Kentucky Transportation Cabinet Value Engineering Study

I-75 Widening, MP 64.5 to MP 69.0, Item No. 08-0006.30 Rockcastle County

Final Value Engineering Study Report VE Study Number 201602

Study Dates: September 20-22, 2016

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

Contact: **Patrice Miller, CVS®**
(602) 493-1947

September 2016

Guiding Teams – Building Success

December 14, 2016

Mr. Shawn Russell
Value Engineering Coordinator
Kentucky Transportation Cabinet
Division of Highway Design
200 Mero Street
Frankfort, KY 40622
Shawn.Russell@ky.gov

Re: I-75 Widening, MP 64.5 to MP 69.0, Item No. 08-0006.30
Rockcastle County
Final Value Engineering Study Report
VE Study Number 201602

Dear Shawn:

Transmitted herewith is the pdf copy of the Final Value Engineering Study Report for the above referenced project. Five (5) print copies of the report will be mailed to you.

RHA appreciates your assistance and cooperation. Should you have any questions please contact us at (602) 493-1947.

Sincerely,

RHA, LLC

Patrice Miller, CVS®
Managing Partner
Patrice@TeamRHA.com

Value Engineering Study
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0, Item No. 08-0006.30
Rockcastle County

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INTRODUCTION

Value Engineering Study
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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 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 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

Report Contents

The report provides the outcomes associated with this VE workshop and includes the following sections:

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

Executive Summary – This section is an overview that includes project background, summary of results, a list of the VE study team members, and the VE punch list.

VE Recommendations and Design Suggestions – Each completed alternative and design suggestion has a separate workbook and is divided by function and project section, where applicable. Each workbook contains the following information:

- Baseline Assumption
- 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 and Cost Estimate Corrections
C – Function Analysis
D - Creative List and Evaluation
E – Supporting Data
- Team Observations
- Risk Identification
- Plan Review Comments
- Agenda
- Outbrief Presentation
- List of Standard KYTC VE Report Abbreviations

EXECUTIVE SUMMARY

Executive Summary

Background

A Value Engineering (VE) study was conducted for the I-75 Widening, MP 64.5 to MP 69.0, Item No. 08-0006.30 project during September 20-22, 2016 for the Kentucky Transportation Cabinet (KYTC).

Project Description

This project involves the widening of I-75, from MP 64.5 to MP 69.0, to six lanes with truck climbing lanes and median barrier wall. The existing highway is a four-lane interstate with a 60-foot depressed grass median. The inside shoulder is six feet wide (four feet paved) and the outside shoulder is twelve feet wide (ten feet paved). The existing horizontal and vertical alignments meet the present criteria for an interstate highway. The curves are superelevated properly. The roadway ditch in some cuts is only eight feet wide with a 3:1 slope. The guardrail is obsolete; it has inadequate turned-down end treatments and the offset blocks are substandard.

Because this project is due to let November 2016, the focus of the VE study was constructability and identifying any fatal flaws in design.

Workshop Objectives

The workshop objectives were identified at the start of the workshop to ensure the best value is attained while meeting the project goals and performance attributes. The VE team identified the following objectives for the workshop:

- Focus on biddable and constructable contract documents
- Identify any potential fatal flaws in the design
- Review phasing of maintenance of traffic control plan

Project Constraints

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

- Both the vertical and horizontal alignments are set and cannot be modified
- Changes to right-of-way could potentially impact the environmental document which is not desired

Summary of Results

The VE team brainstormed a total of 41 ideas. Of the 41 ideas, sixteen (16) ideas were identified for further development into VE proposed alternatives, including cost impacts, as appropriate. There were four (4) Design Suggestions which were also developed without cost impacts and twelve (12) Design Comments for KYTC and the designers to consider. The description and further discussion of these are included in the VE workbooks section of this report. The following table shows the proposed 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.

Value Engineering Proposals

VE Alternative No.	Idea Title	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
SP	**Simplify Phasing**			
1	Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes	$208,890	$0	$208,890
MA	**Maintain Access**			
2	Add bid item for tow service	($20,000)	$0	($20,000)
M	**Miscellaneous**			
3	Reduce replacement of control access fence	$127,170	$0	$127,170
4	Use 4:1 ditch foreslope instead of 6:1 in selected sections	$5,920	$0	$5,920
5	Extend benches to minimize excavations	$81,440	$0	$81,440
6	Add bid item for radar speed signs to reduce speed during construction	($7,400)	$0	($7,400)
7	Extend lane closure in advance of the project worksite	($2,000)	$0	($2,000)
8	Add rumble strips prior to construction	($12,000)	$0	($12,000)
9	Use work zone intrusion alert device to alert workers and drivers	($25,900)	$0	($25,900)
10	Add bid item for law enforcement officers (LEOs) during construction	($201,600)	$0	($201,600)
11	Require a protect-the-queue vehicle	($20,000)	$0	($20,000)
12	Add emergency vehicle median crossover locations	$3,500	$0	$3,500
13	Use single slope barrier wall instead of Jersey shape	$1,451,450	$685,000	$2,136,450
14	Close road at KY 3275 bridge during bridge reconstruction and detour traffic	$33,520	$0	$33,520
15	Close road to reconstruct KY 1505 bridge	$67,126	$0	$67,126
16	Add work zone warning signs with positive messages	($960)	$0	($960)

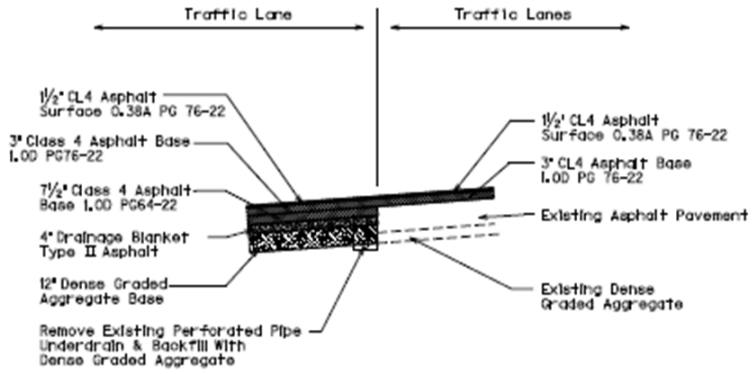
Design Suggestion (Workbook Prepared)

Creative Idea No.	Idea Title	VE Alternative No.
SP	**Simplify Phasing**	
SP-02	Phase 1A Maintenance of Traffic note correction	**17**
MA	**Maintain Access**	
MA-02	Use social media to inform public and communicate project status and updates	**18**
M	**Miscellaneous**	
M-23	Use A+B bidding instead of low bid	**19**
M-24	Create lane rental to minimize overages on lane closures	**20**

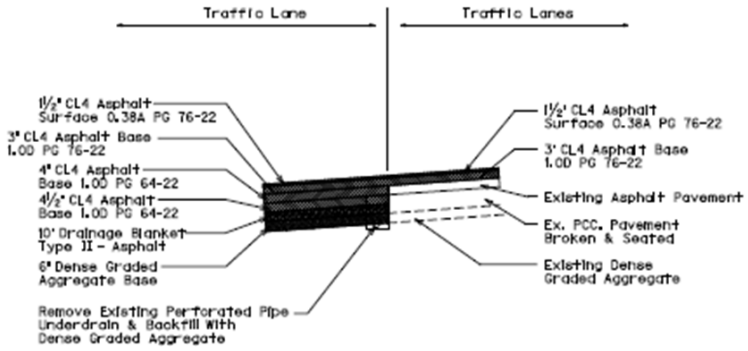
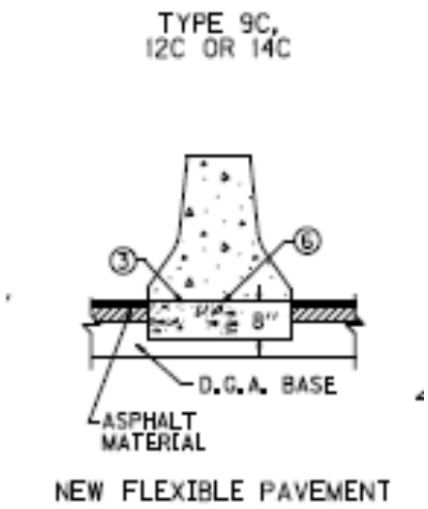
Design Comment (No Workbook Prepared)

Creative Idea No.	Idea Title	VE Alternative No.
MA	**Maintain Access**	
MA-03	Verify that US25 can accommodate trucks. Although US25 is not expected to be a "signed detour," traffic will likely use it in the event of an incident on I-75 causing long delays.	**21**
M	**Miscellaneous**	
M-05	Identify locations on project site for waste. Noting that the project is a "waste project," the idea is to flatten some of the fill slopes to possibly eliminate guardrail.	**22**
M-07	Add bid item for message boards to inform drivers during construction	**23**
M-14	Contractor to coordinate additional utility relocations and verify bid item	**24**
M-15	Use "alternative route" signage during emergencies. Use temporary signage on the primary route to notify motorists that the road is closed and that an alternate route exists. If using portable signs (either portable static signs or portable CMSs), then the devices should be deployed in order to notify upstream motorists that the road is closed and the motorists must divert to a designated alternate route. Incident response teams should carry temporary portable signs in their trucks to be deployed in case an incident warrants. Refer to FHWA Alternate Route Handbook for guidelines.	**25**

Design Comment (No Workbook Prepared)

Creative Idea No.	Idea Title	VE Alternative No.
M-16	Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.	**26**
M-19	Verify elevations at bottom of profile sheets; ensure the elevations are indicative of current conditions (i.e., after the most recent resurfacing project which was done approximately two years ago)	**27**
M-20	Verify what is being used to “build” project, existing or profile grade elevations; use existing elevations plus pavement thicknesses prescribed on typical sections or mathematical profile grades	**28**
M-21	Verify intent of different pavement schedules for median construction. Approximately the first mile (station 3395+00 to 3432+65) has a different pavement schedule (detail “C”) than the remainder of the project (detail “H”).  DETAIL "C"	**29**

Design Comment (No Workbook Prepared)

Creative Idea No.	Idea Title	VE Alternative No.
	 DETAIL "H"	
M-25	Place barrier wall in two lifts (8") of base instead of one lift  NEW FLEXIBLE PAVEMENT	**30**
M-27	Verify that the existing control access fence is at the existing right-of-way limit	**31**
M-28	Show station and offset on all proposed control access fencing. Assuming the control access fencing is to be located directly on the existing and/or proposed right-of-way, station and offsets are needed at the “break points” for the fencing layout and location.	**32**

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 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" processes. 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 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 *Increase Level of Service*.

VE Study Team

- Chris Jenkins, PE – QK4
- Anthony Norman, EIT – KYTC
- Shawn Russell, PE, AVS – KYTC
- Jeremiah Littleton, QK4
- Keith Damron, PE – AEI
- Bob Jones, PE, PLS – KYTC
- Certified Value Specialist (CVS) Team Leader – Pat Miller, RHA

Top row from left: Chris Jenkins, PE – QK4; Anthony Norman, EIT – KYTC; Shawn Russell, PE, AVS – KYTC. *Bottom row from left:* Jeremiah Littleton, QK4; Keith Damron, PE – AEI; Bob Jones, PE, PLS – KYTC.

Certification

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

Patrice Miller, CVS®
RHA, LLC

VALUE ENGINEERING PUNCH LIST: I-75 Widening (MP 64.5 to MP 69.0)
VE Study Number 201602

ITEM NO. **08-0006.30** PROJECT COUNTY: **Rockcastle** DATE OF STUDY: **September 20-22, 2016**

VE Alternative Number	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
Simplify Phasing									
1	Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes			$485,781	$276,890	$208,891	$0		
Maintain Access									
2	Add bid item for tow service			$200,000	$220,000	($20,000)	$0		
Miscellaneous									
3	Reduce replacement of control access fence			$390,655	$263,485	$127,170	$0		
4	Use 4:1 ditch foreslope instead of 6:1 in selected sections			$5,920	$0	$5,920	$0		
5	Extend benches to minimize excavations			$81,440	$0	$81,440	$0		
6	Add bid item for radar speed signs to reduce speed during construction			$0	$7,400	($7,400)	$0		
7	Extend lane closure in advance of the project worksite			$0	$2,000	($2,000)	$0		
8	Add rumble strips prior to construction			$0	$12,000	($12,000)	$0		
9	Use work zone intrusion alert device to alert workers and drivers			$0	$25,900	($25,900)	$0		
10	Add bid item for law enforcement officers (LEOs) during construction			$0	$201,600	($201,600)	$0		
11	Require a protect-the-queue vehicle			$0	$20,000	($20,000)	$0		
12	Add emergency vehicle median crossover locations			$3,675	$235	$3,440	$0		
13	Use single slope barrier wall instead of Jersey shape			$1,208,021	$2,177,175	($969,154)	$685,000		SEE NOTE 1 BELOW
14	Close road at KY 3275 bridge during bridge reconstruction and detour traffic			$33,520	$0	$33,520	$0		
15	Close road to reconstruct KY1505 bridge			$67,126	$0	$67,126	$0		
16	Add work zone warning signs with positive messages			$0	$960	($960)	$0		

VE Alternative Number	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
Design Suggestions									
17	Phase 1A Maintenance of Traffic note correction								
18	Use social media to inform public and communicate project status and updates								
19	Use A+B bidding instead of low bid								
20	Create lane rental to minimize overages on lane closures								
Design Comments									
21	Verify that US25 can accommodate trucks. Although US25 is not expected to be a “signed detour,” traffic will likely use it in the event of an incident on I-75 causing long delays.								
22	Identify locations on project site for waste. Noting that the project is a “waste project,” the idea is to flatten some of the fill slopes to possibly eliminate guardrail.								
23	Add bid item for message boards to inform drivers during construction								
24	Contractor to coordinate additional utility relocations and verify bid item								
25	Use "alternative route" signage during emergencies. Use temporary signage on the primary route to notify motorists that the road is closed and that an alternate route exists. If using portable signs (either portable static signs or portable CMSs), then the devices should be deployed in order to notify upstream motorists that the road is closed and the motorists must divert to a designated alternate route. Incident response teams should carry temporary portable signs in their trucks to be deployed in case an incident warrants. Refer to FHWA *Alternate Route Handbook* for guidelines.								

VE Alternative Number	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
26	Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.								
27	Verify elevations at bottom of profile sheets; ensure the elevations indicative of current conditions (i.e., after the most recent resurfacing project which was done approximately two years ago)								
28	Verify what is being used to “build” project, existing or profile grade elevations; use existing elevations plus pavement thicknesses prescribed on typical sections or mathematical profile grades								
29	Verify intent of different pavement schedules for median construction. Approximately the first mile (station 3395+00 to 3432+65) has a different pavement schedule (detail “C”) than the remainder of the project (detail “H”).								SEE NOTE 2 BELOW
30	Place barrier wall in two lifts (8") of base instead of one lift								SEE NOTE 3 BELOW
31	Verify that the existing control access fence is at the existing right-of-way limit								
32	Show station and offset on all proposed control access fencing. Assuming the control access fencing is to be located directly on the existing and/or proposed right-of-way, station and offsets are needed at the “break points” for the fencing layout and location.								

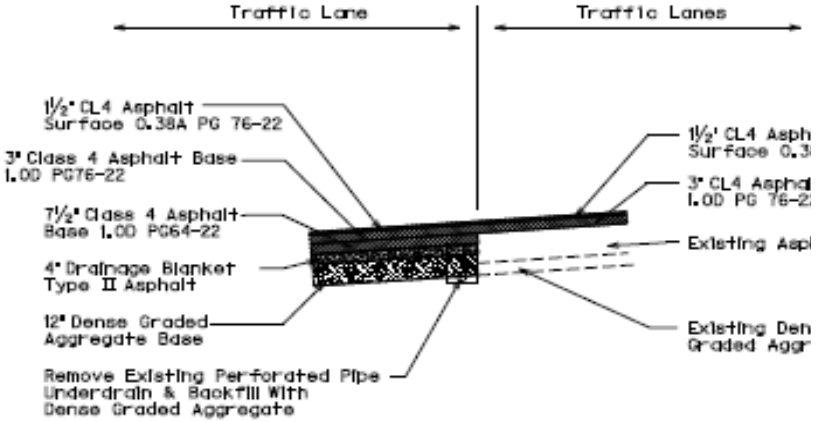
VE Alternative Number	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks

NOTES

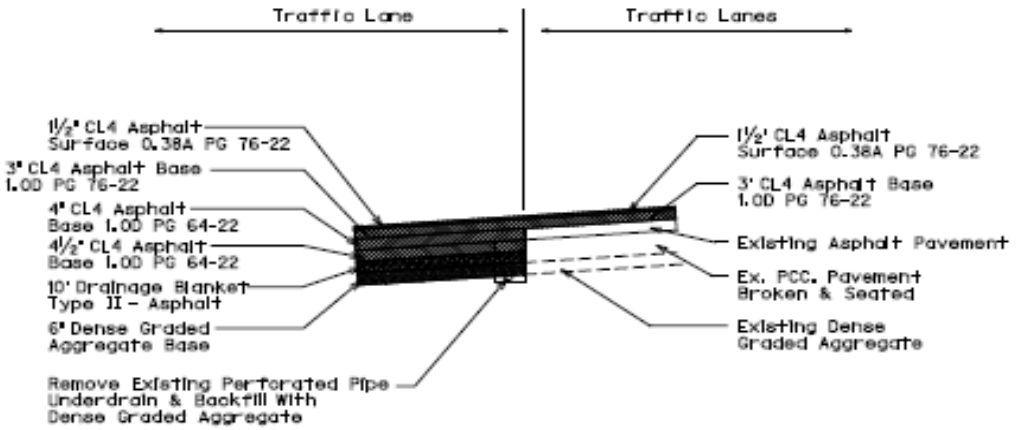
NOTE 1 (VE Alternative No. 13): ACTUAL COST SAVINGS ARE MUCH GREATER THAN INDICATED ABOVE, DUE TO AN ERROR ON THE ORIGINAL COST ESTIMATE. THE ORIGINAL COST ESTIMATE SHOWS ONLY 21 LF, WHEN ACTUAL QUANTITY IS 20,735 LF. FURTHER, THE $58.26 UNIT PRICE APPEARS INCORRECT BASED ON ACTUAL BID PRICES ON PREVIOUS KYTC PROJECTS.

