Value Engineering Study

SOMERSET NORTHERN BYPASS
PULASKI COUNTY, KENTUCKY

Item Number 8-59.60

Kentucky Transportation Cabinet
Frankfort, Kentucky

Study Date: March 15-19, 2010
Report Date: May 14, 2010

KENTUCKY TRANSPORTATION CABINET

URS

SOMERSET NORTHERN BYPASS
PULASKI COUNTY, KENTUCKY

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VALUE ENGINEERING STUDY
for
Kentucky Transportation Cabinet
Frankfort, Kentucky

Study Date: March 15 – 19, 2010

Final Report

May 14, 2010

URS Corporation

EXECUTIVE SUMMARY

General

URS conducted a value engineering (VE) study of the Somerset Northern Bypass in Pulaski County, Kentucky. The item number is 8-59.60. The topic was the70% design submission prepared by T.H.E. Engineers, Inc. and American Engineers Inc. for the Kentucky Transportation Cabinet (KYTC).

The VE team undertook the task assignment using the value engineering work plan and approach. The ideas generated from this process and chosen for full development as VE Team Recommendations are presented in Section 3 of this report. These recommendations are presented to all project stakeholders for judgment as to whether they should be implemented.

Estimate of Construction Costs and Budget

The preliminary construction cost estimate provided to the VE team with the project documents indicates a total construction cost of $40,988,000. This project is scheduled to be let as a design/bid/build project, thus the cost of construction will be determined on a contractor bid.

As a result of this value engineering study, should all of the VE team's selected combination of recommendations be accepted for implementation, the potential cost savings for this project is $3,893,000. These potentials are based upon the VE team's cost estimates of the individual recommendations selected by the VE team as noted on the Summary of Recommendations table below. Total cost savings realized will be based upon the final implementation status of these VE recommendations.

Summary of VE Study Results

During the speculation phase of this VE study, 42 creative ideas were identified. 32 of these ideas were developed into VE recommendations and design comments with cost implications where applicable. Many of the ideas represent changes in design approach, reconsideration of criteria, and in some cases, modification of the project scope. In general, the idea evaluation took into account the economic impact, other benefits obtained, and the effect on the overall project objectives.

The following table presents a summary of the ideas developed into recommendations and design comments with cost implications where applicable. Since cost is an important issue for comparison of VE proposals, the costs presented in this report are based upon original design quantities with unit rates obtained from the estimate as prepared by the design team and included in their submission, published cost databases, and VE team member experience.

The table also identifies the recommendations and alternatives that, in the opinion of the VE team, are the best combination of all the VE recommendations. This selection takes into account not only that the recommendations (and likewise their cost savings) are summarily additive, but also whether the cost savings or project improvement potential of the recommendations are worth the change to the project design.

SUMMARY OF RECOMMENDATIONS

DESCRIPTION		PRESENT WORTH AMOUNTS			
Rec #	Recommendation Title / Description	1st cost savings (or cost)	O & M savings (or cost)	Total LCC savings (or cost)	VE Selected Combo
VE-1	Reduce the cost of staking from $492,000 to $200,000, the cost of clearing & grubbing from $987,070.44 to approximately $300,000 and revise the cost estimate total accordingly	Comment		Comment	
VE-2	Include the omitted unit prices for Guardrail Connector to Bridge End Type A, Crash Cushion Type IX-A, and Culvert Pipe-60 Inch	Comment		Comment	
VE-3	Eliminate $2,604,625 from cost estimate for Rock Roadbed	Comment		Comment	
VE-4	Add bid item to the cost estimate for granular pile core	Comment		Comment	
VE-5	Utilize $5/CY unit price for excavation in lieu of $11/CY	Comment		Comment	
VE-6	Revise profile grade in order to minimize excavation	$1,370,000		$1,370,000	X
	with $5/CY excavation unit price	$617,000		$617,000	X*
VE-7	Utilize a 50 ft median with cable barrier in lieu of 60 ft depressed median section through the entire Section 4	$318,000	($64,000)	$254,000	
	with $5/CY excavation unit price	$72,000	($64,000)	$8,000	
VE-8	Utilize the rock roadbed for drainage and eliminate edge drains	$297,000		$297,000	X
VE-9	Utilize a wagon box for the new proposed Coleman Road alignment crossing in lieu of a twin bridge structures	$271,000		$271,000	
VE-10	Utilize a wagon box askew to the mainline along the existing Coleman Road alignment in lieu of crossing Coleman Road with twin bridge structures and realigning Coleman Road	$550,000		$550,000	X
VE-11	Move location of proposed twin bridges to the existing location of Coleman Road in lieu of realigning Coleman Road	$279,000		$279,000	
VE-12	On the abandoned piece of Coleman Road, leave existing pavement in place in lieu of removing pavement	$18,000		$18,000	X
VE-13	Only construct one bi-directional ramp (along Ramp 4) intersecting with KY-80 in lieu of two ramps	$426,000		$426,000	X

