

Function	Classification
Improve Mobility	***Higher Order***
Facilitate Growth	***Higher Order***
Move Traffic	**Basic**
Accommodate Trucks	Secondary
Manage Access	Secondary
Improve Safety	Secondary
Minimize Maintenance	Secondary
Avoid Right-of-Way	Secondary
Mitigate Environmental Impacts	Secondary
Mitigate Noise	Secondary
Minimize Impact to mainline	Secondary
Accommodate Multi-modal	Secondary
Accommodate Drainage	Secondary
Inform Public	Secondary
Reduce Conflicts	Secondary
Control Traffic	Secondary
Inform Drivers	Secondary
Accommodate ER vehicles	Secondary
Accommodate Transit	Secondary
Re-use Infrastructure	Secondary
Support Vehicles	Secondary
Accommodate Utilities	Secondary
Illuminate Space	Secondary
Maintain Traffic	Secondary

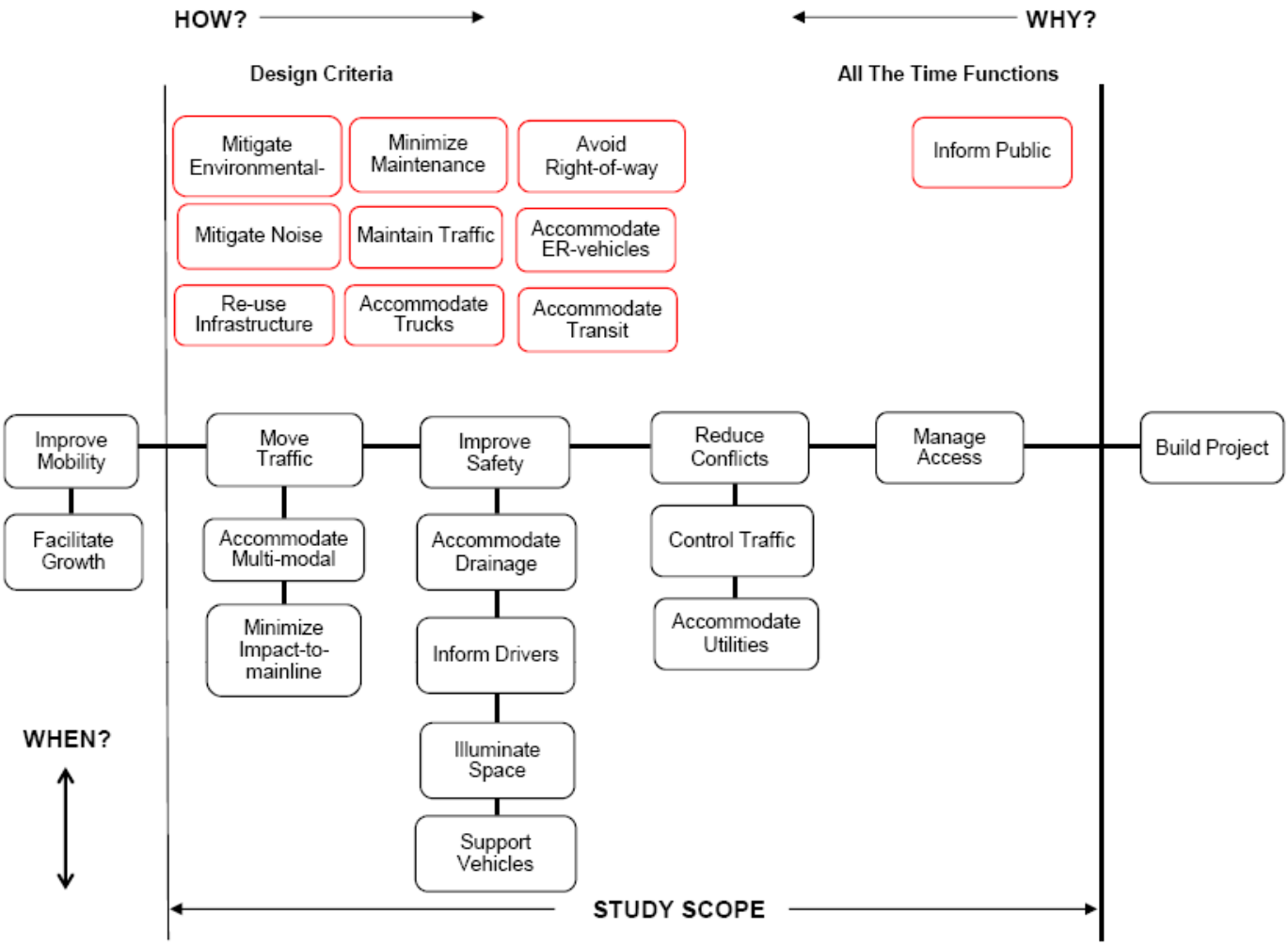
The definitions of the classifications are:

Higher Order Function defines the problem (study) goal and is outside the scope of the study.