REVISED BASELINE COST (JERSEY BARRIER) = 20,735 LF x $175 = $3,628,625
PROPOSED SINGLE SLOPE BARRIER = 20,735 X $105 = $2,177,175
INITIAL REALIZED SAVINGS FOR THIS SUBSTITUTION = $1,451,450

NOTE 2 (Design Comment, VE Alternative No. 29):



DETAIL "C"

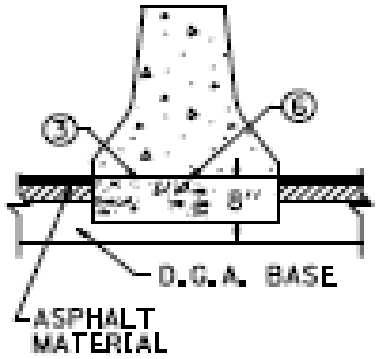


DETAIL "H"

VE Alternative Number	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

NOTE 3 (Design Comment, VE Alternative No. 30):

TYPE 9C,
12C OR 14C



NEW FLEXIBLE PAVEMENT

PROJECT DESCRIPTION

Introduction

The VE study consisted of Segment 08-0006.30 in Rockcastle County, north of Mount Vernon. This project involves the widening of I-75 from Milepost 64.5 to Milepost 69.0 with two bridge replacements, KY 1505 and KY 3275. The project begins 2.5 miles north of the Renfro Valley interchange and ends in the Conway community at Clay Lick Branch.

The build alternative widens the existing road to the inside to make six total driving lanes, three in each direction. The depressed median will be replaced by a barrier wall with 14-foot paved shoulders on each side. As part of another project, the pavement was overlain to increase its carrying capacity and design life. The new pavement and the overlay are designed for 50 million Equivalent Single Axle Loads (ESALs) over the next 20 years. Rideability should be good for the whole design life. Guardrail and end treatments will be upgraded to current standards. Both overpasses will be replaced. Traffic should flow smoothly even at peak times. One hill on the project is at a four percent grade that is over one mile long. Because truck lanes will be be used, the LOS D will be maintained throughout the project in the design year.

Maintenance of Traffic

Traffic on this project must be maintained on two lanes in each direction at all times. No traffic disturbances should occur during peak travel times such as major holidays or special events. The phasing is proposed as follows:

Phase 1: All work in the median (from the bottom of the overlay to the top of existing pavement) will be conducted in this phase. Work will include median drainage inlets, edge drain, median barrier, and full-depth paving. Traffic will be separated from the work zone by temporary concrete barriers. The lane line (road marking) in each direction will be placed one foot farther to the outside and traffic will be maintained on two 11-foot lanes in each direction.

Phase 2: All outside slopes that require work will be handled and truck lanes will be constructed. Traffic will be separated from the work zone by traffic drums. Two 12-foot lanes of traffic each direction will be placed on the newly constructed driving lane and the inside shoulder.

Phase 3: Final layers of base and surface will be placed and shoulder edges will be dressed. Traffic drums will be used for separation. Traffic may be maintained on any of the three driving lanes, the inside shoulder, or the outside shoulder. New guardrail will be installed before any traffic is allowed in the right lane or on the outside shoulder. Two 12-foot lanes in each direction will be maintained at all times.

VE RECOMMENDATIONS & DESIGN SUGGESTIONS

VE Proposed Alternatives & Design Suggestions

Introduction

The VE study evaluated the 41 ideas that were brainstormed during the Creative Phase. The 16 completed Alternatives are located in this section of the report. The alternatives developed included, as needed, the following information:

- Baseline Assumption
- 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, four Design Suggestions were developed to provide some additional design direction to the design team. These are also included in this section of the report. The identified Design Comments can be found on the creative idea list in Appendix D.

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes

FUNCTION: **Simplify Phasing**

BASELINE ASSUMPTION:

The Maintenance of Traffic plans call for three distinct phases of construction along I-75.

PROPOSED ALTERNATIVE:

Combine Phases 2 and 3 to allow for a two-phase construction sequence. The inside (median) can be constructed in Phase 1 to a point flush with the existing edge of pavement. After the median is constructed, the temporary barrier rails can be moved toward the outside and traffic shifted to the inside two lanes on each side.

BENEFITS	RISKS/CHALLENGES
• Eliminates relocation of temporary barrier wall	• Driver using inside (left) lane during Phase 2 could feel "confined" if driving beside tractor trailer truck
• Allows for quicker overall construction completion, thus minimizing construction zone duration	• Compromises emergency vehicle accessibility if traffic is stopped
• Offers ease of construction	• Second phase of construction will not have inside shoulder
• Reduces overall Maintenance of Traffic cost	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 485,781	$ -	$ 485,781
PROPOSED ALTERNATIVE:	$ 276,890	$ -	$ 276,890
TOTAL (Baseline less Proposed)	$ 208,890	$ -	**$ 208,890**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes

DISCUSSION/JUSTIFICATION:

Since this project has recently (within the last two years) been resurfaced, the plan now is to simply add 1-1/4" surface to the current two lanes of traffic on each side. Therefore, the inside (median) can be constructed in Phase 1 to a point flush with the existing edge of pavement.

After the median is constructed to a full depth (less final surface), the temporary barrier rails can be moved approximately 12 ft. toward the outside and traffic shifted to the inside two lanes (leaving 4 ft. inside shoulder, 2 @ 12 ft. driving lanes, and approximate 8 ft. outside shoulder) on each side.

After completion of bridge construction and excavation, project can be finished as a resurfacing project (without the use of temporary concrete barriers) with traffic being channelized using barrels and permanent pavement markings.

The anticipated overall time savings is estimated to be approximately three months for the new phasing. Contributing factors to the reduced schedule include:

- Less relocation of temporary barrier wall
- Less asphalt paving because of recent resurfacing project
- Less temporary striping

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Relocate Temporary Concrete Barrier		LF	46,620	6.13	285,781	23,310	6.13	142,890
Maintain and Control Traffic		LS	1	200,000.00	200,000	0.67	200,000.00	134,000
					485,781			**276,890**
							(BASELINE LESS PROPOSED)	**208,890**

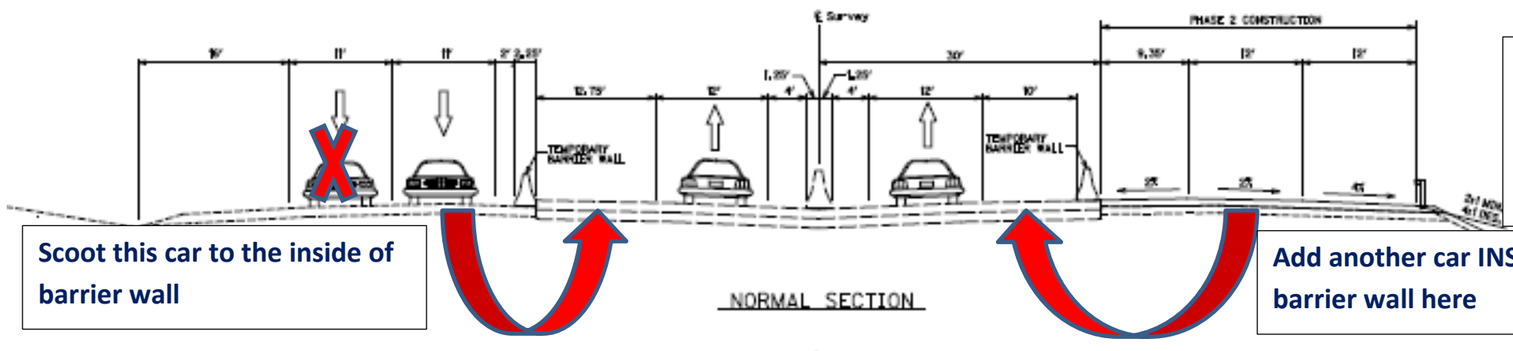
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes

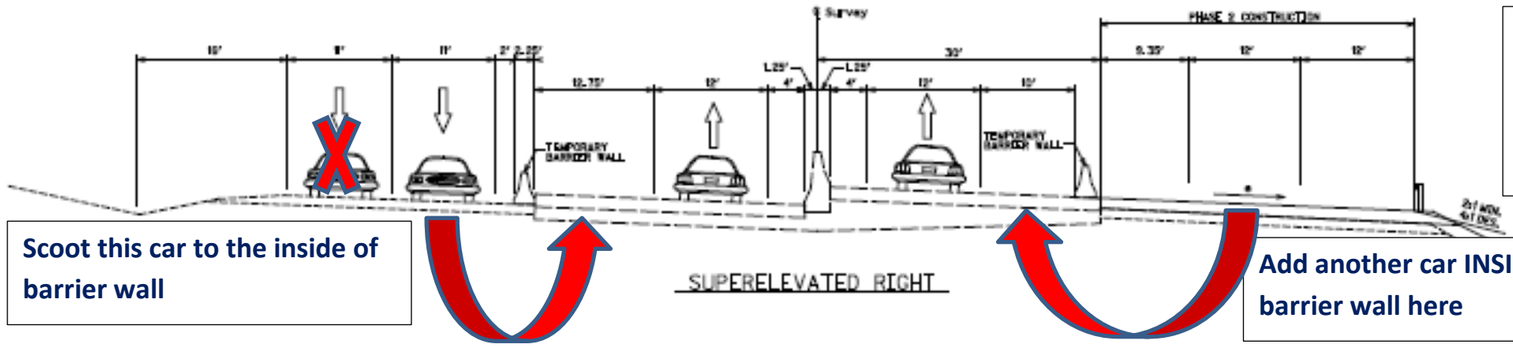
SKETCH OF PROPOSED ALTERNATIVE



Scoot this car to the inside of barrier wall

Add another car INSIDE the barrier wall here

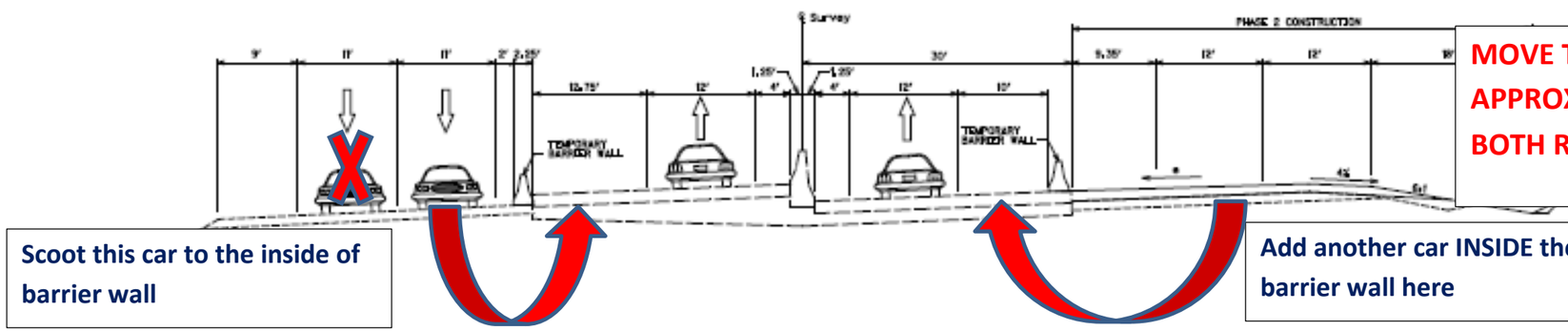
MOVE TEMPORARY BARRIER WALL APPROXIMATELY 12’ (TYPICAL OF BOTH RIGHT AND LEFT SIDES)



Scoot this car to the inside of barrier wall

Add another car INSIDE the barrier wall here

MOVE TEMPORARY BARRIER WALL APPROXIMATELY 12’ (TYPICAL OF BOTH RIGHT AND LEFT SIDES)



Scoot this car to the inside of barrier wall

Add another car INSIDE the barrier wall here

MOVE TEMPORARY BARRIER WALL APPROXIMATELY 12’ (TYPICAL OF BOTH RIGHT AND LEFT SIDES)

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Add bid item for tow service
FUNCTION:	**Maintain Access**

BASELINE ASSUMPTION:

There is no towing/wrecker service required of the contractor.

PROPOSED ALTERNATIVE:

Require by bid item or by modification to the Maintenance of Traffic notes, towing/wrecker service capabilities with reaction time limits.

BENEFITS	RISKS/CHALLENGES
• Shorter traffic queues during incidents	• Establishment of incident reporting
• Reduces user delay costs (stopped traffic)	•
• Helps reduce secondary and tertiary crashes	•
• Potentially faster response times to clear wreckage	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 200,000	$ -	$ 200,000
PROPOSED ALTERNATIVE:	$ 220,000	$ -	$ 220,000
TOTAL (Baseline less Proposed)	$ (20,000)	$ -	**$ (20,000)**

COST

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for tow service

DISCUSSION/JUSTIFICATION:

In previous KYTC projects with long queues expected during traffic incidents, KYTC has required a towing/wrecker service to be on site within 15 minutes of notification of incident. The service would clear traffic lanes to reduce the possibility of the queue entering the work zone. Heavily used in District 5, the concept has reduced secondary and tertiary incidents, as well as maintaining functional levels of service for minimal project cost.

IMPLEMENTATION CONSIDERATIONS:

KYTC should determine if this will be something to be more prevalent in projects. If so, it would be beneficial to create a new bid item as not to further skew the existing 02650 Maintain & Control Traffic item.

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for tow service

DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Maintenance of Traffic		LS	1	200,000.00	200,000	1	220,000.00	220,000
					200,000			**220,000**
							(BASELINE LESS PROPOSED)	**(20,000)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Reduce replacement of control access fence

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

Control of access fence is shown as being removed and replaced throughout the project beginning at Left and Right Stations 3388+50 which is prior to the project beginning at Station 3395+00.

PROPOSED ALTERNATIVE:

Proposed alternative is to not remove control of access fence that is 50 ft. or more from the proposed disturbed limits. Locations to eliminate fence removal and replacement: Left & Right Station 3388+50 to Station 3431+00 (8,500 ft.), Left Station 3508+00 to 3535+00 (2,700 ft.), Right Station 3508+00 to 3522+00 (1,400 ft.), Left and Right Station 3544+00 to Station 3562+00 (3,600 ft.).

BENEFITS	RISKS/CHALLENGES
• Reduces construction time	• Old fence to remain will not match
• Reduces area of disturbance	•
• Reduces right-of-way fence	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 390,655	$ -	$ 390,655
PROPOSED ALTERNATIVE:	$ 263,485	$ -	$ 263,485
TOTAL (Baseline less Proposed)	$ 127,170	$ -	**$ 127,170**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Reduce replacement of control access fence

DISCUSSION/JUSTIFICATION:

In the current economic situation of available transportation funds, this proposed alternative will allow KYTC to be a more efficient steward of road funds by only replacing fences that need to be replaced rather than just because it is in the project limits.

To accomplish this proposed alternative, change the construction notes on the plan sheets and reduce the removal and replacement Fence Quantities (Bid Item 02268); this would result in a total of a 16,200 linear feet reduction.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Reduce replacement of control access fence

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Bid Item 02268 - Remove and Replace Fence		LF	49,765	7.85	390,655	33,565	7.85	263,485
					390,655			**263,485**
							(BASELINE LESS PROPOSED)	**127,170**

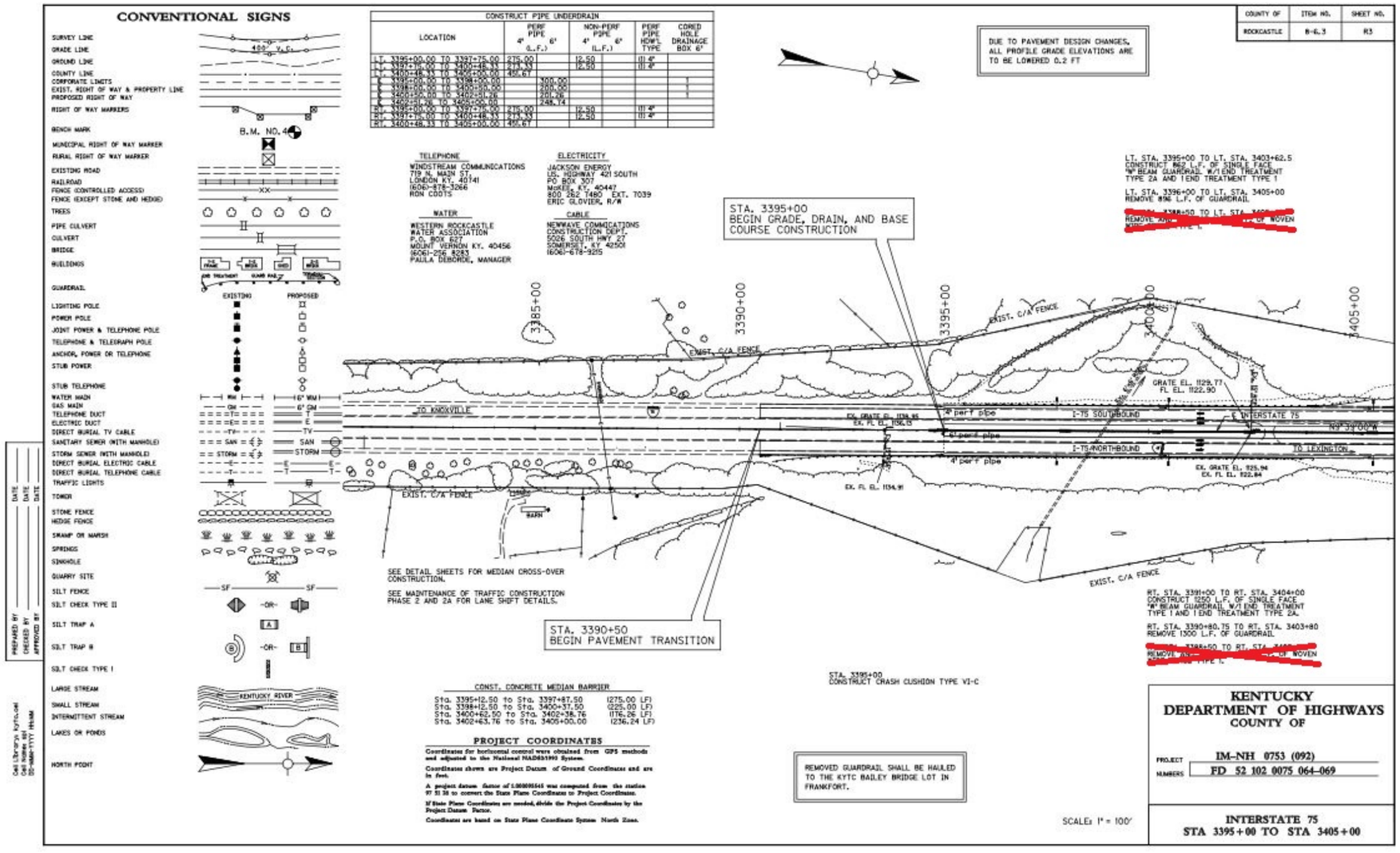
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Reduce placement of control access fence

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use 4:1 foreslope rather than 6:1 in selected sections
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The standard KYTC template was applied to create cut sections.