SUMMARY OF RECOMMENDATIONS

DESCRIPTION		PRESENT WORTH AMOUNTS			
Rec #	Recommendation Title / Description	1st cost savings (or cost)	O & M savings (or cost)	Total LCC savings (or cost)	VE Selected Combo
VE-14	Add bid item to the cost estimate to remove the existing 9'x6' reinforced concrete box culvert on Old KY-80 between the mainline and Ramp 1 on Section 4B	Comment		Comment	
VE-15	Do not construct the double reinforced box culvert at STA 672+54 in the Section 4B project	$892,000		$892,000	X
VE-16	Utilize Tensar Geogrids to decrease the required asphalt pavement thickness	$340,000		$340,000	X
VE-17	Eliminate $275,216.30 from the cost estimate for Granular Embankment since there is available rock on the project	Comment		Comment	
VE-18	Utilize side slopes of 4:1 in lieu of 2:1 to eliminate guardrail where applicable on Ramps 4 and 1 in section 4B (KY-80 interchange)	Comment		Comment	
VE-19	Utilize flatter than 4:1 sideslopes where possible to waste excess material, and utilize surface or field ditches off of the embankment to waste excess material	Comment		Comment	
VE-20	Waste excess material around the Buzzard Knob landlocked parcel with an easement or property purchase	Comment		Comment	
VE-21	Verify existing utilities along Barnesburg Road can remain in place under Ramp 4, mainline, and Ramp 1 with up to an additional 30 feet of fill	Comment		Comment	
VE-22	Reevaluate the alternative analysis cost study including the cost of right-of-way necessary for the Frontage Road	Comment		Comment	
VE-23	Label the location of Note 6 on the typical section plan	Comment		Comment	
VE-24	Utilize Class IV aggregate channel lining in lieu of Class II and III aggregate channel lining	Comment		Comment	
VE-25	Delete pavement removal within disturbed limits from plans	Comment		Comment	
VE-26	Utilize new design policy for the left turn taper along KY-80 per KYTC policy	Comment		Comment	
VE-27	Combine drainage structures where plausible and verify maintenance access requirements for cross drains per chapter DR 707-4 of the drainage manual	Comment		Comment	

SUMMARY OF RECOMMENDATIONS					
DESCRIPTION		PRESENT WORTH AMOUNTS			
Rec #	Recommendation Title / Description	1st cost savings (or cost)	O & M savings (or cost)	Total LCC savings (or cost)	VE Selected Combo
VE-28	Add typical sections for grade and drain section station limits at the end of project	Comment		Comment	
VE-29	Display design speed for Coleman Road, KY-1317, and Barnesburg Road on typical sections	Comment		Comment	
VE-30	Label all radii on the plans (bullet nose, entrances, etc.)	Comment		Comment	
VE-31	Increase the length of the bridge over KY-80 to span the Big Spring Branch in lieu of constructing a double 12'x 6' box culvert at Sta. 672+54	Comment		Comment	
VE-32	Utilize 18" diameter minimum cross drain in lieu of 15" diameter cross drain to meet KYTC design guides (DR-06.240 Culvert Pipe)	Comment		Comment	

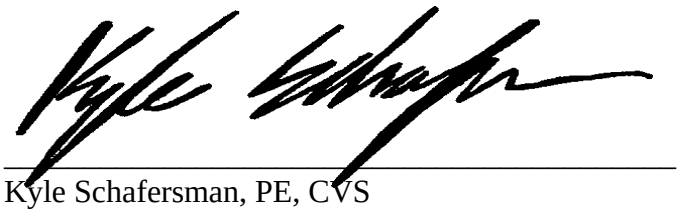
Summary of VE Team Selected Combination (with $11/CY):	**$3,893,000**	**$0**	**$3,893,000**
***Summary of VE Team Selected Combination (with $5/CY):**	**$3,140,000**	**$0**	**$3,140,000**

Acknowledgments
A thank you is given to the staff members from the Kentucky Transportation Cabinet, T.H.E. Engineers, Inc., and American Engineers Inc. for there participation. Special thanks are also extended to Mr. Siamak Shafaghi for his assistance with this study.