Basic Function defines a performance feature that *must* be obtained to satisfy only user's needs not desires. It answers the question, “What must it do?”.

Secondary Functions defines required performance features other than those that must be accomplished. These are the user’s desires and answers the question, “What else do we want or does it do?”.

The following represents the Function Analysis Systems Technique (FAST) Diagram completed for this project.



APPENDIX D
Creative Idea List & Evaluation

Appendix D – Creative List and Evaluation Process

Creative Idea List
The list of ideas and comments that resulted from the study is included in this appendix. Some of the ideas were selected for further development as represented in the previous section.

Performance Attributes
The project manager helped to define the key performance attributes for the VE team members to use for evaluation. The following key attributes were used to score the ideas (see below):

- Preserve Mainline Operations – capacity and safety
- Local Operations / Access Management – access to businesses
- Accommodate Growth – access to future development

Evaluation Process
To aid in the evaluation of the ideas, the team scored the ideas using a nominal group technique. The ideas were scored relative to the performance attributes as described above.

Group Nominal Technique Evaluation Results Score
The prioritization for further development and documentation is as follows:
Score =

- 2-5 – Number of votes meeting the criteria (Workbook)
- 0-1 – Number of votes meeting the criteria (No workbook)
- DS – Design Suggestion (No workbook)
- DS* – Design Suggestion (Workbook)
- FF – Fatal Flaw
- ABC – Already Been Considered
- OS – Outside Scope

The creative idea list represents all of the ideas and includes scoring for the ideas that were rated using the group nominal technique.

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Creative Idea List

No.	Description	Comments	Score
AR	**Avoid Right-of-way**		
AR-01	Reduce gutter widths on KY536 from 2' to 1'		0
AR-02	Reduce shared path on KY536 from 10' to 8' and reduce ROW take (reduce buffers and borders)		0
AR-03	Eliminate shared path on this project; have City pay for it		0
AR-04	On auxiliary lanes, build retaining wall in lieu of slope		4
AR-05	On KY536, use retaining wall to reduce ROW		1
AR-06	Reduce width of the ditch on auxiliary lanes		0
AR-07	On auxiliary lanes, reduce lane widths from 12' to 11'		0
AR-08	On auxiliary lanes, reduce shoulder width from 10' to 8'		0
AR-09	Extend the median on KY536 at Biltmore Blvd.		2
SV	**Support Vehicles**		
SV-01	Salvage Pavement	DS	-
SV-02	For shoulders, use rolled (or compacted) concrete in lieu of asphalt		0
SV-03	Use concrete in lieu of asphalt at US25/KY536 intersection		0
SV-04	Use concrete in lieu of asphalt at Sam Neace Drive/KY536 intersection		2
MA	**Manage Access**		
MA-01	Restrict left hand turns out at Biltmore Blvd.		5
MA-02	Eliminate left turns out at Berberich Drive/Lakeside Drive		2
MA-03	Incorporate the backage road behind the Shell station and make a new backage road connection from Greenlawn Road to Demia Way		3
MA-04	Connect backage road east of Kroger to backage road behind Kroger		0
MA-05	Add concrete median from AutoZone to US25		5
MA-06	Make connection from trailer park backage road to Demia Way	w/MA-03	DS
MA-07	Eliminate driveway at Shell, Fifth Third Bank, BP and Kroger		2
MA-08	Acquire access rights from ramps to Biltmore Blvd.	DS*	-
MA-09	Acquire access rights from ramps to Tiburon Drive	w/MA-08	-
MA-10	Allow u-turns at Sam Neace Drive		0
MA-11	Allow u-turns at Biltmore Blvd. and Berberich Drive	w/MA-02	-
MA-12	Close north entrance at Biltmore Blvd.		1
MA-13	MOU for access management plan between KYTC, County, MPO and Planning & Zoning	DS*	-
MT	**Move Traffic**		
MT-01	Add additional left-turn lane on eastbound KY536 to northbound I-75 dual left		3
MT-02	Re-evaluate DCD decision		1
MT-03	Middle lane shared for left or thru movements on eastbound KY536 to northbound I-75	Dropped	2