PROPOSED ALTERNATIVE:

Review cross sections to optimize excavation. Where possible, change 6:1 foreslope to 4:1.

BENEFITS	RISKS/CHALLENGES
• Improves constructability	• Increases design manhours
• Potential excavation reduction	• Maintains clear zone
•	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 5,920	$ -	$ 5,920
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 5,920	$ -	**$ 5,920**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use 4:1 foreslope rather than 6:1 in selected sections

DISCUSSION/JUSTIFICATION:

On the limestone cut sections that are still in good condition, eliminate the sliver cuts by switching from 6:1 foreslopes to 4:1. Sliver cuts are difficult to blast and therefore can increase the unit price of excavation.

The previous Design Executive Summary (DES) mandated ditch widths and clear zone distances. By implementing this change, care will need to be taken to prevent an "in and out" cut slope.

Please note that the cost detail (following page) does not show potential reduction in cost due to reduction in blasting as well as reduction in impact to the traveling public during blasting.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use 4:1 foreslope rather than 6:1 in selected sections

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Optimize Cut Sections		CY	740	8.00	5,920			
					5,920			
							(BASELINE LESS PROPOSED)	**5,920**

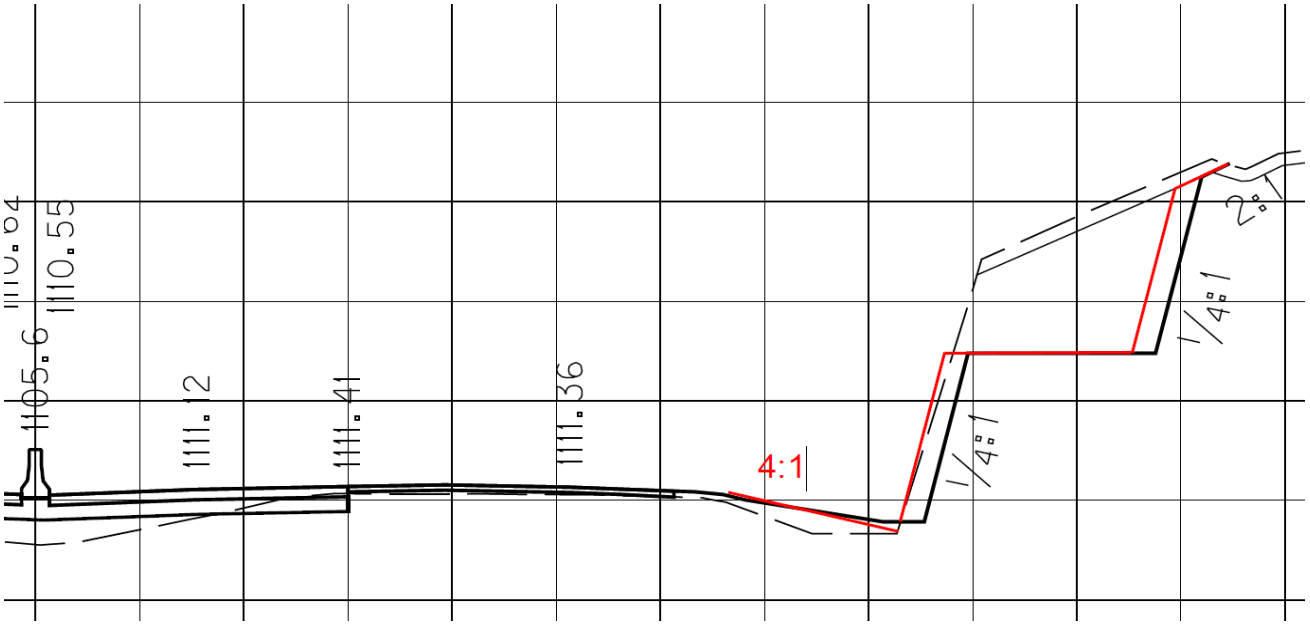
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use 4:1 foreslope rather than 6:1 in selected sections

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend benches to minimize excavation

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The standard KYTC template was applied to create cut sections.

PROPOSED ALTERNATIVE:

Optimize excavation by extending benches vertically where possible.

BENEFITS	RISKS/CHALLENGES
• Improves constructability	• Increases design manhours
• Potential excavation reduction	• Increases potential for fallen rock at edge of roadway
• Reduces opportunity for a "shot rock" closure	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 81,440	$ -	$ 81,440
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 81,440	$ -	**$ 81,440**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend benches to minimize excavation

DISCUSSION/JUSTIFICATION:

Standard overburden benching and cut templates were used to create the cut sections. By manually reviewing the geotechnical information in conjunction with the cross sections, there is potential to optimize the excavation quantities.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend benches to minimize excavation

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Roadway Excavation		CY	10180	8.00	81,440			
					81,440			
							(BASELINE LESS PROPOSED)	**81,440**

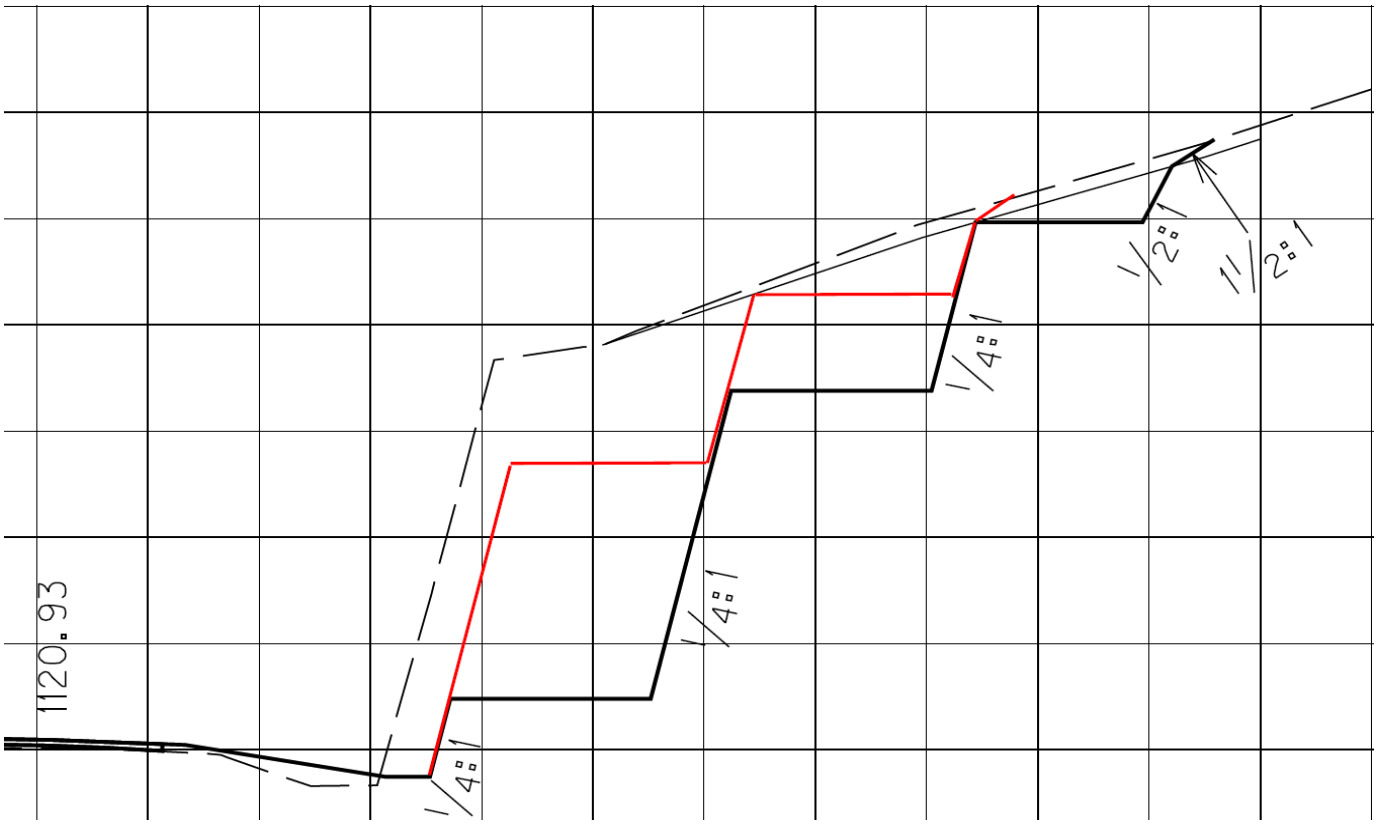
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend benches to minimize excavation

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Add bid item for radar speed signs to reduce speed during construction
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone.

PROPOSED ALTERNATIVE:

Place a Radar Speed Sign before the construction zone on the I-75 northbound and I-75 southbound to reduce driver speeds.

BENEFITS	RISKS/CHALLENGES
• Reduces driver speeds	• None apparent
• Protects workers	•
• Reduces crashes	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 7,400	$ -	$ 7,400
TOTAL (Baseline less Proposed)	$ (7,400)	$ -	**$ (7,400)**

COST

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for radar speed signs to reduce speed during construction

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the project is located in a hilly, rural location, where the posted speed limit is 70 mph. Likely, there will be a consistent flow of cars, SUVs, trucks and recreational vehicles that will be driving through the construction zone at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Therefore, the radar speed signs should help reduce speeds to provide for a safer work zone. The radar speed signs should be placed in advance of the construction zone or merging zone just after the beginning of the reduced speed zone. This allows drivers to slow down to the construction zone speed limit.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for radar speed signs to reduce speed during construction

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Radar Speed Sign		EA				2	3,700.00	7,400
								7,400
							(BASELINE LESS PROPOSED)	**(7,400)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Add bid item for radar speed signs to reduce speed during construction

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend lane closure in advance of the project worksite

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The Maintenance of Traffic Plans call for standard lane closures per MUTCD requirements at either end of the project, when setting temporary barrier wall. The southbound side on an adjacent project to the north is already a three-lane section.

PROPOSED ALTERNATIVE:

Extend lane closure beyond MUTCD minimums to group drivers in advance of the worksite. This would also cause require the third lane in the southbound direction to be closed well in advance of the one-lane section.

BENEFITS	RISKS/CHALLENGES
• Positively affects traffic flow by more evenly distributing the "bottleneck," thus potentially reducing back-ups	• Work items extend beyond construction limits
• Reduces crash potential near work zone	• Increases contractor daily maintenance
• Reduces driver frustration of two lanes merging into one at the same time	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 2,000	$ -	$ 2,000
TOTAL (Baseline less Proposed)	$ (2,000)	$ -	**$ (2,000)**

COST

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend lane closure in advance of the project worksite

DISCUSSION/JUSTIFICATION:

Oftentimes, there are long queue back-ups resulting from lane closures on the Interstate. This particular location (the southbound lanes on the north end of the project) presents a situation where traffic will be transitioned from three lanes to one lane during the placement of the temporary barrier wall. If one of the lanes on the section to the north is closed well in advance of the project limits, traffic would have time to be "calmed" before having to merge again immediately prior to the project. This circumstance is unique to the southbound side.

The barrels could be left in place on the outside edges of existing lanes during the remainder of the project (allowing normal transition from a three-lane section to a two-lane section.

Although there would be a slight cost by having to add additional traffic control devices (i.e., traffic delineators such as barrels), the benefits of potentially shorter back-ups and fewer crashes could far outweigh the additional cost to the project.

To accomplish the longer transition area, project would need to account for additional TCD (barrels) and the assumption would be approximately an additional one-half mile.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend lane closure in advance of the project worksite

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Additional Barrels		EA				40	50.00	2,000
								2,000
							(BASELINE LESS PROPOSED)	**(2,000)**

*Note: Costs are rounded to nearest thousand dollars.

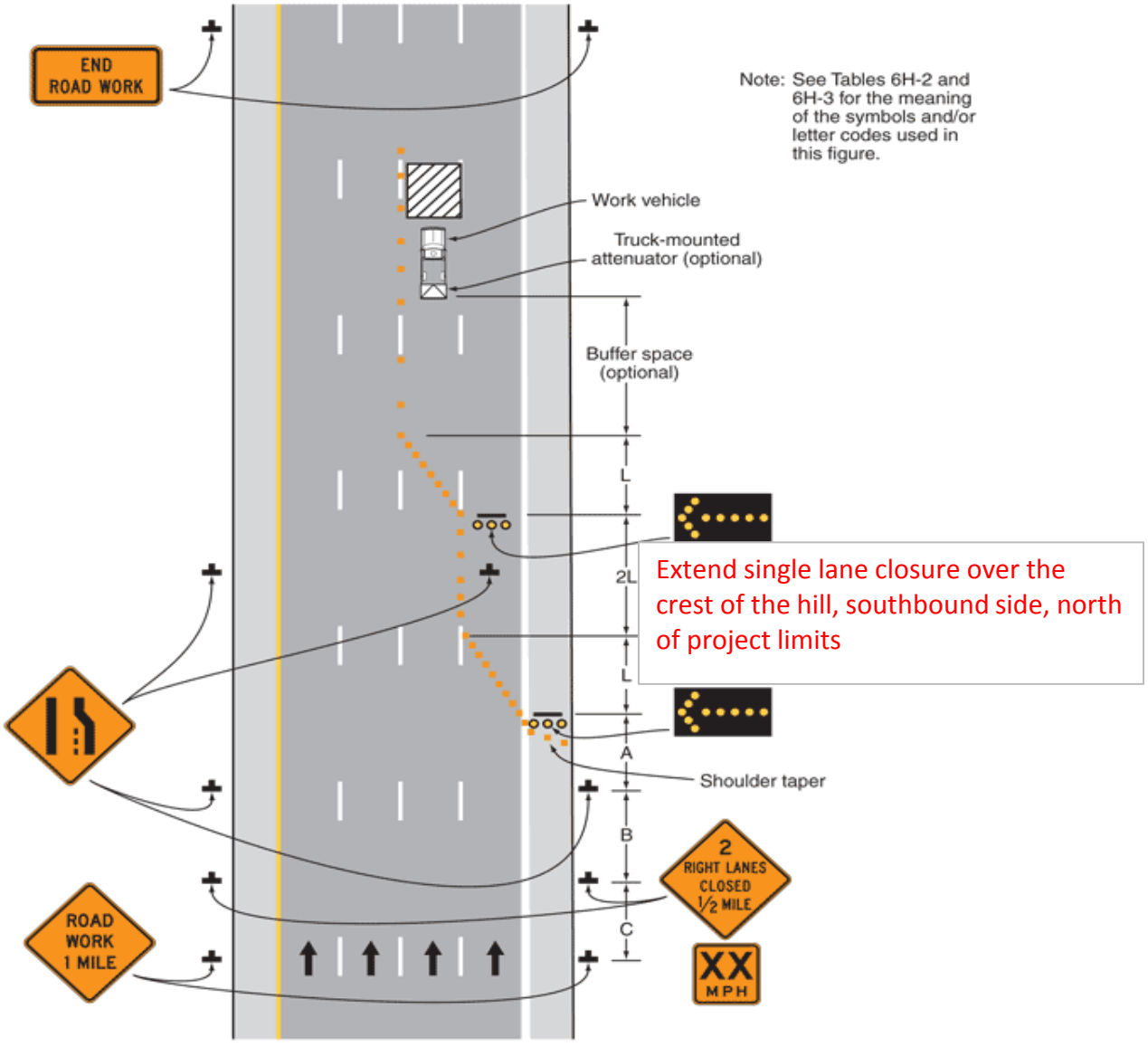
COST

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Extend lane closure in advance of the project worksite

SKETCH OF PROPOSED ALTERNATIVE

Figure 6H-37. Double Lane Closure on a Freeway (TA-37)



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VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add rumble strips prior to construction

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone.

PROPOSED ALTERNATIVE:

Place rumble strips before the construction zone to alert drivers of the need to reduce speed. There will be several for the northbound and several for the southbound traffic.

BENEFITS	RISKS/CHALLENGES
• Potentially protects workers due to a reduction in speed	• Could increase motorcycle crashes
• Potentially reduces crashes due to a reduction in speed	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 12,000	$ -	$ 12,000
TOTAL (Baseline less Proposed)	$ (12,000)	$ -	**$ (12,000)**

COST

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add rumble strips prior to construction

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the project is located in a hilly, rural location, where the posted speed limit is 70 mph. Likely, there will be a consistent flow of cars, SUVs, trucks and recreational vehicles that will be driving through the construction zone at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Therefore, the rumble strips should help to reduce vehicle speeds through the work zone; they give drivers a good audio cue that they are about to enter a work zone and need to slow down.

The roadway should be cleaned before the rumble strips are installed.

The rumble strips should be placed well in advance to allow the drivers to slow down. Yet, they should not be too far in advance that drivers ignore them or speed back-up again.

IMPLEMENTATION CONSIDERATIONS:

The designer should reference the MUTCD, Guidance for the Use of Temporary Rumble Strips in Work Zones, and another guidance or document for the spacing and amount of rumble strips to reduce the drivers speed form 70 mph to the construction zone speed limit. This recommendation has priced out the installation of 10 rumbles strips for north bound and south bound I-75. In addition, the following guidance for motorcycles should be followed:

- Well lit signs warning motorcyclists that rumbles strips are coming up.
- The rumble strips should be visible during day time and night time.
- The distance between the rumble strips should be wide enough so that one motorcycle tire is on a rumble strip at a time.

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add rumble strips prior to construction

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Rumble Strips		EA				20	600.00	12,000
								12,000
							(BASELINE LESS PROPOSED)	**(12,000)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add rumble strips prior to construction

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use work zone intrusion alert device to alert workers and drivers

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone. In addition, standard KYTC protection devices including barrels and barriers will be protecting the workers from vehicles.

PROPOSED ALTERNATIVE:

A bid item should be added for work zone intrusion devices. Both of the following should be used in areas where the workers are vulnerable:

- Shadow Vehicles
- SonoBlaster® or something similar

BENEFITS	RISKS/CHALLENGES
• Enhances safety for workers	• May startle drivers
• Reduces speeds in work zone	•
• Enhances safety for drivers	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 25,900	$ -	$ 25,900
TOTAL (Baseline less Proposed)	$ (25,900)	$ -	**$ (25,900)**

COST

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use work zone intrusion alert device to alert workers and drivers

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the project is located in a hilly, rural location, where the posted speed limit is 70 mph. Likely, there will be a consistent flow of cars, SUVs, trucks and recreational vehicles that will be driving through the construction zone at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Therefore, the intrusion devices, shadow vehicles and a SonoBlaster®, should help to protect workers from incoming vehicles.