Value Engineering Study - Core Team

Name	Discipline / Role	Organization	Telephone
Greg Groves, PE	Roadway Design	URS	502-569-2301
Rodney Little, PE	Construction	KYTC	606-677-4017
Kyle Schafersman, PE, CVS	VE Team Leader	URS	913-344-1019
Mitch Thomas, PE	Roadway Design	URS	502-569-2301

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



Kyle Schafersman, PE, CVS
Value Engineering Program Manager

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Appendices

SECTION 1 - INTRODUCTION

This report documents the results of a value engineering study on the Somerset Northern Bypass in Pulaski County, Kentucky. The item number is 8-59.50. The study workshop was held at the KYTC offices in Frankfort, KY on March 15-19, 2010. The study team was from URS. Kyle Schafersman, a Certified Value Specialist (CVS) and Professional Engineer (PE), team leader from URS, facilitated the study. The names and telephone numbers of all participants in the study are listed in Appendix A.

The Job Plan

This study followed the value engineering methodology as endorsed by SAVE International, the professional organization of value engineering. This report does not include any detailed explanations of the value engineering / value analysis processes used during the workshop in development of the results presented herein. This would greatly expand the size of the report. The sole purpose of this report is to document the results of the study. Additional information regarding the processes used during the study can be obtained by contacting the Certified Value Specialist team leader that facilitated the study.

Ideas and Recommendations

Part of the value engineering methodology is to generate as many ideas as is practical, evaluate each idea, and then select as candidates for further development only those ideas that offer added value to the project. If an idea thus selected, turns out to work in the manner expected, that idea is put forth as a formal value engineering recommendation. Recommendations represent only those ideas that are proven to the VE team's satisfaction.

Design Comments

Some ideas that did not make the selection for development as recommendations, were, nevertheless judged worthy of further consideration. These ideas have been written up as Design Comments and are included in Section 3 after the recommendations.

Level of Development

Value Engineering studies are working sessions for the purpose of developing and recommending alternative approaches to a given project. As such, the results and recommendations presented are of a conceptual nature, and are not intended as a final design. Detailed feasibility assessment and final design development of any of the recommendations presented herein, should they be accepted, remain the responsibility of the designer. The VE team members and report have not, and will not, sign or seal these recommendations and comments as certifiable engineering or architectural design.

Organization of the Report

The report is organized in the following outline.

1. Introductory Information
    a. Section 1- Introduction
    b. Section 2- Project Description
2. Primary body of results…….Section 3- Recommendations and Design Comments
4. Supporting documentation……Appendices

SECTION 2 – PROJECT DESCRIPTION

The Kentucky Transportation Cabinet (KYTC) is in the design stage for a bypass along the northern portion of the City of Somerset in Pulaski County, Kentucky. Project plans include new construction consisting of a four lane divided highway providing two lanes of traffic in either direction with a 60' median, a Frontage Road, approach road realignments, and a partial interchange. The job is currently unbalanced with a schedule waste of approximately 960,000 CY of material.

Section 4 of the Northern Bypass begins approximately one-half mile to the east of KY-39 and continues to the east where it ends at KY-80. The project begins at Mainline Station 545+00 and ends at Mainline Station 674+60. The mainline crosses Coleman Road, KY-1317, and Barnesburg Road before ending at KY-80. The mainline length for Section 4 is approximately 2.5 miles long and consists of 4-12' lanes (2 in each direction), 4' inside paved shoulders, and 10' outside paved shoulders. In conjunction with the mainline, two (2) ramps are proposed as part of a partial interchange with KY-80. In addition, part of Coleman Road will be realigned and a Frontage Road will be constructed from KY-1317 to KY-80.

Coleman Road will begin at Station 40+00 and be realigned to tie back into the existing Coleman Road at Station 69+50. The realigned portion of Coleman Road will cross under the proposed mainline at Mainline Station 574+00. At this point a bridge will be constructed along the mainline passing over Coleman Road. Coleman Road will consist of 2-12' lanes. The new Frontage Road will begin at Station 3+50 and end at Station 52+24.60, which turns into KY-80. The Frontage Road will have 2-11' lanes with 2' paved outside shoulders. The ramps typical section consists of a 15' lane with a 4' inside and 6' outside paved shoulder. Ramp 1 will be an entrance ramp for traffic traveling west on the bypass. This ramp will begin at Station 30+83.30 and end at Station 49+50. Ramp 4 will be an exit ramp onto KY-80. It will begin at Station 9+00 and end at Station 23+42.40.

Overall Arial Image of Project

Location of Pulaski County within Kentucky

SECTION 3 - VE RECOMMENDATIONS & DESIGN COMMENTS

Organization of Recommendations
This section contains the complete documentation of all recommendations that have resulted from this study. Each recommendation has been marked by a unique identification number.

The parent idea, or ideas from which the recommendation began, can be determined from the Creative Idea List located in Appendix D of this report.

Each recommendation is documented by a separate write-up that includes a description of both the original design and recommended change, a list of advantages and disadvantages, sketches where appropriate, calculations, cost estimate, and the economic impact of the recommendation on the first cost, and where applicable, the life cycle cost. The economic impact is shown in terms of savings or added cost.