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Creative Idea List

No.	Description	Comments	Score
MT-04	Add right deceleration lane at Biltmore Blvd., Sam Neace Drive, and Lakeside Drive- eastbound		3
MT-05	At US25, use Continuous Flow Intersection (CFI) in lieu of a traditional signalized intersection	DS*	-
MT-06	Add right turn lane at Biltmore Blvd. - westbound	w/MT-04	0
MT-07	Add roundabout at Tiburon Drive		2
MT-08	Eliminate from project roundabout on Sam Neace Drive		1
CT	**Control Traffic**		
CT-01	Use roundabout at Sam Neace Dr. and eliminate signal		0
CT-02	Install interconnect system from US25 to Tiburon Drive		1
CT-03	Install ramp meters on northbound I-75 entrance ramp		2
CT-04	Re-evaluate length of turn lanes on KY536	DS	-
CT-05	Ensure distance between stop bar and signal head meets standards	DS	-
CT-06	Add free right turn lane at KY536/US25 from eastbound to southbound		0
CT-07	Add right turn lanes at KY536/US25 from eastbound to southbound		2
CT-08	Add free right turn lane at KY536/US25 from westbound to northbound		0
CT-09	Add right turn lane at KY536/US25 from westbound to northbound	w/CT-07	0
CT-10	Reduce length of improvements on US25 northbound to Aristocrat Drive and southbound to Beeson Drive	Dropped	2
MN	**Mitigate Noise**		
MN-01	Eliminate noise walls	w/M-07	-
MN-02	Use alternative bids to noise walls	DS	-
MN-03	Add landscaping in lieu of noise walls		0
AM	**Accommodate Multi-modal**		
AM-01	Provide sidewalk connections to local businesses on KY536		0
AM-02	Continue path to east end of project	DS	-
AM-03	Look for additional parking spaces for park and ride	OS	-
AM-04	Add bicycle racks at park and ride	DS	-
AM-05	Reduce sidewalk from 5' to 4'		0
AM-06	Install a HAWK at the eastbound to northbound pedestrian crossing on ramp with dual lanes	w/MT-01 and M-03	-
M	**Miscellaneous**		
M-01	Progression should be modeled to determine through-put	DS	-
M-02	Use a 2:1 slope with good material		2
M-03	Rebuild bridge to accommodate trucks		1
M-04	Provide access management data illustrating performance to the traveling public (i.e. access, time frames, wait times)	DS	-
M-05	Establish a formal public information process/plan for construction	DS*	-

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No.	Description	Comments	Score
M-06	Use Accellerated Bridge Construction (ABC) for bridge removal	w/M-03	-
M-07	Use more of the existing roadbed on I-75		3

APPENDIX E
Supporting Data

Appendix E – Supporting Data

Team Observations

The VE team identified observations, concerns and opportunities to be addressed during the creative generation of potential ideas and alternatives. The following is a list of the VE team's observations:

- The cost of acquiring right-of-way is $1 million per acre, or $20 per square foot.
- The double crossover diamond (DCD) has a high ownership for the design.
- The project allows flexibility for the type of wall design on the north side of KY 536.
- The project's top priority is maintaining the Interstate (I-71/75), then the Interchange at KY 536.
- There is a critical noise issue on the west side of KY 536.
- There is new development on the west side of KY 536.
- There is a general lack of confidence in the traffic modeling.
- The project is not over-designed.
- The project appears to require heavy borrow and team members were concerned that that detention basins shown, may not have been accounted for in the cost estimates.
- The project will address "interim improvements" and is expected to last for 20 years.
- US25 is an "at grade" crossing.
- There are Environmental Justice (EJ) issues due to four trailer homes. Any impact to this area could potentially add six months to project schedule.
- The project has conflicting priorities; access management versus access to property.
- There may be potential conflicts with design speeds.
- An unstated goal is that the project should not increase storm water runoff.
- The project should avoid the identified AT&T facilities.
- The TANK park-and-ride could use extra parking spaces.
- There is concern that the project will not meet sight distance requirements.
- There is concern that there may be too many signalized intersections planned for KY536.
- There is concern with the left continuous on-ramp going from two lanes to one lane.
- There is concern with the high number of crashes.
- There is concern with the safety improvements for KY 536.
- There is concern with potential back-up of traffic from US25.
- There is concern about building the slopes for the project because of right-of way costs.
- This project is a "system" issue not just a "KY 536" issue.
- Boone County is expecting major growth into the future.
- Parking is a premium on the south side of KY 536.
- The project area has site-specific growth (i.e., Gateway Community College).
- Traffic control is not yet decided at Tiburon Drive.

Risk Registry

During the kick-off meeting, the project team identified the risk elements related to the overall project success. The group then rated and ranked the risks defining the probability and the severity of the risk if the risk occurred.. The following risk registry summarizes those discussions.

The VE team brainstormed opportunities for mitigating the identified risks and identified potential ideas and alternatives. These are included as ideas on the creative idea list.