The shadow vehicles will be positioned at the beginning of the active work zone, during night construction on the bridge when it is reduced to one lane, and any other area that the drivers are vulnerable to a work zone intrusion. The shadow vehicles will have truck mounted attenuators on the back of them and radar speed signs. The truck mounted attenuators will be a barrier to protect workers from errant vehicles. These will be used in areas where a shadow vehicle can fit and be able to protect workers. The radar speed sign will alert drivers of their speed and flash and/or possibly make noise if a vehicle is going too fast. This aspect of the shadow vehicle can make it an mobile speed reduction device, which will be good for areas where drivers are driving above the speed limit in the construction site.

The SonoBlaster® is a device attached to a construction cone or barrel. If the construction cone or barrel is knocked over or disturbed the device will blast a horn allowing and giving workers enough time to move out of harm's way. These devices should be placed far enough away to give the workers adequate time to get out of harms way, and need to be placed to cover all vulnerable areas in the work zone. Since the posted speed limit is 70 mph, the SonoBlaster® devices should be attached to cones that are far enough away to give workers adequate time to get away if a driver is traveling at that speed.

These two devices can be used in conjunction with each other, since a shadow vehicle cannot fit in every location and the shadow vehicle will give a bit if it is hit. In addition, the SonoBlasters® do not alert people that they are driving too fast, which would be good to know in the active portion of the construction zone.

IMPLEMENTATION CONSIDERATIONS:

The SonoBlaster® would need to be placed so that they provide protection for all vulnerable areas of the work zone, and they need to be placed to reduce the false alarms. This allows the workers to get to a safe place when there is an errant vehicle. If there are quite a few false alarms, then the workers will ignore the horn, which could be a fatal mistake. In addition, the SonoBlasters® need to be placed to cover all vulnerable areas of the active work zone. Both of these items need to be moved as the active construction area moves.

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use work zone intrusion alert device to alert workers and drivers

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Truck Mounted Attenuator		EA				1	20,000.00	20,000
Radar Speed Sign		EA				1	5,000.00	5,000
SonoBlaster®		EA				10	89.95	900
								25,900
							(BASELINE LESS PROPOSED)	**(25,900)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use work zone intrusion alert device to alert workers and drivers

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Add bid item for Law Enforcement Officers (LEOs) during construction
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

No traffic calming methods are currently proposed.

PROPOSED ALTERNATIVE:

Add Law Enforcement Officers.

BENEFITS	RISKS/CHALLENGES
• Reduces travel speeds	• None apparent
• Increases driver awareness	•
• Faster incident response times	•
• Increases worker safety	•
• Removes unsafe motorists (e.g., drunk driver) from the highway	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 201,600	$ -	$ 201,600
TOTAL (Baseline less Proposed)	$ (201,600)	$ -	**$ (201,600)**

COST

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for Law Enforcement Officers (LEOs) during construction

DISCUSSION/JUSTIFICATION:

The addition of Law Enforcement Officers has been shown on previous projects to reduce travel speeds through work zones, increase traveler awareness, increase worker safety, decrease incident response times, and reduce work zone delays.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add bid item for Law Enforcement Officers (LEOs) during construction

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Law Enforcement Officers		HR				4200	48.00	201,600
								201,600
							(BASELINE LESS PROPOSED)	**(201,600)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Require a protect-the-queue vehicle
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

No vehicle is currently required.

PROPOSED ALTERNATIVE:

Add a protect-the-queue vehicle to reduce crashes related to construction backups.

BENEFITS	RISKS/CHALLENGES
• Reduces crash potential	• New concept for KYTC; may require learning curve
• Protects workers	•
• Improves communication to motorist	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 20,000	$ -	$ 20,000
TOTAL (Baseline less Proposed)	$ (20,000)	$ -	**$ (20,000)**

COST

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Require a protect-the-queue vehicle

DISCUSSION/JUSTIFICATION:

Extensive traffic backups are expected for this stretch of I-75. When the contractor will have to close a lane in order to set-up temporary concrete barriers, back-ups may extend for miles. These long back-ups have the potential to result in severe crashes, due to the possibility of being encountered before drivers see the advance warning signs.

If a truck equipped with an attenuator and changeable message sign unit is located beyond the traffic queue, drivers have an additional warning of the hazard ahead.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Require a protect-the-queue vehicle

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Protect-the-Queue Vehicle		EA				1	20,000.00	20,000
								20,000
							(BASELINE LESS PROPOSED)	**(20,000)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Require a protect-the-queue vehicle

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Require a protect-the-queue vehicle

PROPOSED ALTERNATIVE - SPECIFICATION
(2 pages attached)

S T A T E **O F** **T E N N E S S E E**

January 1, 2015

SPECIAL PROVISION

REGARDING

TRAFFIC QUEUE PROTECTION

Description: When construction activities are performed on control-access or limited access facilities, the Contractor shall pursue efforts for the protection of traffic queues caused by project operations and clearly demonstrate adequate good faith efforts as described herein. The queue protection truck is expected to alert motorists (inside or outside of project limits) of all stopped traffic caused by construction activities or incidents within the project limits.

Equipment: The contractor shall provide a minimum of one (1) queue protection truck for each traveling direction where traffic flow is reduced. One (1) additional queue protection truck shall be onsite in reserve. The system deployed must fulfill the following minimum requirements:

1. A truck mounted attenuator that meets or exceeds NCHRP TL-3 requirements.
2. Four (4) round yellow strobe lights (with auto-dimmers) positioned rear facing
    - Two (2) mounted under rear bumper
    - Two (2) mounted at cab level
3. One (1) standard cab mounted light bar.
4. A truck mounted message board with a minimum of 3 Lines and 8 Characters per line.
5. Four Hour National Traffic Incident Management (TIM) Responder Training for Queue Truck Operators.

Maintenance of Traffic: The following procedures will be followed until free flow traffic conditions are present:

- The queue protection truck shall be positioned no further than ½ mile upstream from the back of the slow moving traffic.
- The queue protection truck shall be positioned on the shoulder and clear of the traveled way so as not to impede traffic.
- The queue protection truck shall relocate as needed to maintain the minimum ½ mile distance from the back of the slow moving traffic.
- The 2nd queue protection truck shall be held in reserve, on site, and

support the primary truck if conditions prevent repositioning by reverse. This truck shall not be paid for idle time.

- Trucks shall be kept in project limits during planned lane closures and other project activities expected to cause a queue.
- Queue length estimates and traffic conditions shall be reported to the TDOT District Operations Supervisor or designee at the following periods:
    1. At 30 minute intervals
    2. At significant changes
    3. When free flow traffic is achieved

The queue protection truck shall be mobilized as directed by the District Operations Supervisor or designee and shall be de-mobilized when free flow conditions are reached.

Basis of Payment: The queue protection truck, all related equipment, and labor shall be paid for as Item No. 712-08.10, per hour. All costs are to be included in the price bid. Idle time shall not be paid.

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Add emergency vehicle median crossover locations
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The current highway has two emergency vehicle median crossover points. The project will eliminate them, since the project is using the median for the additional lane.

PROPOSED ALTERNATIVE:

On the north end of the project, add an emergency vehicle access point.

BENEFITS	RISKS/CHALLENGES
• Provides emergency vehicle access	• Non-emergency vehicle use
• Reduces accident delay	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 3,675	$ -	$ 3,675
PROPOSED ALTERNATIVE:	$ 235	$ -	$ 235
TOTAL (Baseline less Proposed)	$ 3,440	$ -	**$ 3,440**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add emergency vehicle median crossover locations

DISCUSSION/JUSTIFICATION:

Currently, there are two emergency access points in the project located at milepost 68 and 64.7, and there is an additional one located at milepost 71.9, which will be another phase of the project. With the widening of the I-75 occurring in the median, these emergency access points will be removed. This means from exit 76 to exit 62, 14 miles, on I-75 there will be no emergency access points. This could prove problematic if emergency vehicles are needed at either exit, or if there is a crash on the highway. As already indicated, there will be a 14-mile stretch after the project and its additional phases are complete, where there is no emergency access points. Depending on where the emergency on the highway is or where the emergency vehicle needs to go, this could mean a significant delay in the reaction time, which could be the difference between life and death. Therefore, having one emergency access location on the northern end of the project around milepost 69 is definitely needed on this project. It would be preferred if the current emergency access points are replaced on this project, since they provide multiple areas for emergency vehicles to response to emergencies.

The proposed sketch shows an image of the proposed design for the emergency access point located on I-64, between Simpsonville and I-265. This design has a 21-foot gap for emergency vehicles and 140 feet before the gap the barrier wall is tapered around a ratio of 1:50. This would be a good design or good base design for this project.

The gap needs to provide easy access for all emergency vehicles, especially fire trucks and ambulances. A fire truck will be a good design vehicle.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add emergency vehicle median crossover locations

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Barrier Wall		LF	21	175.00	3,675	1	175.00	175
Access Sign		EA				2	30.00	60
					3,675			**235**
							(BASELINE LESS PROPOSED)	**3,440**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add emergency vehicle median crossover locations

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use single slope barrier wall instead of Jersey shape
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

Standard Jersey-type permanent concrete median barrier is in the current design.

PROPOSED ALTERNATIVE:

Use a single slope permanent concrete median barrier in lieu of Jersey-type.

BENEFITS	RISKS/CHALLENGES
• Simplifies construction	• Less energy dissipation (when hit)
• Less complex when constructed in superelevated sections (different elevation on each side)	• May not be "preferred" standard for agency
• Ease of repair if/when hit	•
• Multiple overlays can be applied without impacting geometry	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs*	O&M Costs	Total Life Cycle Cost*
BASELINE ASSUMPTION:	$ 1,208,021	$ 916,000	$ 2,124,021
PROPOSED ALTERNATIVE:	$ 2,177,175	$ 231,000	$ 2,408,175
TOTAL (Baseline less Proposed)	$ (969,154)	$ 685,000	**$ (284,154)**

***NOTE:** Please see next page for corrected initial cost and life cycle cost.

COST

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use single slope barrier wall instead of Jersey shape

DISCUSSION/JUSTIFICATION:

Jersey-type concrete median barrier is currently proposed per the construction plans. However, there are several locations which have superelevated cross-slopes making the construction of the Jersey barrier complex. In these situations, one side is higher than the other. In order to speed up construction and save cost, a single-slope concrete median barrier could be used in the place of the Jersey barrier. The single-slope concrete barrier will allow for safe separation of traffic, while allowing for more speedy construction and at a lesser cost.

The single-slope concrete median barrier offers benefits that include:
- Ease of construction
- Longer life expectancy
- Less frequent "mill and fill" required
- Ease of repair if/when damaged

ACTUAL COST SAVINGS ARE MUCH GREATER THAN INDICATED IN DETAIL TAB, DUE TO AN ERROR ON THE ORIGINAL COST ESTIMATE. THE ORIGINAL COST ESTIMATE SHOWS ONLY 21 LF, WHEN ACTUAL QUANTITY IS 20,735 LF. FURTHER, THE $58.26 UNIT PRICE APPEARS INCORRECT BASED ON ACTUAL BID PRICES ON PREVIOUS KYTC PROJECTS.

REVISED BASELINE COST (JERSEY BARRIER) = 20,735 LF x $175 = $3,628,625
PROPOSED SINGLE SLOPE BARRIER = 20,735 X $105 = $2,177,175
INITIAL REALIZED SAVINGS FOR THIS SUBSTITUTION = $1,451,450
REPLACEMENT COSTS = $685,000
TOTAL INITIAL PLUS REPLACEMENT COSTS = $2,139,450

IMPLEMENTATION CONSIDERATIONS:

During the week of this VE study, it was assumed a Type 14a barrier wall would be utilized instead of a Type 12c barrier wall. This seemed more plausible given average unit bid prices did not show the Type 12c barrier wall being used for the last 5 to 6 years. Also the estimate provided for the project seemed to show out-of-date bid item prices for the original Type 12c barrier wall intended to be used. During the VE implementation meeting held in District 8, it was determined that the Type 12c barrier wall would actually be used since this type of (narrow) wall is used when lighting will not be mounted to the top. The Type 14a barrier wall is used when lighting will be installed during construction or at a later date. The Project Manager was also able to provide more accurate prices from past bids for the Type 12c barrier wall and single slope wall putting them at $65.00 and $85.00 per foot, respectively. In this case, the traditional Type 12c barrier wall in plans and estimate will be significantly less expensive to construct.

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use single slope barrier wall instead of Jersey shape

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Concrete Median Barrier Type 12C (50")		LF	20,735	58.26	1,208,021			
Single Slope Median Barrier						20,735	105.00	2,177,175
					1,208,021			**2,177,175**
							(BASELINE LESS PROPOSED)	**(969,154)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use single slope barrier wall instead of Jersey shape

Assumptions			
Interest/Discount Rate (%):	3.5%	**Economic Life (yrs):**	40

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Replace Jersey Barrier (after second resurface)	40	3,628,625	916,491		
2	Single Slope Wall	80			3,628,625	231,480
3						
4						
5						
Total Salvage & Replacement Costs			**3,628,625**	**916,491**	**3,628,625**	**231,480**

Annual Costs (pres worth calculated over 40 yrs)		**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs					

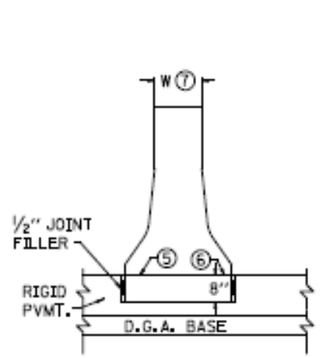
SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth)	916,000	231,000
RESULTS (Proposed less baseline)		**685,000**

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

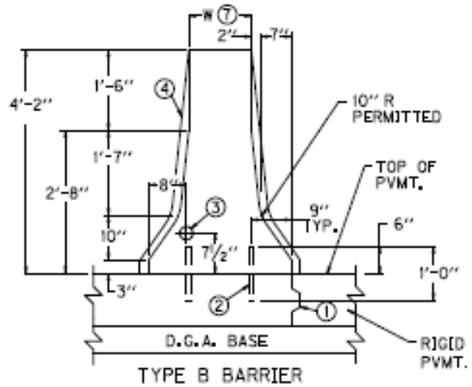
VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use single slope barrier wall instead of Jersey shape

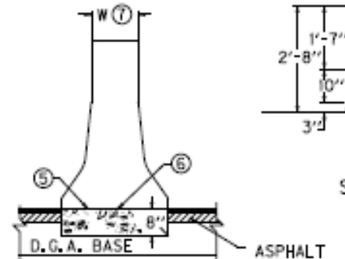
SKETCH OF BASELINE ASSUMPTION



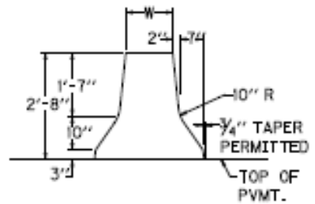
TYPE A BARRIER
(NEW RIGID PAVEMENT)



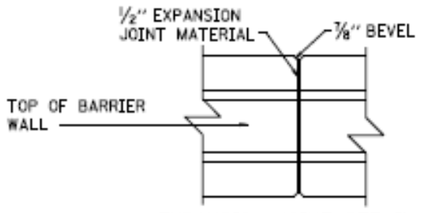
TYPE B BARRIER
(NEW RIGID PAVEMENT)



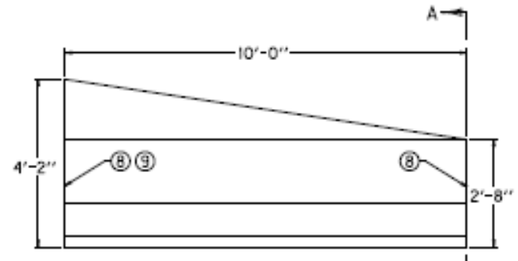
TYPE C BARRIER
(NEW FLEXIBLE PAVEMENT)



SECTION A-A



EXPANSION JOINT DETAIL



WALL TRANSITION
(ELEVATION VIEW)

~ NOTES ~

THE CONTRACT UNIT PRICE PER LINEAR FOOT FOR "CONCRETE MEDIAN BARRIER TYPE ☆ ⊕ 50" SHALL BE FULL COMPENSATION FOR ALL MATERIALS, EQUIPMENT, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.

☆ 12 OR 14 DEPENDING ON "W".

⊕ A, B OR C DEPENDING ON PAVEMENT TYPE.

① LONGITUDINAL CONSTRUCTION JOINT WITHOUT TIE BARS IS REQUIRED AND SHALL BE PLACED AT THE LOCATION SHOWN OR MAY BE INSTALLED AT THE CORRESPONDING POINT ON THE OPPOSITE SIDE OF THE BARRIER, AT THE OPTION OF THE CONTRACTOR. IT SHALL BE REQUIRED ON THE LOW SIDE OF A SUPERELEVATED SECTION.

② NO. 8 DOWEL BARS SPACED 4'-0" O.C. AND STAGGERED 2'-0".

③ 3" RACEWAY (TYPICAL). SEE ELSEWHERE IN THE PLANS FOR LOCATION AND PAYMENT FOR RACEWAY WHEN REQUIRED.

④ WALL MAY BE FIXED-FORMED AS DEPICTED BY PHANTOM LINES.

⑤ WHEN A CONSTRUCTION JOINT IS USED, DOWEL BARS WILL BE REQUIRED AS SHOWN WITH TYPE B BARRIERS.

⑥ CONSTRUCTION JOINT PERMITTED WHEN FIXED FORMS OR SLIP FORMS ARE USED.

⑦ A 14" WALL WITH 3" RACEWAY IS REQUIRED WHEN THE ROADWAY WILL BE LIGHTED FROM THE MEDIAN.

⑧ THE WALL TRANSITION DETAILED IS FOR A FIXED-FORM OR SLIP-FORM WALL. SEE CURRENT STANDARD DRAWING RBM-053 FOR CONNECTION DETAILS, STEEL PLACEMENT, LIFTING HOLE DIMENSIONS, ETC. WHEN WALL IS PRECAST.

⑨ SEE TYPE B BARRIER DETAIL FOR WALL DIMENSIONS.

APPROX. QUANTITIES PER LINEAR FOOT

TYPE	12" WALL		14" WALL	
	CONC. IN CU. YDS.	STEEL IN POUNDS	CONC. IN CU. YDS.	STEEL IN POUNDS
A	0.27	△ 1.34	0.30	△ 1.34
B	0.21	1.34	0.23	1.34
C	0.27	△ 1.34	0.30	△ 1.34

△ WHEN REQUIRED

CONCRETE QUANTITIES SHOWN INCLUDE 8" BASE THICKNESS FOR TYPE A AND TYPE C. THE CONTRACTOR IS RESPONSIBLE FOR ADDITIONAL CONCRETE QUANTITIES.