Acceptance of VE Recommendations
The Summary of Recommendations table presented in the Executive Summary of this report identifies the recommendations that, in the opinion of the VE team, are the best combination of all the VE recommendations. This selection takes into account not only that the recommendations (and likewise their cost savings) are summarily additive, but also the likelihood and ease of implementing the recommendations.

However, this report also includes other recommendations that could enhance the value of this project. These recommendations are either mutually exclusive of the recommendations selected by the VE team (i.e. implementing one immediately precludes the implementation of another) or they require additional design and/or evaluation prior to implementation. These recommendations should be evaluated individually to determine whether they are worthy of implementation or not. Consideration should be given to the areas within a recommendation that are acceptable and implement those parts only. Any recommendation can be accepted in whole or in part as the owner and design team see fit.

Design Comments
Design Comments are ideas that in the opinion of the team were good ideas, but for any number of reasons were not selected for development as VE recommendations. Design Comments can be notes to the owner or designer, a documentation of various thoughts that come up during the course of the study, a reference to possible problems, suggested items that might need further study, or questions that the owner and designer might want to explore. Some comments might relate to things of which the owner or designer is already aware. Because the study is done on a design in progress and as an independent team, the VE team may not be aware of everything intended by the owner and designer. The following comments are presented with the intent that they may aid the design team in some way.

VALUE ENGINEERING DESIGN COMMENT # VE-1

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Reduce the cost of staking from $492,000 to $200,000, the cost of clearing & grubbing from $987,070.44 to approximately $300,000 and revise the cost estimate total accordingly.

COMMENTARY:

The cost estimate dated February 10, 2010 indicates a $987,070.44 line item for clearing and grubbing which was calculated as 3% of the grade, drain and surfacing subtotal. The VE team quickly estimated this project would require approximately 150 acres of clearing and grubbing. At $2,000/acres, the VE team assumes this amount should be closer to approximately $300,000 in lieu of $987,070.

The cost estimate line item for staking is currently listed at $492,248.67. The VE team suggests reducing this cost to around $200,000.

Also, the VE team discovered that the clearing and grubbing line item was not added to the project grand total in the cost estimate Excel worksheet. The VE team assumed that due to an inadvertent error the cost of clearing and grubbing (G120) had not been included in the subtotal along with mobilization, demobilization, and staking.

Microsoft Excel - Cost Estimate.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

SUM =G117+G121+G122+G123

	A	B	C	D	E	F	G	H
1						Item No.	8-59.60	
2	County:	Pulaski						
3	UPN							
4	Road	I-66						
5		GRADE, DRAIN AND SURFACING						
6	Bid			Quantity	Quantity			
7	Code	Bid Item	Unit	Section 4A (AEI)	Section 4B (THE)	Unit Price	Amount	
110		STRUCTURES BOX CULVERT STA. 672+54	LP SUM		1	$892,000.00	$892,000.00	
111		STRUCTURES BOX CULVERT STA. 34+98	LP SUM		1	$587,000.00	$587,000.00	
112		STRUCTURES BOX CULVERT STA. 18+75	LP SUM		1	$169,000.00	$169,000.00	
113		STRUCTURES BOX CULVERT STA. 42+75	LP SUM		1	$440,000.00	$440,000.00	
114		MODIFIED SILT CHECK TYPE II	EACH		7	$150.00	$1,050.00	
115		CLEAN MODIFIED SILT CHECK TYPE II	EACH		14	$50.00	$700.00	
116								
117		SUB-TOTAL GRADE, DRAIN & SURFACING					$32,816,578.15	
118								
119		**MISCELLANEOUS**						
120	2545	CLEARING AND GRUBBING @ 3%	LP SUM	1		$984,497.34	$984,497.34	
121	2568	MOBILIZATION @ 3%	LP SUM	1		$984,497.34	$984,497.34	
122	2569	DEMOBILIZATION @ 1.5%	LP SUM	1		$492,248.67	$492,248.67	
123	2726	STAKING @ 1.5%	LP SUM	1		$492,248.67	$492,248.67	
124								
125						SUB-TOTAL	=G117+G121+G122	
126				15% ENGR. & CONG.			$5,217,835.93	
127				**GRAND TOTAL**			**$40,003,408.77**	
128								
129		Estimated by: American Engineers, Inc.						
130		Estimated on: May 19, 2003						
131		Revised on: February 10, 2010						
132								

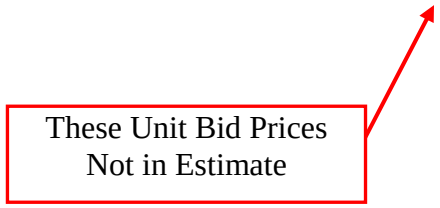
This item not added into subtotal

VALUE ENGINEERING DESIGN COMMENT # VE-2

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Include the omitted unit prices for Guardrail Connector to Bridge End Type A, Crash Cushion Type IX-A, and Culvert Pipe-60 Inch.