Risk Matrix

DATE: 6/24/2012

I-75 at KY 536 Interchange & I-75 Auxiliary Lanes

Probability of Occurrence	**Highly Likely**	**Likely**	**Possible**	**Unlikely**	**Very unlikely**	**MATRIX KEY**
	> 70%	51 - 70%	21 - 50%	5 - 20%	< 5%	
Severity of Impact	**Catastrophic**	**Substantial**	**Moderate**	**Marginal**	**Negligible**	
	100	50	20	5	1	
Risk Rating	**Extremely High**		**High**	**Moderate**	**Low**	
	Red (50- 100)		Orange (15 - 49)	Yellow (3 - 14)	Green (0 - 2.9)	

Identify the Risk		Assign the Risk	Classify the Risk			Quantify		Risk Response	
Risk ID	**Description of Risk**	**Who does the risk affect?**	**Probability of Occurrence %**	**Severity of Impact (numeric)**	**Risk Rating**	**$$ Impact**	**Schedule Impact**	**Avoid? Mitigate? Accept? Transfer?**	**Comments**
1 Mainline Operations									
1.1	Capacity may not handle the proposed traffic counts on I-75	Travelling public	**50%**	**5**	**5.0**	$ -	None	Accept	
1.2	Adding a significant number of cars northbound from KY536 merging onto I-75 with a 2-lane on ramp	Mainline thru-traffic	**70%**	**20**	**40.0**	-	None	Mitigate	The surge and merge of traffic on the on ramp
1.3	DCD configuration does not allow bypassing the bridge in case of emergency	Mainline and emergency response	**1%**	**50**	**10.0**	-	None	Accept	
2 Local Operations/Access Management									
2.1	Uncertainties of development	Traffic Volumes	**60%**	**50**	**100.0**	$5M	6 months	Accept	Could require additional lanes in the future - estimated 1 lane in each direction - redesign
2.2	Continuation of conflicts; higher rate of accidents	Travelling public and emergency response	**100%**	**50**	**100.0**	-	None	Mitigate	Current design mitigates some accidents only
2.3	Operational transition from KY536 to Biltmore Blvd.	Travelling public and capacity	**52%**	**20**	**40.0**	-	None	Mitigate	The maneuvers required immediately after the signal (traffic shift) to access Biltmore Blvd.
2.4	Left hand turn lanes at the Biltmore Blvd. intersection and additional "green light" time on KY536, impacts to queue	Access, travelling public, capacity and operations	**100%**	**50**	**100.0**	-	None	Mitigate	Safety, mobility
2.5	Push back from businesses to reduce the level of access control	KYTC and design, operations	**10%**	**50**	**25.0**	-	6 months	Accept	Continue public outreach
2.6	Back-up in the queue at Biltmore Blvd. and all east to north left turns	Operations and capacity	**10%**	**50**	**25.0**	-	None	Mitigate	Safety
2.7	No deceleration lane for right turns at the businesses along KY536	Operations and capacity	**100%**	**5**	**25.0**	-	None	Mitigate	Safety

Risk Matrix

DATE:	6/24/2012

I-75 at KY 536 Interchange & I-75 Auxiliary Lanes

Probability of Occurrence	**Highly Likely**	**Likely**	**Possible**	**Unlikely**	**Very unlikely**	**MATRIX KEY**
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Severity of Impact	**Catastrophic**	**Substantial**	**Moderate**	**Marginal**	**Negligible**	
	100	50	20	5	1	
Risk Rating	**Extremely High**		**High**	**Moderate**	**Low**	
	Red (50- 100)		Orange (15 - 49)	Yellow (3 - 14)	Green (0 - 2.9)	

Identify the Risk		Assign the Risk	Classify the Risk			Quantify		Risk Response	
Risk ID	**Description of Risk**	**Who does the risk affect?**	**Probability of Occurrence %**	**Severity of Impact (numeric)**	**Risk Rating**	**$$ Impact**	**Schedule Impact**	**Avoid? Mitigate? Accept? Transfer?**	**Comments**
3 Accommodate Growth									
3.1	Too many signals limit future growth; too much congestion	Economic Development, travelling public and capacity	100%	**20**	**100.0**		None	Mitigate	Safety
3.2	Interchange is under designed to accommodate future growth	Economic Development, traveling public and traffic volumes	60%	**20**	**40.0**		None	Mitigate	Only at peak hours; impacts to a possible back up onto the interstate
3.3	KY536 is under designed to accommodate future growth	Economic Development, traveling public and traffic volumes	70%	**5**	**10.0**		None	Mitigate	
4 Miscellaneous									
4.1	Utilities	Schedule and budget	15%	**5**	**2.5**				Adequate utility locations during design