USE WITH CUR. STD. DWG. RBM-053

KENTUCKY DEPARTMENT OF HIGHWAYS

CONCRETE MEDIAN BARRIER FIXED-FORM OR SLIP-FORM (PERMANENT) (50" TALL WALL)

STANDARD DRAWING NO. RBM-050-01

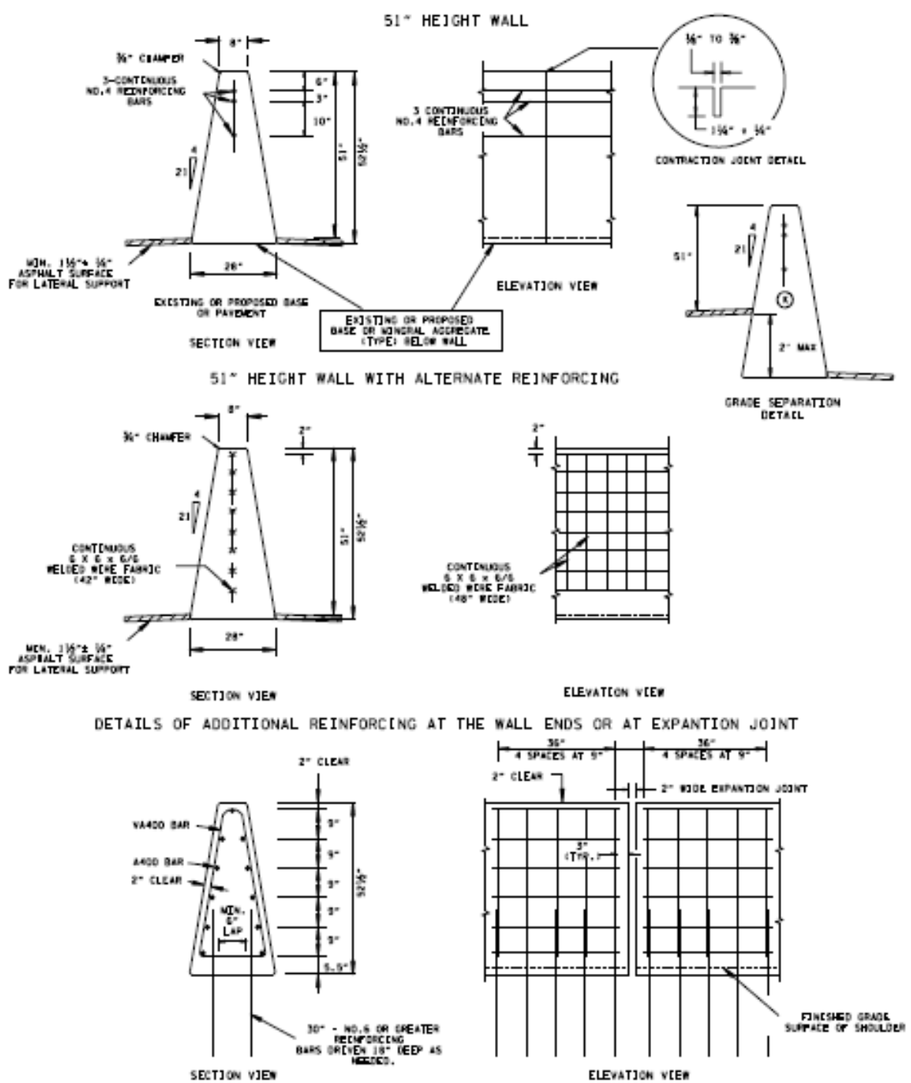
SUBMITTED: 12-01-15 DATE

APPROVED: 12-01-15 DATE

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use single slope barrier wall instead of Jersey shape

SKETCH OF PROPOSED ALTERNATIVE



DELINEATOR NOTES

1. MEDIAN BARRIER DELINEATOR REFLECTIVE SHEETING SHALL MEET ASTM D4956, TYPE V SPECIFICATIONS. DELINEATORS WITH DIMENSIONS OTHER THAN 4" X 3" MAY BE USED IF THE PRODUCT IS ON THE APPROVED PRODUCTS LIST. THE VARIATIONS IN DELINEATOR DIMENSION SHOULD NOT EXCEED A 10%. DIFFERENT SIZE OR MANUFACTURED MEDIAN BARRIER DELINEATORS SHOULD NOT BE MIXED IN THE SAME LINE.
2. MEDIAN BARRIER DELINEATORS SHALL BE HIGH IMPACT, UV-STABILIZED, ENGINEERED THERMOPLASTIC OR POLYCARBONATE SUBSTRATE. SEE TDOT APPROVED QUALIFIED PRODUCT LISTS FOR ACCEPTABLE PRODUCTS.
3. MEDIAN BARRIER DELINEATORS WILL NOT BE REQUIRED IN AREAS WHERE ROADWAY IS LIGHTED.
4. SINGLE WHITE REFLECTIVE SHEETING WILL BE SUBSTITUTED FOR THE DOUBLE YELLOW REFLECTIVE SHEETING WHEN TRAFFIC ON EACH SIDE OF THE BARRIER IS GOING IN THE SAME DIRECTION.
5. THE COST OF FURNISHING AND INSTALLING MEDIAN BARRIER DELINEATORS, INCLUDING ALL MATERIALS, LABOR, AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN BID PRICE FOR CONCRETE MEDIAN BARRIER.
6. MEDIAN BARRIER DELINEATORS SHALL BE MOUNTED TO THE CONCRETE MEDIAN BARRIER WITH A ONE COMPONENT ADHESIVE AS RECOMMENDED BY THE MANUFACTURER. THEY SHALL BE INSTALLED NO EARLIER THAN THREE WEEKS AFTER THE TEXTURE COATING HAS BEEN APPLIED.

GENERAL NOTES

A. CONCRETE BARRIER WALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, SECTION 711 AND/OR CURRENT SPECIAL PROVISIONS.

B. IF SAWED CONTRACTION JOINTS ARE USED, THE JOINTS MUST BE SAWED WITHIN FOUR (4) HOURS AFTER THE CONCRETE IS PLACED.

C. THE CONTRACTION JOINTS ARE TO BE SPACED AT 20 TO 25 FOOT INTERVALS WHEN CONSTRUCTED ON ASPHALT PAVEMENT. WHEN THE CONCRETE BARRIER WALL IS ATTACHED TO CONCRETE PAVEMENT THE CONTRACTION JOINTS WILL CORRESPOND TO THE JOINTS IN THE CONCRETE PAVEMENT. THE COST OF MATERIAL AND LABOR FOR THE JOINT INSTALLATION SHALL BE INCLUDED IN THE BID PRICE FOR CONCRETE MEDIAN BARRIER.

D. THE CONCRETE BARRIER WALL SHALL BE GIVEN AN APPLIED TEXTURE FINISH. THE COLOR OF THE FINISH SHALL BE WHITE. FEDERAL SPECIFICATION NO. 37886. THE COST OF MATERIALS AND LABOR FOR THE TEXTURE FINISH SHALL BE INCLUDED IN THE BID PRICE FOR CONCRETE MEDIAN BARRIER.

E. THE TWO (2) INCH OPEN EXPANSION JOINTS SHALL BE PLACED AT A MAXIMUM SPACING NOT TO EXCEED 300 FEET. IF FIXED OBJECTS SUCH AS BRIDGE PIERS, BRIDGE ENDS, OVERHEAD SIGN SUPPORTS, OR OTHER FEATURES PROJECTING THROUGH, INTO OR AGAINST THE BARRIER EXIST THAT REQUIRE TWO INCH EXPANSION JOINTS, THEN THE DISTANCE BETWEEN THE EXPANSION JOINTS IS TO BE REDUCED OR INCREASED TO ALLOW AN EQUAL DISTANCE BETWEEN JOINTS THAT IS LESS THAN 300 FEET. ALL ADDITIONAL STEEL REQUIRED AT EXPANSION JOINTS TO BE EPOXY COATED REINFORCING STEEL. THE COST OF MATERIAL AND LABOR FOR THE JOINT INSTALLATION SHALL BE INCLUDED IN THE BID PRICE FOR CONCRETE MEDIAN BARRIER.

F. CHAMFER TOP AND END EDGES ¾ INCH.

G. BAR SPLICES FOR ROADWAY BARRIER SHALL BE A MINIMUM OF 24 TIMES THE NOMINAL DIAMETER OF THE BAR.

H. ANY METHOD REVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL ROADWAY REINFORCING STEEL WILL BE FIXED AGAINST MOVEMENT AND POSITIONED ± ½ INCH AS DIMENSIONED WHEN TIED TO THE TRANSVERSE ROADWAY REINFORCING STEEL WILL BE SATISFACTORY.

I. PAYMENT WILL BE MADE UNDER ITEM NO. 711-05.71, 51" SINGLE SLOPE CONCRETE BARRIER WALL PER LINEAR FOOT.

J. MIN. SAFETY PERFORMANCE OF 51" SINGLE SLOPE WALL IS ACCEPTABLE ACCORDING TO THE TL-4 EVALUATION CRITERIA SPECIFIED IN NCHRP REPORT 350.

K. IF GRADE SEPARATION EXCEEDS 2" USE S-6SWB-9 INSTEAD.

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Close road at KY 3275 bridge during bridge reconstruction and detour traffic
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The KY 3275 bridge is proposed to be constructed using part width construction with a temporary traffic signals and one lane traffic.

PROPOSED ALTERNATIVE:

Close KY 3275, then construct the bridge and use a detour on KY 3275 to KY 1505 to US 25, a distance of appoximately 9.2 miles.

BENEFITS	RISKS/CHALLENGES
• Reduces construction time	• Some inconvience for users
• Reduces confusion when lane changes	•
• Improves final product	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 33,520	$ -	$ 33,520
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 33,520	$ -	**$ 33,520**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road at KY 3275 bridge during bridge reconstruction and detour traffic

DISCUSSION/JUSTIFICATION:

The proposed alternative is to close KY 3275, then construct the bridge, eliminating the temporary signal and all associated Traffic Control necessary to maintain one-lane. The ADT on this route was 471 in 2015. A detour would be signed from KY 3275 to KY 1505 to US 25, a distance of appoximately 9.2 miles from the point of closure back to the closure on the opposite side of the bridge. For most users, the point of destination would most likely not be to the opposite side of the bridge and therefore would be less than the 9.2 miles. The bridge construction should occur at a different time than the KY 1505 bridge construction. *(See Value Engineering Proposal M-33)*

The average motorist can assume to travel the detour in no more than five to six miles. With a temporary traffic signal, delays can result be up to two or three minutes, about one-half the time as traveling the detour.

This value engineering proposal would involve editing the Traffic Control Plan and revising the contruction estimate. Bid Item 02650 - Maintain and Control Traffic would need to be updated.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road at KY 3275 bridge during bridge reconstruction and detour traffic

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Bid Item 04933 Temporary Signal 2 Phase		EA	2	7,000.00	14,000			
Bid Item 06551 Pavement Striping-Temporary Rem Tape-Y		LF	1000	1.34	1,340			
Bid Item 06550 Pavement Striping-Temorary Rem Tape-W		LF	1000	1.52	1,520			
Bid Item 02005 Waterfilled Barrier Wall		LF	1000	16.66	16,660			
					33,520			
							(BASELINE LESS PROPOSED)	**33,520**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road at KY 3275 bridge during bridge reconstruction and detour traffic

SKETCH OF BASELINE

KY 3275
Stage One
Place temproary traffic control signals and signs. The temproary traffic control signal timing shall be established by authorized officals. Place Temporary Concrete Barrier Type 9T right of the centerline. Traffic will be maintained on the right portion of the existing bridge. Remove the left portion of the existing bridge and construct the left portion of the proposed stucture. Grade, drain and base course construction of the approach roadways.

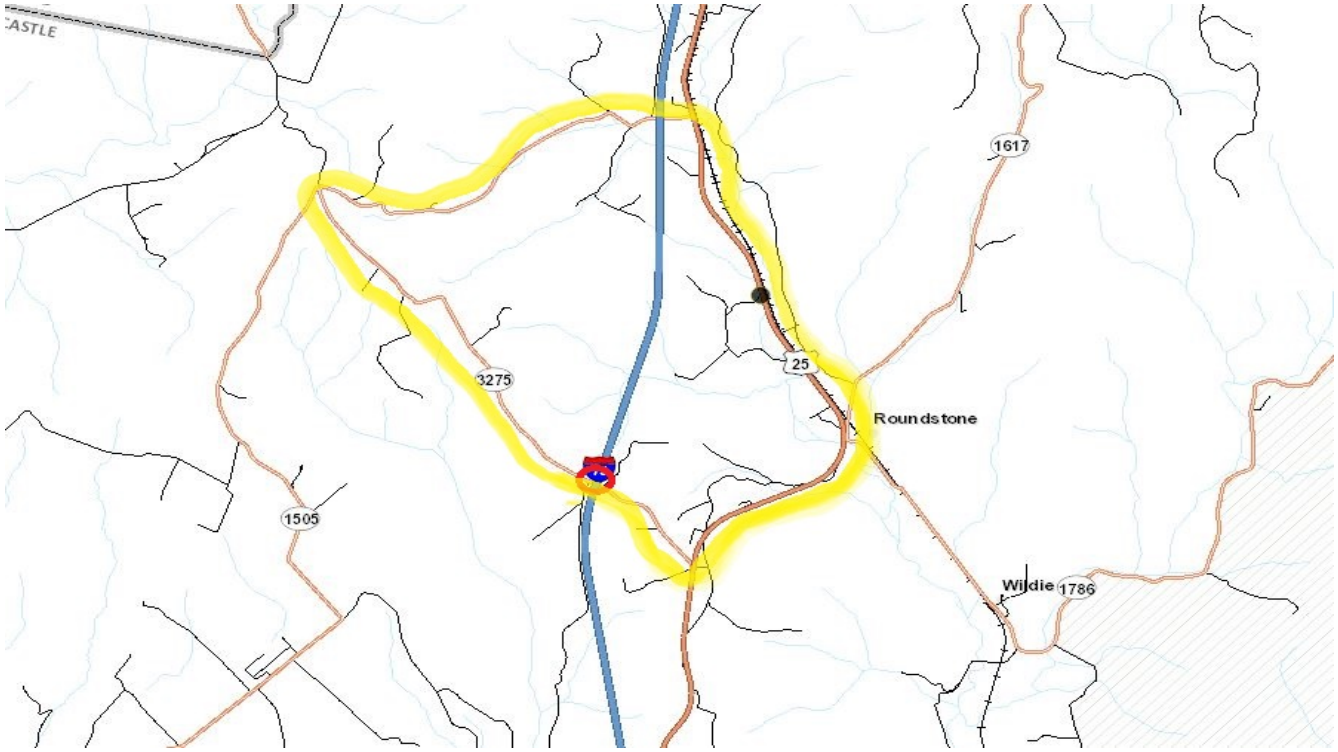
Stage Two
Move temporary barrier to the newly constructed structure and shift traffic to newly constructed structure. Remove the remaining structure and construct the right portion of the proposed structure and grade, drain and base course construction of the approach roadways.

Stage Three
Remove temporary barrier and const final approach roadway surface. Remove temporary traffic control signals and signs.

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road at KY 3275 bridge during bridge reconstruction and detour traffic

SKETCH OF PROPOSED ALTERNATIVE



The map above shows the 9.2-mile detour route.

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Close road to reconstruct KY 1505 bridge
FUNCTION:	**Miscellaneous**

BASELINE ASSUMPTION:

The KY 1505 bridge is proposed to be constructed using part width construction with a temporary traffic signals and one lane of traffic.

PROPOSED ALTERNATIVE:

Close KY 1505, then construct the new bridge in place, eliminating the need for new approaches.

BENEFITS	RISKS/CHALLENGES
• Reduces construction time	• Some inconvenience for users due to the detour
• Reduces confusion when lane changes	• Eliminates use of placing waste on the approach
• Reduces some future maintenance by shortening the approaches	•
• Eliminates an entrance located near the intersection	•
• Improves the quality of the final product	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 67,126	$ -	$ 67,126
PROPOSED ALTERNATIVE:	$ 25,000	$ -	$ 25,000
TOTAL (Baseline less Proposed)	$ 42,126	$ -	**$ 42,126**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road to reconstruct KY 1505 bridge

DISCUSSION/JUSTIFICATION:

The proposed alternative is to close KY 1505, then construct the new bridge in place, eliminating the need for new approaches. The ADT was 958 in 2013. A detour on KY 1505 to KY 3275 to US 25 with a distance of appoximately 9.2 miles would be signed. The detour would be appoximately 9.2 miles from the point of closure back to the closure on the opposite side of the bridge. For most users, the point of destination would most likely not be to the opposite side of the bridge and therefore would be less than the 9.2 miles. The bridge construction should occur at a different time than the KY 3275 bridge construction. Because it has a larger ADT than KY 3275, this bridge construction would be best to occur over the summer months in order to minimize the impact to shool traffic. *(See Value Engineering Proposal No. 14)*

The average motorist can assume to travel the detour in no more than five to six miles. With a temporary traffic signal, delays can result in up to two or three minutes, about one-half the time as traveling the detour.