COMMENTARY:
The cost estimate dated February 10, 2010 omitted the unit bid price for line items; Guardrail Connector to Bridge End Type A, Crash Cushion Type IX-A, and Culvert Pipe-60 Inch. The addition of these three line items will result in the cost estimate being increased by $85,770. The VE team has assumed these unit bid prices are as follows:

Bid Code	Bid Item	Unit	Quantity	Unit Price	Amount
472	CULVERT PIPE-60 INCH	LIN FT	607	$110.00	$66,770.00
2363	GUARDRAIL CONNECTOR TO BRIDGE END TYPE A	EACH	4	$2,500.00	$10,000.00
2365	CRASH CUSHION TYPE IX-A	EACH	2	$4,500.00	$9,000.00



VALUE ENGINEERING DESIGN COMMENT # VE-3

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Eliminate $2,604,625 from cost estimate for Rock Roadbed.

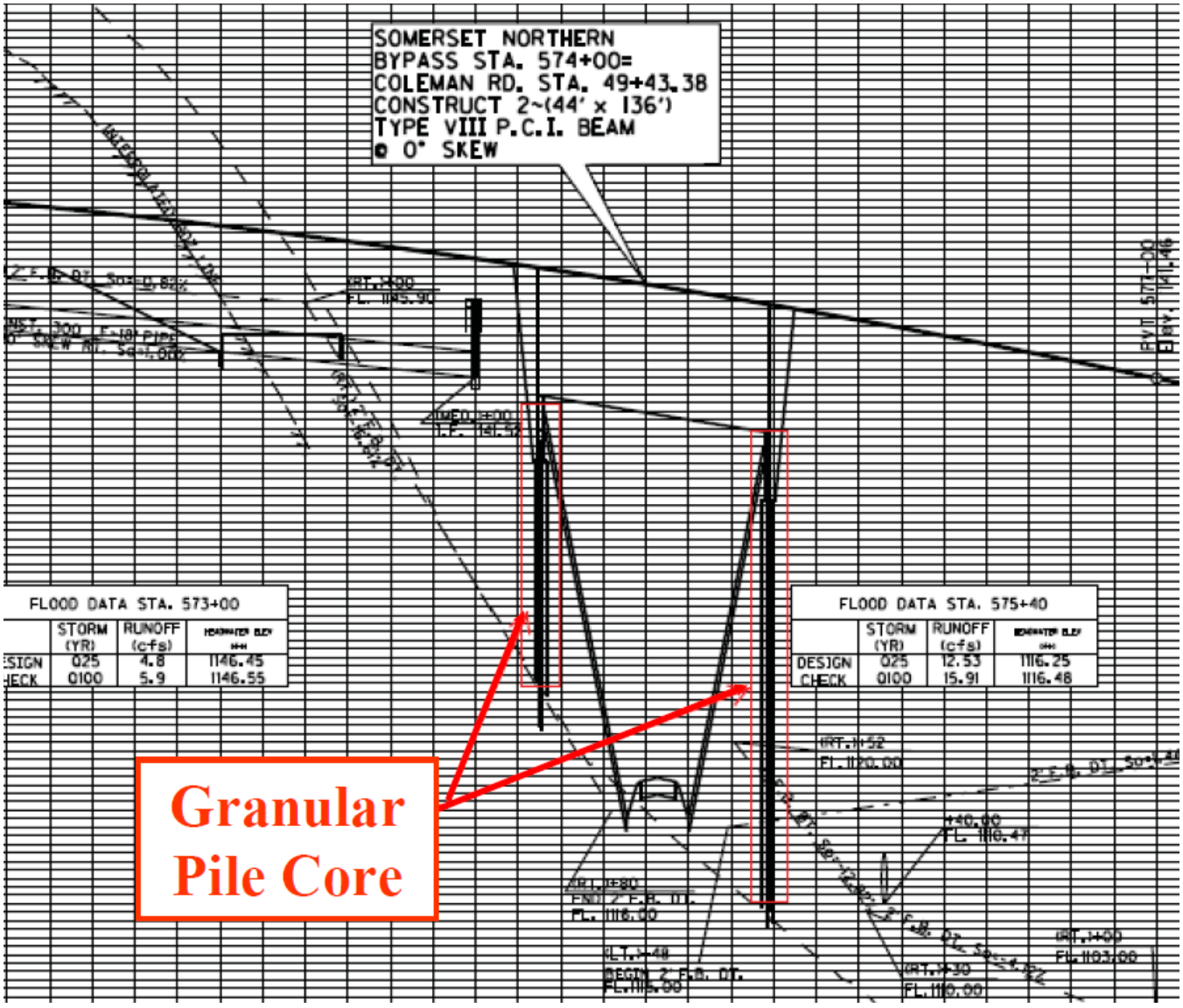
COMMENTARY:
Eliminate bid item from project cost estimate for Rock Roadbed. As currently designed this project's earthwork is paid as Roadway Excavation. Therefore, suitable rock from cuts on project is to be used for the rock roadbed. Generally for this situation, KYTC requires that the work related to the rock roadbed be made incidental to the Roadway Excavation bid item. It is recommended that a note be included in Plans (Geotechnical Notes or General Notes) to clarify this issue.