This would involve editing the proposed bridge plans by replacing the bridge in-place and deleting the proposed new approaches. Because the bridge lengths and geotechnical conditions should not differ, these plans as presented, should be able to shift with only minimal edits. Bridge and roadway bid items, along with Maintain and Control Traffic would need to be updated.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Close road to reconstruct KY 1505 bridge

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Bid Item 00001 DGA		TON	450	21.62	9,729			
Bid Item 00212 Asphalt Base 1.00D PG64-22		LF	625	70.43	44,019			
Bid Item 00307 Asphalt Surface 0.38D PG64-22		LF	150	89.19	13,379			
Contract Modification for changing the design plans						LS	25,000.00	25,000
					67,126			**25,000**
							(BASELINE LESS PROPOSED)	**42,126**

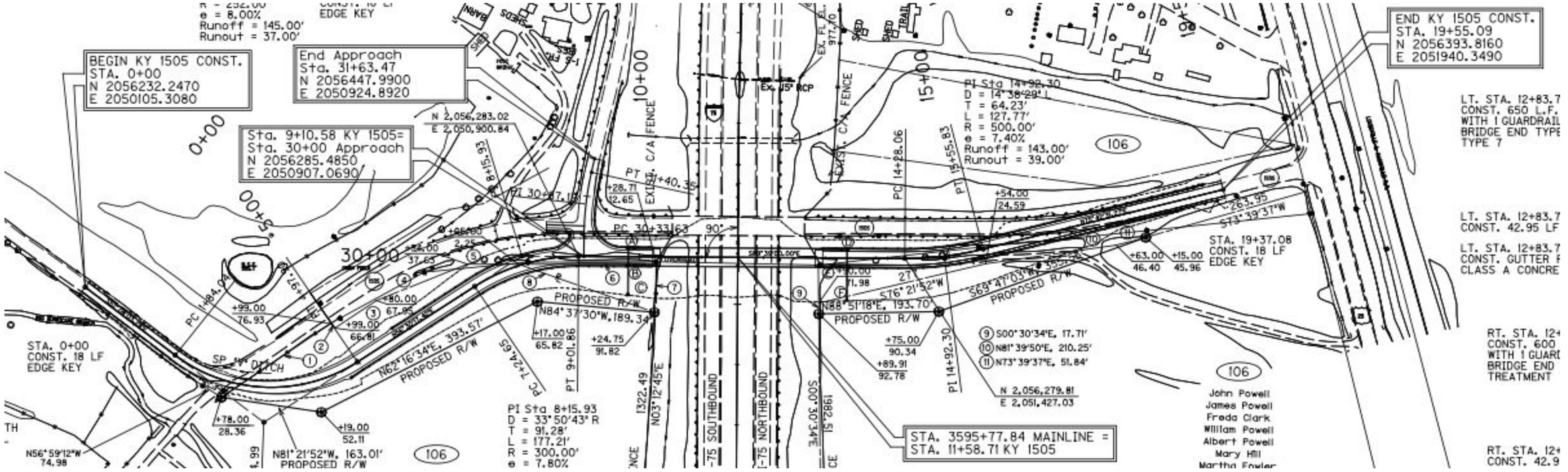
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Close road to reconstruct KY 1505 bridge

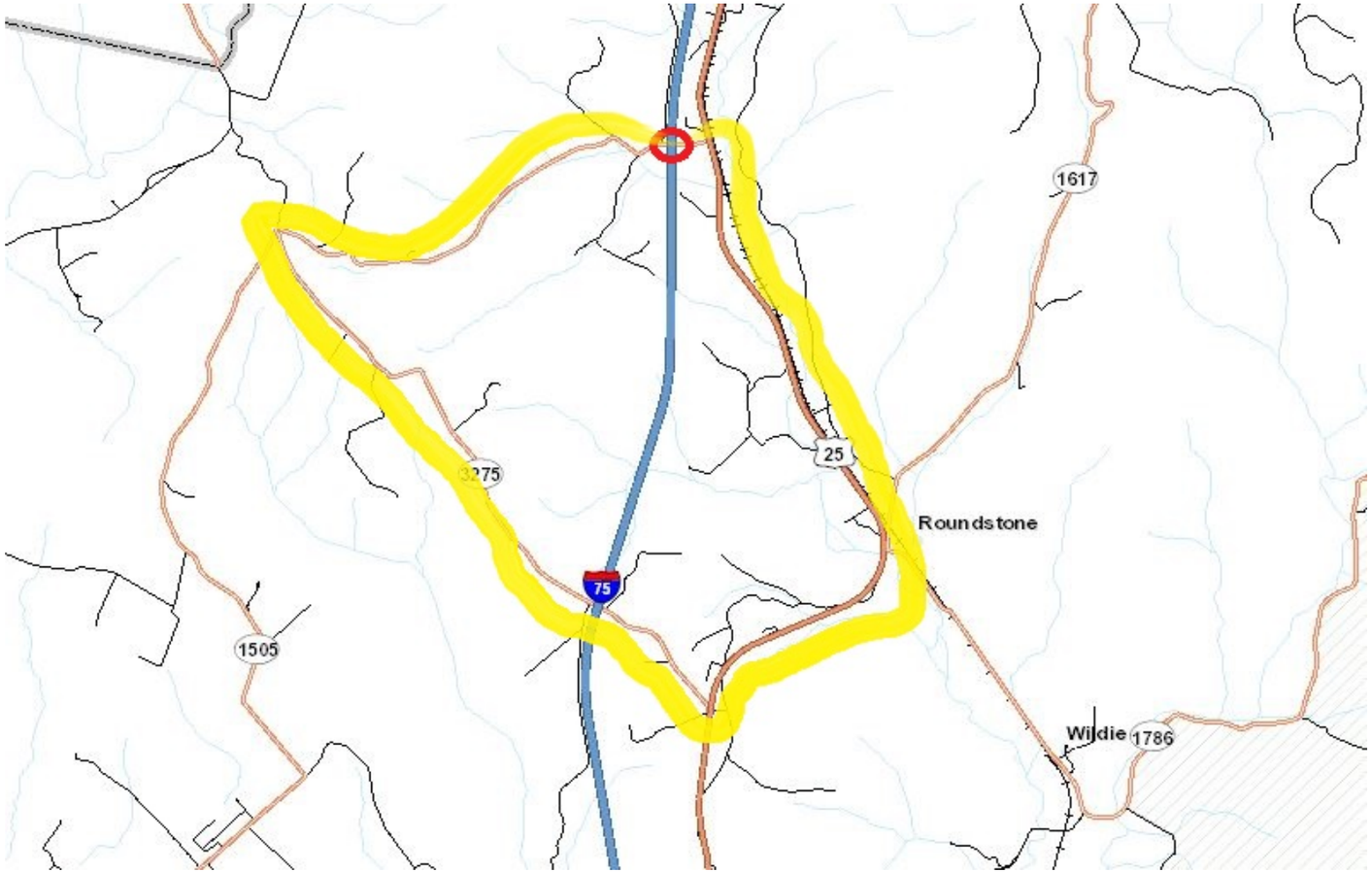
SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Close road to reconstruct KY 1505 bridge

SKETCH OF PROPOSED ALTERNATIVE



The map above shows the 9.2-mile detour route.

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add work zone warning signs with positive messages

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone.

PROPOSED ALTERNATIVE:

Place positive signage in the work zone to remind drivers that the workers are humans and have families. It is proposed that there will be several for the northbound and several for the southbound traffic.

BENEFITS	RISKS/CHALLENGES
• Makes drivers more conscientious of speed	• None apparent
• Reminds drivers that "someone's family member works here"	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 960	$ -	$ 960
TOTAL (Baseline less Proposed)	$ (960)	$ -	**$ (960)**

COST

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add work zone warning signs with positive messages

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the project is located in a hilly, rural location, where the posted speed limit is 70 mph. Likely, there will be a consistent flow of cars, SUVs, trucks and recreational vehicles that will be driving through the construction zone at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Therefore, positive signs should help remind drivers that the workers are fellow humans and have families. The signs should be placed in areas where there will be consistent construction or where the workers are most vulnerable.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add work zone warning signs with positive messages

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
4 Positive Construction Signs		SF				128	7.50	960
								960
							(BASELINE LESS PROPOSED)	**(960)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Add work zone warning signs with positive messages

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Phase 1A Maintenance of Traffic note correction

FUNCTION: **Simplify Phasing**

BASELINE ASSUMPTION:

Traffic Control Plan Sheet R 51 Phase 1A: Mill existing lanes plus 4 feet of outside shoulder and resurface with 1 inch class 4 asphalt 0.388B PG 64-722.

PROPOSED ALTERNATIVE:

Phase 1A: Resurface existing lanes plus 4 feet of outside shoulder with 1 inch class 4 asphalt 0.388B PG 64-722. Narrow driving lanes from 12 ft. to 11 ft.

BENEFITS	RISKS/CHALLENGES
• Clarity in wording and when to narrow lanes to 11 feet with new striping	• None apparent
• Wording eliminates "mill" which is no longer being done on mainlines	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Phase 1A Maintenance of Traffic note correction

DISCUSSION/JUSTIFICATION:

While moving from Phase 1A to Phase 1B it should be stated that with the new surfacing, the contractor shall stripe the new pavement; it is not stated until the reference in Phase 1B to narrow to 11-foot lanes. By the end of Phase 1A, this striping should be completed and, therefore, needs to be referenced in Phase 1.

In addition, milling is eliminated on mainline; however, the VE team was unsure about the shoulders.

This value engineering proposal would be accomplished by making an edit to the Traffic Control Plan prior to submitting plans for letting.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use social media to inform public and communicate project status and updates

FUNCTION: **Maintain Access**

BASELINE ASSUMPTION:

Project updates will be added to the District's website and to 511 website.

PROPOSED ALTERNATIVE:

In addition to the District`s website and the 511 website, the public relations officer would doing the following to inform the public about construction updates for the project:

- Update Twitter, Facebook, etc. daily with developments for the project
- Set up an email server/text message server for major users of this route, especially truck drivers and local traffic
- Use Facebook, Twitter, email, text message to notify the public of any emergencies or major changes the project.

This can be done in conjunction with the following, especially for emergencies and major traffic changes:

- Message Boards
- AM Radio channel devoted to the project

BENEFITS	RISKS/CHALLENGES
● Informs the public	● Keeping information current and up-to-date
● Reduces delays	● Access to social media
● Enhances safety	●
● Reduces frustration from the public	●
●	●
●	●
●	●

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use social media to inform public and communicate project status and updates

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the project is located in a hilly, rural location, where the posted speed limit is 70 mph. Likely, there will be a consistent flow of cars, SUVs, trucks and recreational vehicles that will be driving through the construction zone at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Therefore, it will be beneficial if the public relations officer uses social media to communicate with the public about updates on the project and about emergencies that occur during construction, since this will keep the public informed and help increase safety.

KYTC has used social media on several other projects to keep the public informed about lane changes and lane closures. KYTC District 6 has used social media on its I-75, and 275 projects to notify the public on lane closures, switching of lanes, emergencies, and any other information that was valuable to the public. In addition, KYTC District 7 used Twitter to notify the public about construction issues and delays on its Leestown road project. The Twitter had 277 followers, yet the followers, which include the media, rebroadcasted the tweet. This was an effective way to inform the public about the construction of the project.

The following considerations will need to be addressed:

• The information should be monitored to ensure that it is up-to-date and relevant to the drivers, especially the message boards, radio and Twitter.

• Everything is updated at the same time, there should be no conflicting information.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Use A+B bidding instead of low bid
FUNCTION:	**Miscellaneous**
BASELINE ASSUMPTION:	
Current design uses a low bid process.	
PROPOSED ALTERNATIVE:	
As an alternative, use the A+B bidding process.	

BENEFITS	RISKS/CHALLENGES
• Reduces construction time	• Contractor might rush to meet schedule which could affect quality of workmanship
• Reduces user delay cost	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Use A+B bidding instead of low bid

DISCUSSION/JUSTIFICATION:

Two key issues for this project's consideration: First, to minimize impacts to motorists on I-75, the A+B bidding will provide a target date set by the contractor with strong penalties for not completing constrction by the scheduled date. Second, experience blasting of for rock excavation on this project is important because of the narrow rock slivers to be removed can result in rock debri from blast operations in the contractor is not experienced with blasting and, therefore, not necessarily depend on the lowest bid will allow a contractor to pay a more experienced driller/blasting person. The time factor will help to guarantee experience in order to meet the times.

SPECIAL NOTE FOR FIXED COMPLETION DATE AND DISINCENTIVE FEES "A+B"

Fixed Completion Dates and "A+B" Bidding. The procedure for evaluation of bids on this project involves an "A+B" concept. The "A" component of the bid involves the dollar amount for all work to be performed under the contract.

The "B" component involves the number of calendar days that I-75 is out of its normal configuration for times other than those allowed in the Maintenance of Traffic (MOT) plans.

This project will have a fixed completion date for completion of all work.

A disincentive fee of $10,000 per day will be charged for each calendar day that all work is not completed after the specified end date. These fees are in addition to contract liquidated damages per the Standard Specifications. Contrary to Section 108.09 of the Standard Specifications, the $10,000 per day disincentive and/or contract liquidated damages will be charged during the months of December through March if all required work is not completed.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE:	Create lane rental to minimize overages on lane closures
FUNCTION:	**Miscellaneous**
BASELINE ASSUMPTION:	
Standard liquidated damages are applied to the project.	
PROPOSED ALTERNATIVE:	
Modify project notes to apply escalating damages for lane closures.	

BENEFITS	RISKS/CHALLENGES
• Greater emphasis on traffic conveyance	• None apparent
• Reduces impacts during construction	•
• Reduces traffic back-ups	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

TITLE: Create lane rental to minimize overages on lane closures

DISCUSSION/JUSTIFICATION:

By using escalating lane rental rates for partial and full lane closures, emphasis is given to the conveyance of traffic over contractor profitability. Due to the high traffic volumes, it is reasonable to apply lane rentals to minimize road user delay costs. Due to the high traffic volumes, it is reasonable to apply lane rentals to minimize road user delay costs. Lane rental rates are based heavily on user costs rather than liquidated damage rates set by project cost.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

APPENDICES

APPENDIX A
Study Participants

VALUE ENGINEERING STUDY ATTENDEES
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30), Rockcastle County
Kentucky Transportation Cabinet
September 20-22, 2016

September			Name	Organization	Position	Office Phone Cell Phone	Email
20	21	22					
X			Andre Johannes	KYTC	Project Manager		Andre.Johannes@ky.gov
		X	Randy Turner	KYTC	Highway Design		Randy.Turner@ky.gov
X	X	X	Brent Sweger	KYTC	Quality Assurance Branch TEBM		Brent.Sweger@ky.gov
P		X	Clint Goodwin	Vaughn & Melton	Designer		
X	X	X	Shawn Russell	KYTC	Value Engineering	Off: (502) 782-4926	Shawn.Russell@ky.gov
X	X	X	Bob Jones	KYTC	VE Team	Off:	Bob.Jones@ky.gov
X	X	X	Chris Jenkins	Qk4	VE Team: Construction	Off: (865) 661-1554 Cell: (865) 254-3118	cjenkins@qk4.com
X	X	X	Jeremiah Littleton	Qk4	VE Team: Construction	Off: (502) 585-2222 Cell: (606) 261-0684	jlittleton@qk4.com
X	X	X	Keith Damron	American Engineers, Inc.	VE Team: Roadway	Off: (502) 245-3813 Cell: (502) 409-2544	kdamron@aei.cc
X	X	X	Anthony Norman	KYTC	VE Team	Off:	Anthony.Norman@ky.gov
X	X	X	Patrice Miller	RHA, LLC	VE Team Leader	Off: (602) 493-1947 Cell: (480) 773-8533	Patrice@TeamRHA.com

P = via Phone

VALUE ENGINEERING STUDY ATTENDEES
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30), Rockcastle County
Kentucky Transportation Cabinet
September 20-22, 2016

September			Name	Organization	Position	Office Phone Cell Phone	Email
20	21	22					
X			Danny Jasper	KYTC CO - Construction	Tran Engr Spec	Off: (812) 630-5867	Danny.Jasper@ky.gov
X		X	Claire Stapleton	KYTC	Intern	Off:	
X		X	Joe Tucker	KYTC CO	TEBM	Off: (502) 782-4915	Joseph.Tucker@ky.gov
		X	Tamra Wilson	KYTC D8	CDE	Off: (606) 677-4017	Tamra.Wilson@ky.gov
		X	Sue Gossage	KYTC D8	TEBM	Off: (606) 677-4017	Joseph.Gossage@ky.gov
		X	Ryan Tenges	FHWA		Off: (502) 223-6750	Ryan.Tenges@dot.gov
		X	Paul Looney	KYTC	Deputy State Highway Engineer	Off: (502) 782-4897	Paul.Looney@ky.gov
		X	Andy Barber	KYTC	Deputy State Highway Engineer	Off: (502) 551-4828	Andy.Barber@ky.gov
		X	Patty Dunaway	KYTC	State Highway Engineer	Off: (502) 782-4917 Cell: (270) 401-5350	Patty.Dunaway@ky.gov

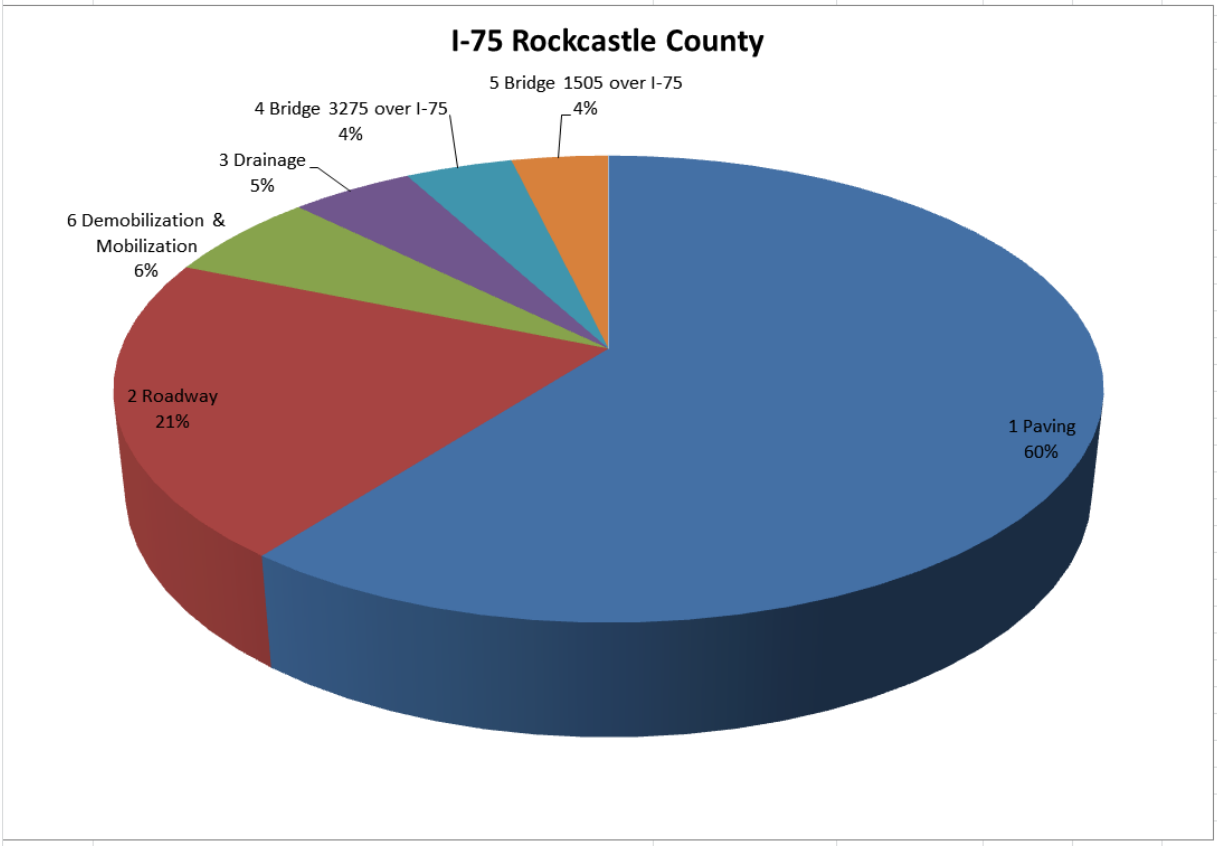
P = via Phone

APPENDIX B
Pareto Cost Models

Appendix B – Cost Model and Cost Estimate Corrections

The team reviewed and discussed the project's cost model (below). The VE team also reviewed the cost estimate, the basis of the cost model, and unit prices were adjusted and/or updated; the cost estimate corrections are shown on the following pages.