VALUE ENGINEERING DESIGN COMMENT # VE-4

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Add bid item to the cost estimate for granular pile core.

COMMENTARY:

Add bid item and quantity for Granular Pile Core to General Summary in plans and in cost estimate as required for the twin bridges over Coleman Road. Pile core is needed for proper construction of proposed bridge end bents. The Geotechnical Notes specified pile core to be granular.



VALUE ENGINEERING DESIGN COMMENT # VE-5

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize $5/CY unit price for excavation in lieu of $11/CY.

COMMENTARY:

Utilize $5/CY unit price for Roadway Excavation bid item in lieu of $11/CY in project cost estimate. This revision in price better reflects actual prices that KY Transportation Cabinet has received recently on other projects in this District that have had significant earthwork quantities.

VALUE ENGINEERING RECOMMENDATION # VE-6

DESCRIPTIVE TITLE OF RECOMMENDATION:
Revise profile grade in order to minimize excavation.

ORIGINAL DESIGN:
The original design specifies alignment and roadway section that requires 1,627,859 cubic yards of excavation with 1,244,801 cubic yards of embankment, resulting in a significant amount of excess material.

RECOMMENDED CHANGE:
The VE team recommends revising the vertical alignment on Section 4A to raise the grade through the two major cuts on project. In this study the profile grade is changed from beginning of project to Station 638+00. This would reduce roadway excavation by approximately 125,500 cubic yards. The quantities included in this study are based on **only** one alternative vertical alignment. A further in-depth evaluation of different vertical alignment adjustments will possibly provide more decrease in total excavation and better overall earthwork balance. The proposed revision does also raise grade in embankment area from approximately Station 557+00 to Station 566+00 which will require additional right-of-way in this section.

The cost estimates included in this recommendation do not include additional design costs or additional right-of-way costs.

ADVANTAGES:
- Less excavation
- Shorter construction duration
- Less excess material

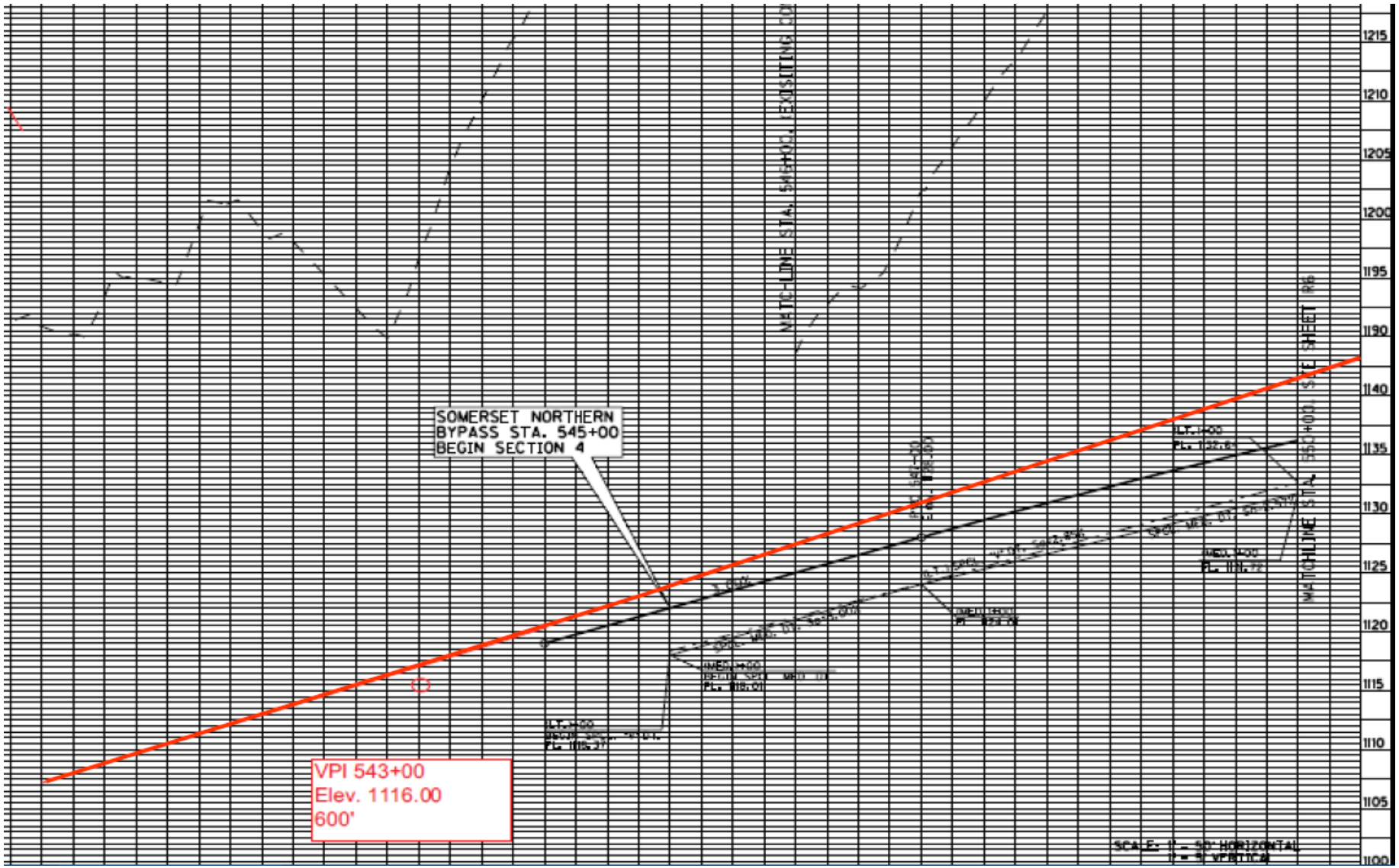
DISADVANTAGES:
- Plan redesign
- Additional right-of-way
- Steeper vertical tangent grade at beginning

JUSTIFICATION:
The Roadway Excavation work is the major bid item on this project and represents a substantial portion of the total project cost. The recommended change will decrease amount of roadway excavation required on project and also result in less excess material to waste. This change should have no effect on future maintenance of roadway section.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$18,046,000	$0	$18,046,000
RECOMMENDED DESIGN	$16,676,000	$0	$16,676,000
ESTIMATED SAVINGS OR (COST)	$1,370,000	$0	$1,370,000

VALUE ENGINEERING RECOMMENDATION # VE-6

SKETCH OF RECOMMENDED DESIGN



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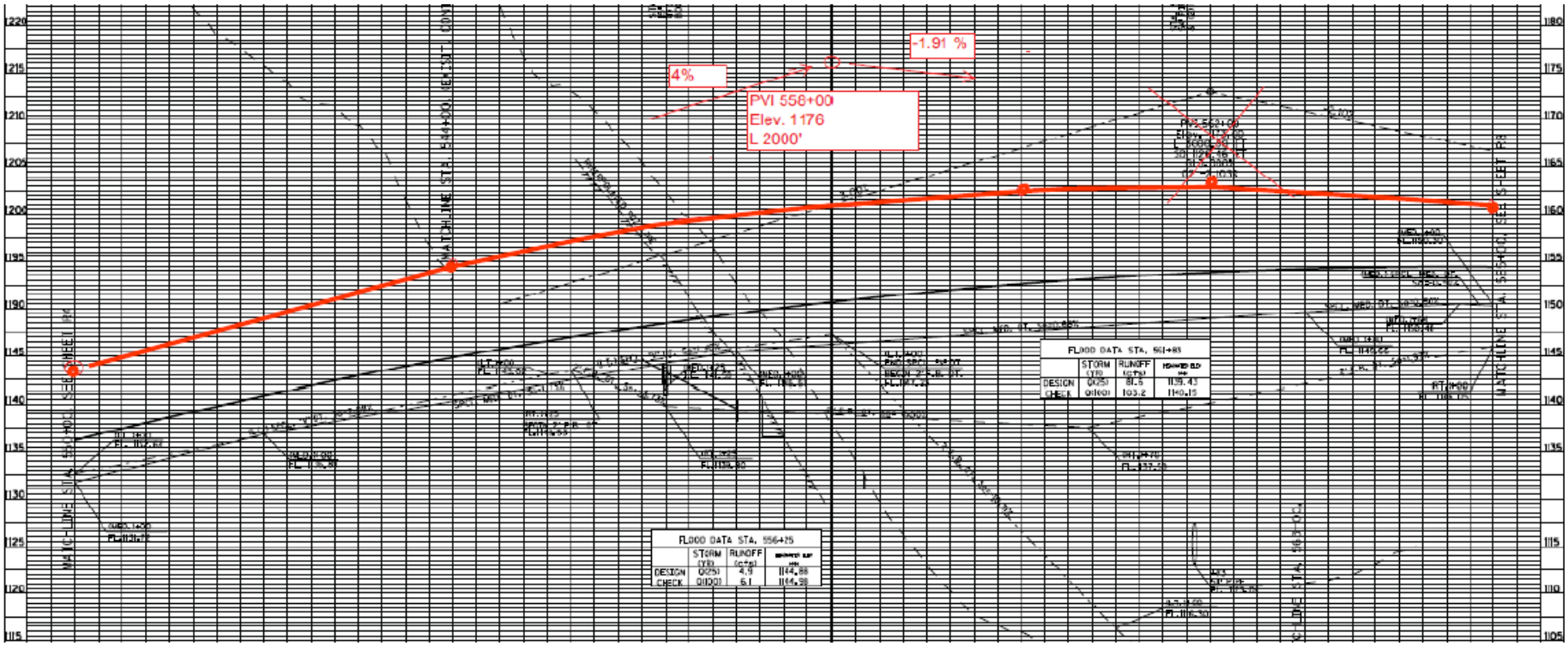