Group #	Name		Cost	% of Total Project	
1	Paving	$	19,857,138	60.51%	60.51%
2	Roadway	$	6,806,821	20.74%	81.25%
6	Demobilization & Mobilization	$	2,002,916	6.10%	87.35%
3	Drainage	$	1,557,132	4.74%	92.10%
4	Bridge 3275 over I-75	$	1,364,000	4.16%	96.25%
5	Bridge 1505 over I-75	$	1,229,000	3.75%	100.00%
	TOTAL	**$**	**32,817,007**		



Estimate 8-6.3

Based on Average Unit Bid Prices for
Districts 7, 8, and 11
Letting Years 2011-2015
~$45,700,000
15%
~$52,500,000

Estimated Cost:$32,817,006.50

Contingency: 15.00%

Estimated Total: $37,739,557.48

I-75 Rockcastle County

Base Date: 03/17/16

Spec Year: 08

Unit System: E

Work Type: GRADE, DRAIN & SURFACE WITH BRIDGE

Highway Type: INTERSTATE

Urban/Rural Type: RURAL

Season: WINTER

County: ROCKCASTLE

Latitude of Midpoint: 372639

Longitude of Midpoint: 842018

District: 08

Federal/State Project Number: FD 52 1002 0075 064-069

Prepared by System Administrator on 03/17/16

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price			Extension
Group 0001: PAVING							
0144	00001 DGA BASE	90,763.00	TON	$21.62	$36.445	$3,307,857	$1,962,296.06
0145	00018 DRAINAGE BLANKET-TYPE II-ASPH	94,826.00	TON	$40.33	$59.00	$5,594,734	$3,824,332.58
0146	00100 ASPHALT SEAL AGGREGATE	414.00	TON	$94.71			$39,209.94
0147	00190 LEVELING & WEDGING PG64-22	40,000.00	TON	$70.71	$81.567	$3,262,680	$2,828,400.00
0148	00212 CL2 ASPH BASE 1.00D PG64-22	1,668.00	TON	$70.43			$117,477.24
0149	00214 CL3 ASPH BASE 1.00D PG64-22	11,157.00	TON	$58.75	$66.69	$744,060	$655,473.75
0150	00217 CL4 ASPH BASE 1.00D PG64-22	78,953.00	TON	$55.54	$56.78	$4,482,951	$4,385,049.62
0151	00219 CL4 ASPH BASE 1.00D PG76-22	44,238.00	TON	$62.18	$70.128	$3,102,322	$2,750,718.84
0152	00291 EMULSIFIED ASPHALT RS-2	50.00	TON	$549.92			$27,496.00
0153	00307 CL2 ASPH SURF 0.38B PG64-22	379.00	TON	$89.19			$33,803.01
0154	00339 CL3 ASPH SURF 0.38D PG64-22	4,699.00	TON	$74.38			$349,511.62
0155	00342 CL4 ASPH SURF 0.38A PG76-22	22,318.00	TON	$82.91	$85.643	$1,911,380	$1,850,385.38
0156	02676 MOBILIZATION FOR MILL & TEXT	1.00	LS	$2,865.00			$2,865.00
0157	02677 ASPHALT PAVE MILLING & TEXTURING	3,417.00	TON	$17.38			$59,387.46
0158	23142ES403 CL4 ASPH SURF 0.38B PG 64-22	9,132.00	TON	$106.30			$970,731.60
						Total for Group 0001:	$19,857,138.10
Group 0002: ROADWAY							
0005	00078 CRUSHED AGGREGATE SIZE NO 2	2,118.00	TON	$23.67			$50,133.06
0006	01000 PERFORATED PIPE-4 IN	46,600.00	LF	$6.29			$293,114.00

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price			Extension
0007	01001 PERFORATED PIPE-6 IN	23,148.00	LF	$6.53			$151,156.44
0008	01010 NON-PERFORATED PIPE-4 IN	1,856.00	LF	$13.20			$24,499.20
0009	01020 PERF PIPE HEADWALL TY 1-4 IN	48.00	EACH	$451.77			$21,684.96
0010	01021 PERF PIPE HEADWALL TY 1-6 IN KYTC 2008 Unit Summary	1.00	EACH	$685.03			$685.03
0011	01028 PERF PIPE HEADWALL TY 3-4 IN	32.00	EACH	$517.31			$16,553.92
0012	01032 PERF PIPE HEADWALL TY 4-4 IN	37.00	EACH	$485.92			$17,979.04
0013	01641 JUNCTION BOX-15 IN KYTC 2008 Unit Summary	2.00	EACH	$1,500.00			$3,000.00
0014	01643 JUNCTION BOX-24 IN KYTC 2008 Unit Summary	1.00	EACH	$1,500.00			$1,500.00
0015	01644 JUNCTION BOX-30 IN KYTC 2008 Unit Summary	1.00	EACH	$2,362.50			$2,362.50
0016	01741 CORED HOLE DRAINAGE BOX CON-6 IN KYTC 2008 Unit Summary	107.00	EACH	$70.00			$7,490.00
0017	01845 ISLAND INTEGRAL CURB KYTC 2008 Unit Summary	116.00	LF	$36.13			$4,191.08
0018	01967 CONC MEDIAN BARRIER TYPE ~~12C~~ 14C KYTC 2008 Unit Summary	21.00 20,735	LF	$58.26		$142.62	$1,223.46 $2,957,225
0019	01985 DELINEATOR FOR BARRIER-YELLOW	488.00	EACH	$5.89			$2,874.32
0020	02003 RELOCATE TEMP CONC BARRIER	46,620.00	LF	$6.13			$285,780.60
0021	02014 BARRICADE-TYPE III	32.00	EACH	$221.49			$7,087.68
0022	02159 TEMP DITCH	11,650.00	LF	$0.40			$4,660.00
0023	02200 ROADWAY EXCAVATION	449,596.00	CUYD	$8.00	$20.24	$9,099,823	$3,596,768.00
0024	02242 WATER	883.00	MGAL	$0.18			$158.94
0025	02268 REMOVE & REPLACE FENCE KYTC 2008 Unit Summary	49,765.00	LF	$7.85			$390,655.25

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price			Extension
0026	02351 GUARDRAIL-STEEL W BEAM-S FACE	27,188.00	LF	$15.81	$17.177	$467,008	$429,842.28
0027	02360 GUARDRAIL TERMINAL SECTION NO 1	5.00	EACH	$45.26			$226.30
0028	02367 GUARDRAIL END TREATMENT TYPE 1	13.00	EACH	$2,189.94			$28,469.22
0029	02369 GUARDRAIL END TREATMENT TYPE 2A	12.00	EACH	$610.30			$7,323.60
0030	02371 GUARDRAIL END TREATMENT TYPE 7	7.00	EACH	$1,129.68			$7,907.76
0031	02378 GUARDRAIL CONNECTOR TO BRIDGE END TY D KYTC 2008 Unit Summary	8.00	EACH	$1,565.22			$12,521.76
0032	02381 REMOVE GUARDRAIL	27,785.00	LF	$1.51			$41,955.35
0033	02488 CHANNEL LINING CLASS IV KYTC 2008 Unit Summary	727.00	CUYD	$10.04			$7,299.08
0034	02545 CLEARING AND GRUBBING KYTC 2008 Unit Summary	1.00	LS	$60,000.00			$60,000.00
0035	02562 SIGNS	2,400.00	SQFT	$4.49			$10,776.00
0037	02585 EDGE KEY	134.00	LF	$32.62			$4,371.08
0038	02650 MAINTAIN & CONTROL TRAFFIC	1.00	LS	$200,000.00			$200,000.00
0159	02701 TEMP SILT FENCE	12,600.00	LF	$1.59			$20,034.00
0160	02703 SILT TRAP TYPE A	43.00	EACH	$89.39			$3,843.77
0161	02704 SILT TRAP TYPE B	43.00	EACH	$147.36			$6,336.48
0162	02705 SILT TRAP TYPE C	43.00	EACH	$84.33			$3,626.19
0163	02706 CLEAN SILT TRAP TYPE A	129.00	EACH	$2.59			$334.11
0164	02707 CLEAN SILT TRAP TYPE B	129.00	EACH	$5.38			$694.02
0165	02708 CLEAN SILT TRAP TYPE C	129.00	EACH	$3.31			$426.99

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price			Extension
0166	02709 CLEAN TEMP SILT FENCE	12,600.00	LF	$0.54			$6,804.00
0167	02726 STAKING	1.00	LS	$25,000.00			$25,000.00
0168	02731 REMOVE STRUCTURE	2.00	LS	$40,000.00			$80,000.00
0170	02888 CRASH CUSHION TYPE VI D KYTC 2007 Unit Summary	2.00	EACH	$13,650.00			$27,300.00
0171	02894 CRASH CUSHION TYPE VI-T	3.00	EACH	$5,969.01			$17,907.03
0172	02898 RELOCATE CRASH CUSHION	3.00	EACH	$1,554.96			$4,664.88
0173	03171 CONCRETE BARRIER WALL TYPE 9T	46,620.00	LF	$13.49	$20.115	$937,761	$628,903.80
0174	05950 EROSION CONTROL BLANKET	250.00	SQYD	$2.89			$722.50
0175	05952 TEMP MULCH	206,184.00	SQYD	$0.09			$18,556.56
0176	05953 TEMP SEEDING AND PROTECTION	16,200.00	SQYD	$0.21			$3,402.00
0177	05966 TOPDRESSING FERTILIZER	11.00	TON	$565.73			$6,223.03
0178	05985 SEEDING AND PROTECTION	206,184.00	SQYD	$0.34			$70,102.56
0179	05989 SPECIAL SEEDING CROWN VETCH	49,942.00	SQYD	$0.18			$8,989.56
0180	06417 FLEXIBLE DELINEATOR POST-W	175.00	EACH	$30.06			$5,260.50
0181	06510 PAVE STRIPING-TEMP PAINT-4 IN	209,628.00	LF	$0.13			$27,251.64
0182	06542 PAVE STRIPING-THERMO-6 IN W	74,263.00	LF	$0.66			$49,013.58
0183	06543 PAVE STRIPING-THERMO-6 IN Y KYTC 2008 Unit Summary	49,847.00	LF	$0.70			$34,892.90
0184	06592 PAVEMENT MARKER TYPE V-B W/R	1,229.00	EACH	$22.62			$27,799.98
0185	08100 CONCRETE-CLASS A	21.15	CUYD	$700.91			$14,824.25

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price			Extension
0186	08150 STEEL REINFORCEMENT	264.00	LB	$1.35			$356.40
0187	20911ED HIGH SLUMP 3000 PSI GROUT KYTC 2007 Unit Summary	96.50	CUYD	$200.00			$19,300.00

Total for Group 0002:$6,806,820.64

Group 0003: DRAINAGE

0190	15" cmp	466.00		$100.00			$46,600.00
0191	00461 CULVERT PIPE-15 IN	398.00	LF	$50.65			$20,158.70
0192	00462 CULVERT PIPE-18 IN	284.00	LF	$110.05			$31,254.20
0193	00464 CULVERT PIPE-24 IN	24.00	LF	$113.81			$2,731.44
0194	00466 CULVERT PIPE-30 IN	28.00	LF	$118.49			$3,317.72
0195	00473 CULVERT PIPE-66 IN	28.00	LF	$165.23			$4,626.44
0196	00521 STORM SEWER PIPE-15 IN	14,784.00	LF	$51.07	$54.167	$800,804	$755,018.88
0197	00522 STORM SEWER PIPE-18 IN	852.00	LF	$58.69			$50,003.88
0198	01432 SLOPED BOX OUTLET TYPE 1-15 IN	5.00	EACH	$1,805.92			$9,029.60
0199	01450 S & F BOX INLET-OUTLET-18 IN	2.00	EACH	$2,557.40			$5,114.80
0200	01451 S & F BOX INLET-OUTLET-24 IN	1.00	EACH	$2,957.35			$2,957.35
0201	01452 S & F BOX INLET-OUTLET-30 IN	2.00	EACH	$4,570.51			$9,141.02
0202	01480 CURB BOX INLET TYPE B	8.00	EACH	$4,145.71			$33,165.68
0203	01490 DROP BOX INLET TYPE 1	6.00	EACH	$4,036.27			$24,217.62
0204	01493 DROP BOX INLET TYPE 2	1.00	EACH	$3,355.06			$3,355.06
0205	01559 DROP BOX INLET TYPE 13G	4.00	EACH	$2,984.10			$11,936.40

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0206	01608 CONC MED BARR BOX INLET TY 12B1	54.00	EACH	$5,000.00	$270,000.00
0207	01641 JUNCTION BOX-15 IN	2.00	EACH	$1,500.00	$3,000.00
0208	01643 JUNCTION BOX-24 IN	1.00	EACH	$1,956.98	$1,956.98
0209	01644 JUNCTION BOX-30 IN	1.00	EACH	$2,362.50	$2,362.50
0211	08150 STEEL REINFORCEMENT	1,588.00	LB	$1.35	$2,143.80
0212	08100 CONCRETE-CLASS A	25.52	CUYD	$700.91	$17,887.22
0213	02488 CHANNEL LINING CLASS IV	214.40	CUYD	$10.04	$2,152.58
0214	23804EC CONC MED BARRIER BOX INLET-TY 12A1	1.00	EACH	$5,000.00	$5,000.00
0215	23805EC CONC MED BARRIER BOX INLET-TY 12A2	2.00	EACH	$5,000.00	$10,000.00
0216	23806EC CONC MED BARRIER BOX INLET-TY 12B2	46.00	EACH	$5,000.00	$230,000.00

Total for Group 0003:$1,557,131.87

Group 0004: BRIDGE 3275 OVER INTERSTATE 75

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0219	Bridge on Route 3275 over Interstate 75	1.00	LS	$1,364,000.00	$1,364,000.00

Total for Group 0004:$1,364,000.00

Group 0005: BRIDGE 1505 OVER INTERSTATE 75

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0220	Bridge on Route 1505 over Interstate 75	1.00	LS	$1,229,000.00	$1,229,000.00

Total for Group 0005:$1,229,000.00

Group 0006: DEMOBILIZATION AND MOBILIZATION

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0217	02568 MOBILIZATION	1.00	LS	$1,540,704.53	$1,540,704.53
0218	02569 DEMOBILIZATION	1.00	LS	$462,211.36	$462,211.36

Total for Group 0006:$2,002,915.89

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 project based using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. Those functions identified as high risk or high cost was identified as such and were potentially easy targets for the VE team to brainstorm in the Creative Phase.

FUNCTION	CLASSIFICATION	FUNCTION IDENTIFIED AS HIGH RISK (R) OR HIGH COST ($)
Increase Level of Service	Basic	
Enhance Mobility	Higher Order	
Convey Traffic	Secondary	
Move Freight	Secondary	$
Connect Communities	Secondary	
Reduce Crashes	Secondary	R
Reduce Delays	Secondary	
Reduce User-cost	Secondary	$
Maintain Access (during construction)	Secondary	R, $
Minimize Change-orders	Secondary	$
Improve Constructability	Secondary	
Simplify Phasing	Secondary	R, $
Reduce Ambiguity (plan set)	Secondary	R, $
Maintain Access (bridges)	Secondary	R
Span Space	Secondary	R

FUNCTION	CLASSIFICATION	FUNCTION IDENTIFIED AS HIGH RISK (R) OR HIGH COST ($)
Convey Information	Secondary	R
Limit Access (fencing)	Secondary	
Define Limits (striping)	Secondary	
Accommodate Vehicle	Secondary	
Accommodate Utilities	Secondary	R
Convey Water (and other materials)	Secondary	
Remove Water	Secondary	
Separate Traffic	Secondary	R
Increase Capacity	Secondary	$
Maintain Service	Design Objective	
Meet Schedule	Design Objective	
Protect Workers	All the Time	
Enhance Safety	All the Time	

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 define 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?”.

Design Objective Functions express specific design objectives of the project.

All-the-Time Functions happen all-the-time anywhere in the performance of the project.

A Function Analysis Systems Technique (FAST) diagram was not completed.

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 decision maker/stakeholders identified and defined the following performance attributes as a means to aid the team in evaluating the ideas:

- Schedule
- Bidability/Constructability
    - Quality of documents
    - Ease of construction
    - Promotes competition
    - No change orders
    - Minimize impacts
- Level of Service – "D"
    - Reduce accidents
    - Reduce congestion
- Maintenance of Traffic – 55 mph in the construction zone

Evaluation Process

To aid in the evaluation of the ideas, the team scored the ideas using a group nominal technique using functions and the performance attributes as their guide. All ideas that received a rating of "4" (Good Value Opportunity) or "5" (Great Value Opportunity) were further developed.

The creative idea list represents all of the ideas and includes scoring for the ideas that were rated using the value index.

Value Relationship		**Value Index = Function / Cost = F / C**					
Rating							
5.	Great Opportunity	F C--	F+ C-	F++ C	F++ C-	F++ C--	F++ C+
4.	Good Opportunity	F- C--	F C-	F+ C	F+ C-	F+ C+	F++(*) C++
3.	Moderate Value	F-- C--	F- C-	F++(*) C++			
2.	Poor Value	F-- C	F-- C--	F C+	F C++		
1.	Unacceptable Impacts/Fatal Flaw						

*Is the Function improved to the point that it overcomes the high cost?

VALUE CUE KEY – MAGNITUDE OF CHANGE

F	=	No impact to function
F-	=	Small negative impact to function
F--	=	Large negative impact to function
F+	=	Small increase in function
F++	=	Large increase in function
C	=	No impact to cost
C-	=	Small decrease in cost
C--	=	Large decrease in cost
C+	=	Small increase in cost
C++	=	Large increase in cost

Value Engineering Study
Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0 (Item #08-0006.30)
Rockcastle County, KY

Creative Idea List

Creative Idea No.	Idea Title	Score	VE Alternative No.
SP	**Simplify Phasing**		
SP-01	Combine Maintenance of Traffic Phases 2 and 3, and move all traffic to the two inside lanes	4	**1**
SP-02	Phase 1A Maintenance of Traffic note correction	DS	**17**
SS	**Span Space**		
SS-01	Change concrete girders to steel girders for bridges	2	
SS-02	Use pre-engineered bridges instead of conventional design	2	
MA	**Maintain Access**		
MA-01	Add bid item for tow service	5	**2**
MA-02	Use social media to inform public and communicate project status and updates	DS	**18**
MA-03	Verify that US25 can accommodate trucks. Although US25 is not expected to be a "signed detour," traffic will likely use it in the event of an incident on I-75 causing long delays.	DC	**21**
M	**Miscellaneous**		
M-01	Use cable barrier instead of median barrier wall	2	
M-02	Reduce replacement of control access fence	4	**3**
M-03	Use 4:1 ditch foreslope instead of 6:1 in selected sections	4	**4**
M-04	Extend benches to minimize excavations	4	**5**
M-05	Identify locations on project site for waste. Noting that the project is a "waste project," the idea is to flatten some of the fill slopes to possibly eliminate guardrail.	DC	**22**
M-06	Add bid item for radar speed signs to reduce speed during construction	4	**6**
M-07	Add bid item for message boards to inform drivers during construction	DC	**23**
M-08	Extend lane closure in advance of the project worksite	4	**7**
M-09	Add rumble strips prior to construction	4	**8**
M-10	Use work zone intrusion alert device to alert workers and drivers	4	**9**
M-11	Use flashing lights that "flash" when workers are present	w/M-07	
M-12	Add bid item for law enforcement officers (LEOs) during construction	5	**10**
M-13	Require a protect-the-queue vehicle	4	**11**
M-14	Contractor to coordinate additional utility relocations and verify bid item	DC	**24**
M-15	Use "alternative route" signage during emergencies. Use temporary signage on the primary route to notify motorists that the road is closed and that an alternate route exists. If using portable signs (either portable static signs or portable CMSs), then the devices should be deployed in order to notify upstream motorists that the road is closed and the motorists must divert to a designated alternate route. Incident response teams should carry temporary portable signs in their trucks to be deployed in case an incident warrants. Refer to FHWA *Alternate Route Handbook* for guidelines.	DC	**25**

OS = Out of Scope
FF = Fatal Flaw
DC = Design Comment (No Workbook)
DS = Design Suggestion (Workbook Prepared)
EC = Estimate Correction
ABC= Already Being Considered

Creative Idea List

Creative Idea No.	Idea Title	Score	VE Alternative No.
M-16	Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.	DC	26
M-17	Add emergency vehicle median crossover locations	4	12
M-18	Build bridges adjacent to permanent location and slip into place	3	
M-19	Verify elevations at bottom of profile sheets; ensure the elevations are indicative of current conditions (i.e., after the most recent resurfacing project which was done approximately two years ago)	DC	27
M-20	Verify what is being used to “build” project, existing or profile grade elevations; use existing elevations plus pavement thicknesses prescribed on typical sections or mathematical profile grades	DC	28
M-21	Verify intent of different pavement schedules for median construction. Approximately the first mile (station 3395+00 to 3432+65) has a different pavement schedule (detail “C”) than the remainder of the project (detail “H”).	DC	29
M-22	Use precast culvert instead of cast-in-place culvert	2	
M-23	Use A+B bidding instead of low bid	DS	19
M-24	Create lane rental to minimize overages on lane closures	DS	20
M-25	Place barrier wall in two lifts (8") of base instead of one lift	DC	30
M-26	Identify locations off site for waste	2	
M-27	Verify that the existing control access fence is at the existing right-of-way limit	DC	31
M-28	Show station and offset on all proposed control access fencing. Assuming the control access fencing is to be located directly on the existing and/or proposed right-of-way, station and offsets are needed at the “break points” for the fencing layout and location.	DC	32
M-29	Use single slope barrier wall instead of Jersey shape	4	13
M-30	Conduct periodic (e.g., monthly) coordination meeting with Emergency Management Services (EMS)/first responders	w/M-16	
M-31	Use prefabricated bridge elements (PBE) instead of conventional bridge construction	3	
M-32	Close road at KY 3275 bridge during bridge reconstruction and detour traffic	5	14
M-33	Close road to reconstruct KY 1505 bridge	5	15

Creative Idea List

Creative Idea No.	Idea Title	Score	VE Alternative No.
M-34	Add work zone warning signs with positive messages	4	**16**

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:

- There should be a potential $2 million reduction within the cost estimate due to a resurface project that was completed two years ago
- There may be an opportunity to consider cable barrier
- Most of the cross-section information is in the median
- Truck lanes are needed (and in place at the south end of county)
- Elevations at the bottom of the profile sheets are based on the elevations as shown before the previous resurface project was completed
- The goal of the project appears to be improving the Level of Service from "F" to "D"
- There appear to be long stretches of roadway without emergency access (both outside access and U-turn)
- There may be an opportunity to reduce blast debris
- There needs to be focus on reducing accidents causing delays
- The current design is proposing construction items outside the project limits, including access fence, lane transitions and MOT items
- There may be an opportunity to extend benches to eliminate or minimize excavations
- Evaluate a 4:1 versus a 6:1 foreslope at certain locations to eliminate sliver cuts
- Waste areas within the project limits need to be identified
- By changing slope, there is an opportunity to eliminate guardrail and gain a waste area
- Land owners are not adverse to accepting waste during construction
- Potential to unofficially use US Route 25 for overflow

Risk Identification

The VE team identified potentials risks of the project. The purpose of understanding the project risks is to identify potential mitigation strategies during creative generation of potential ideas and alternatives.

- Blast debris
- Accidents – clear to minimize any secondary or tertiary issues/accidents that could be even worse than initial accident

Plan Review Comments

The VE team reviewed the plan documents for the project and provided comments. These were forwarded, under separate cover and before the conclusion of the VE workshop, to Shawn Russell, Value Engineering Coordinator.

Value Engineering Study Agenda
I-75, MP 64.5 – 69.0 (Item #08-0006.30)
Kentucky Transportation Cabinet
Rockcastle County

VE Study Workshop Agenda (3-Day): September 20-22, 2016

Tuesday, September 20, 2016: Kick-Off Meeting – KYTC Office, 200 Mero Street, Frankfort, KY
3rd Floor, Conference Room 311
(Attendance by Stakeholders, Decision Makers, Designers and VE Team)

9:00 – 9:15	Introductions (All) & Brief Overview of the VE Process (Team Leader-Patrice Miller)
9:15 – 10:15	Project Overview & Presentation (Project Manager/Design Team)
10:15 – 10:30	Break
10:30 – 11:30	Project Goals & Constraints, Workshop Objectives, Identify Key Performance Attributes Identify Risks *Conclusion of Kick-Off Meeting Adjourn all but the VE Team*
11:30 – 12:30	Lunch
12:30 – 12:45	Review Cost Estimate
12:45 – 1:30	VE Team Observations
1:30 – 2:15	Function Analysis
2:15 – 5:00	Speculation – Team Brainstorming

Wednesday, September 21: 3rd Floor Conference Room 311, Frankfort, KY

8:00 – 8:15	Recap of First Day/Additional Information Review
8:15 – 10:00	Evaluation of Ideas
10:00 – 10:15	Review/Distribution of Handouts and VE Alternative Forms
10:15 – 12:00	Alternatives Development
12:00 – 1:00	Lunch
1:00 – 5:00	Alternatives Development

Thursday, September 22: 3rd Floor Conference Room 311, Frankfort, KY

8:00 – 11:30	Alternatives Development
11:30 – 12:30	Working Lunch
12:30 – 1:30	Finalize Alternatives Development
1:30 – 3:00	Group Review of VE Alternatives / Prepare Presentation
3:00 – 4:30	***Presentation of VE Alternatives Meeting*** **(Presentation of VE Study Results to Management and Stakeholders)**
4:30 – 5:00	Team Wrap-up

Kentucky Transportation Cabinet
I-75 Widening, MP 64.5 to MP 69.0
Rockcastle County
Item #08-0006.30

Value Engineering Presentation

September 22, 2016

VE Study Team Members

- Anthony Norman, EIT – KYTC
- Bob Jones, PE, PLS – KYTC
- Shawn Russell, PE, AVS – KYTC
- Chris Jenkins, PE – QK4
- Jeremiah Littleton, QK4
- Keith Damron, PE – AEI
- Certified Value Specialist (CVS) Team Leader – Pat Miller, RHA

VE Job Plan


Information Phase
Function Analysis Phase
Creative Phase
Evaluation Phase
Development Phase
Presentation Phase
SAVE
Adding Value. Enhancing Ideas.

Workshop Objectives

- Focus on Constructability
- Review Maintenance of Traffic
- Review Phasing Plan
- Identify Value Opportunities & Fatal Flaws

Creative Ideas

- **41** Ideas
  - **16** VE Alternatives developed
  - **4** Design Suggestions developed
  - **12** Design Comments identified

ALTERNATIVES

Maintenance of Traffic & Safety

- MA-01: Add bid item for tow service
- M-08: Extend buffer zone in advance of project
- M-06: Add bid item for radar speed signs to reduce speed during construction

Maintenance of Traffic & Safety

- M-09: Add rumble strips prior to construction
- M-34: Add positive signs to the work zone

Maintenance of Traffic & Safety

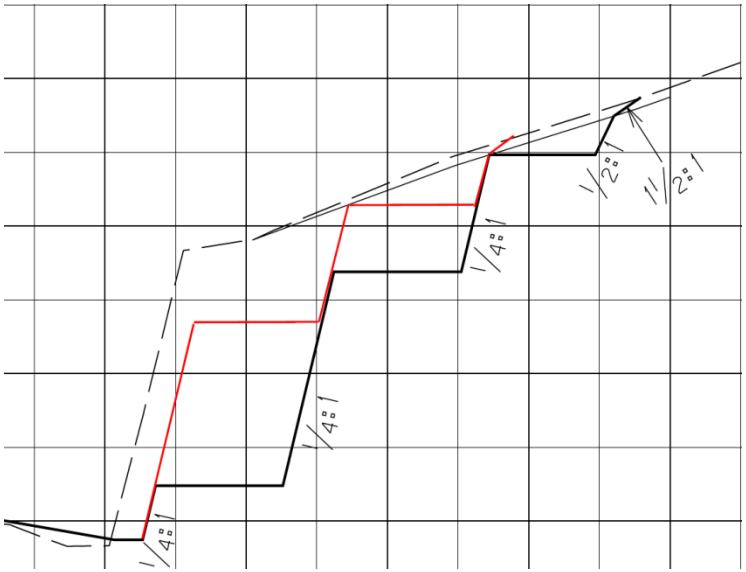
- M-10: Use work zone intrusion alert device to alert workers and drivers
- M-12: Add bid item for law enforcement officers (LEOs) during construction
- M-13: Require a protect-the-queue vehicle

Maintenance of Traffic & Safety

- M-17: Add emergency vehicle access to project to be used post-construction
- MA-02(DS): Use social media to inform public and communicate project status and updates
- SP-02(DS): Identify Phase I missing components

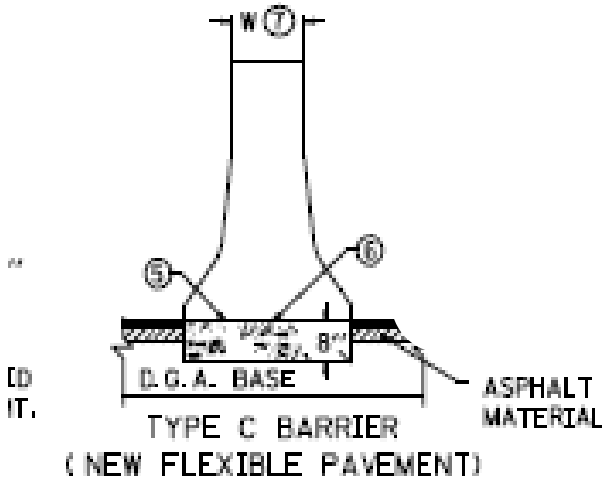
Construction Details

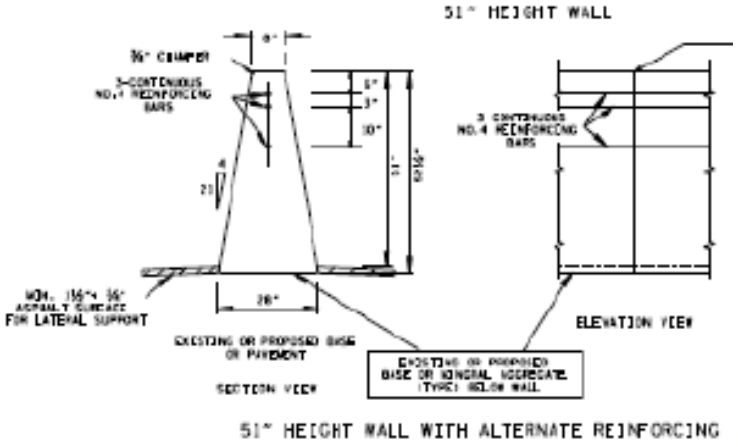
- M-02: Reduce replacement of control access fence
- M-03: Use 4:1 ditch foreslope instead of 6:1 in selection sections
- M-04: Extend benches to eliminate or minimize excavations



Construction Details

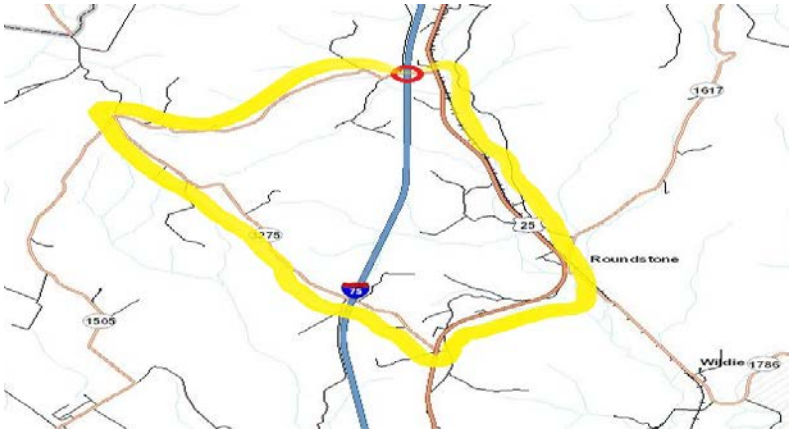
- M-29: Use single slope barrier wall instead of Jersey shape





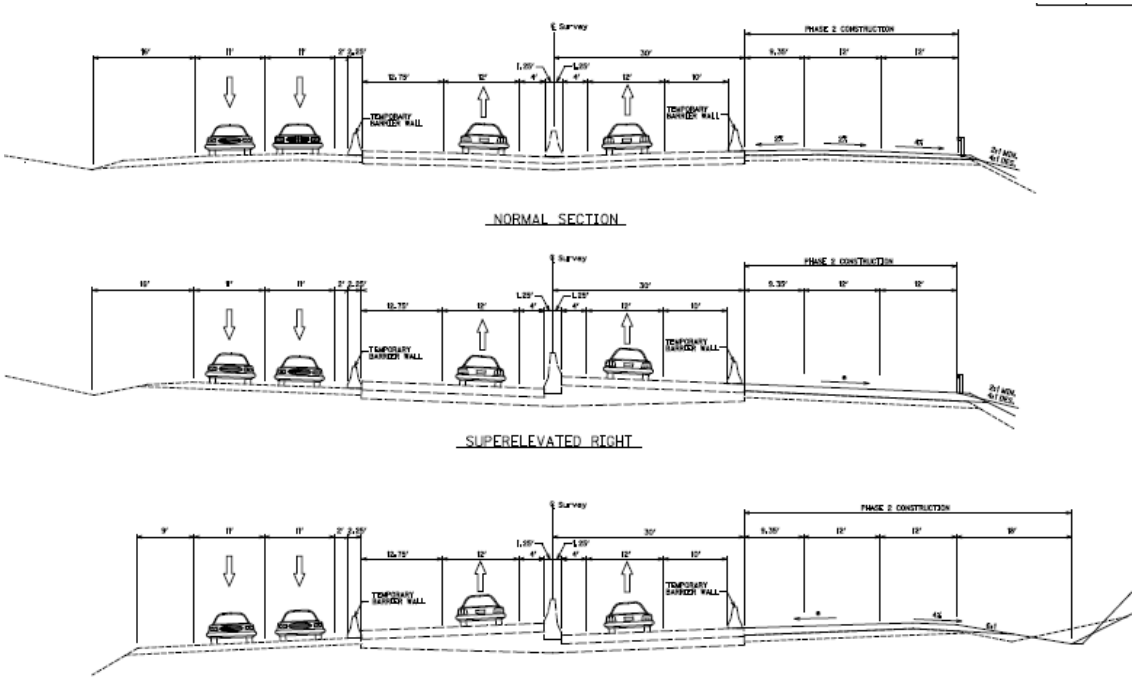
Bridges

- M-32: Close road at bridge KY3275 during bridge reconstruction and detour traffic
- M-33: Close road and reconstruct bridge KY1505 in place and eliminate proposed new approaches



Phasing

- SP-01: Combine Phases 2 and 3, and move all traffic to the middle



Procurement

- M-23(DS): Use A+B bidding instead of low bid
- M-24(DS): Create lane rental to minimize overages on lane closures

Cost Estimate

- 2000 - $18.5M
- 2008 - $32.8M
- 2016 - $45M
  - Unit Prices
  - Excavation
  - Quantity for median barrier wall

Next Steps

- Draft Report – September 29, 2016
- Implementation Meeting – TBD/ASAP
- Final Report – within one week of comments

Questions

Standard KYTC VE Report Abbreviations

List of Common Abbreviations

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADD	Area Development District
ADT	Average Daily Traffic
CRF	Crtical Rate Factor
CSB	Crushed Stone Base
CY	Cubic Yard
DES	Design Executive Summary
DGA	Dense Graded Aggregate
DHV	Design Hour Volume
EA	Each
FHWA	Federal Highway Administration
FT	Foot or Feet
IJS	Interchange Justification Study
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
LF	Linear Feet
LOS	Level of Service
LS	Lump Sum
MI	Mile
MOU	Memorandum of Understanding
MP	Milepoint
MPO	Metropolitan Planning Organziation
MSE	Mechanically Stabilized Earth
NHS	National Highway System
PD	Project Development
PDP	Project Delivery and Preservation
PL&G	Preliminary Line and Grade
RCBC	Reinforced Concrete Box Culvert
ROW	Right-of-Way
SYP	Six Year Plan
TRB	Transportation Research Board
V/C	Volume to Capacity Ratio
VE	Value Engineering
VPH	Vehicles per Hour