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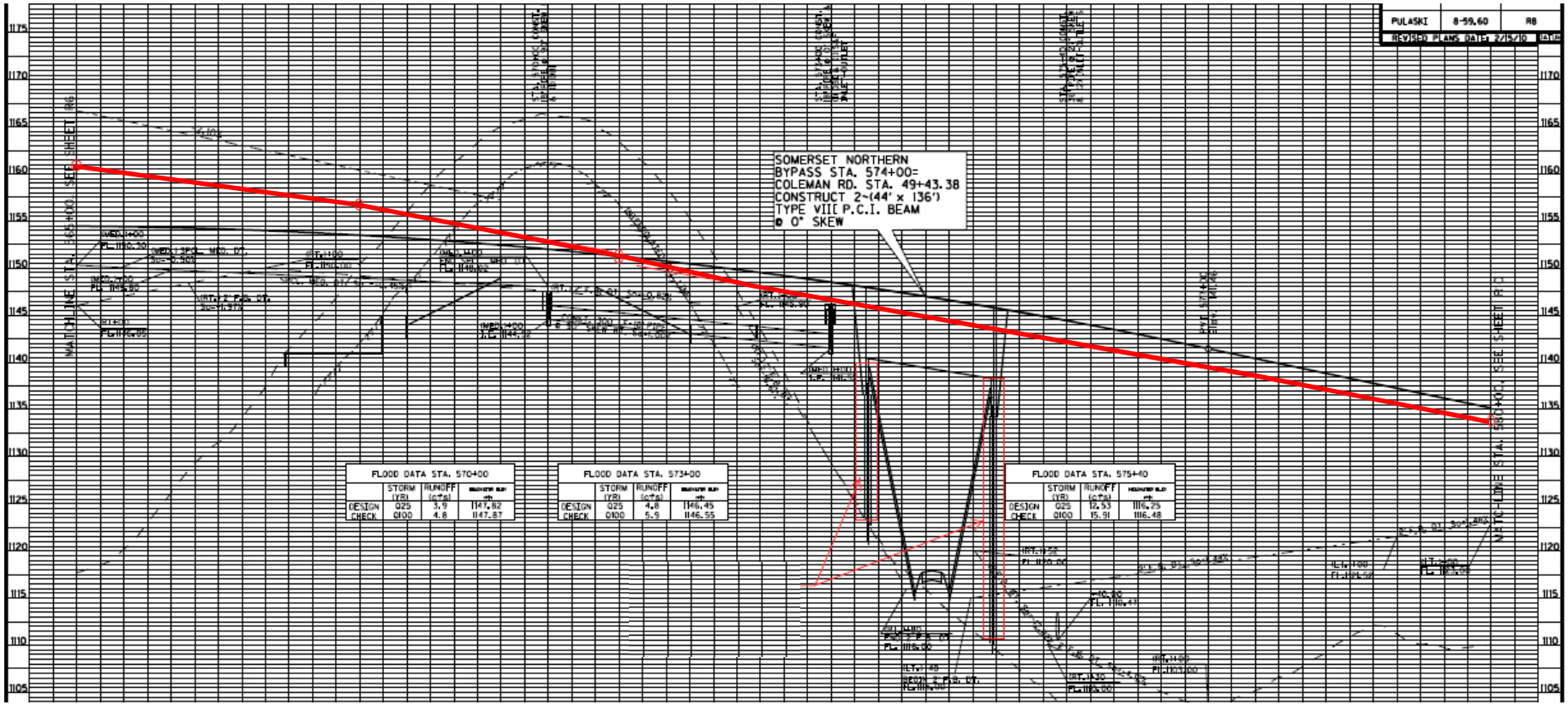

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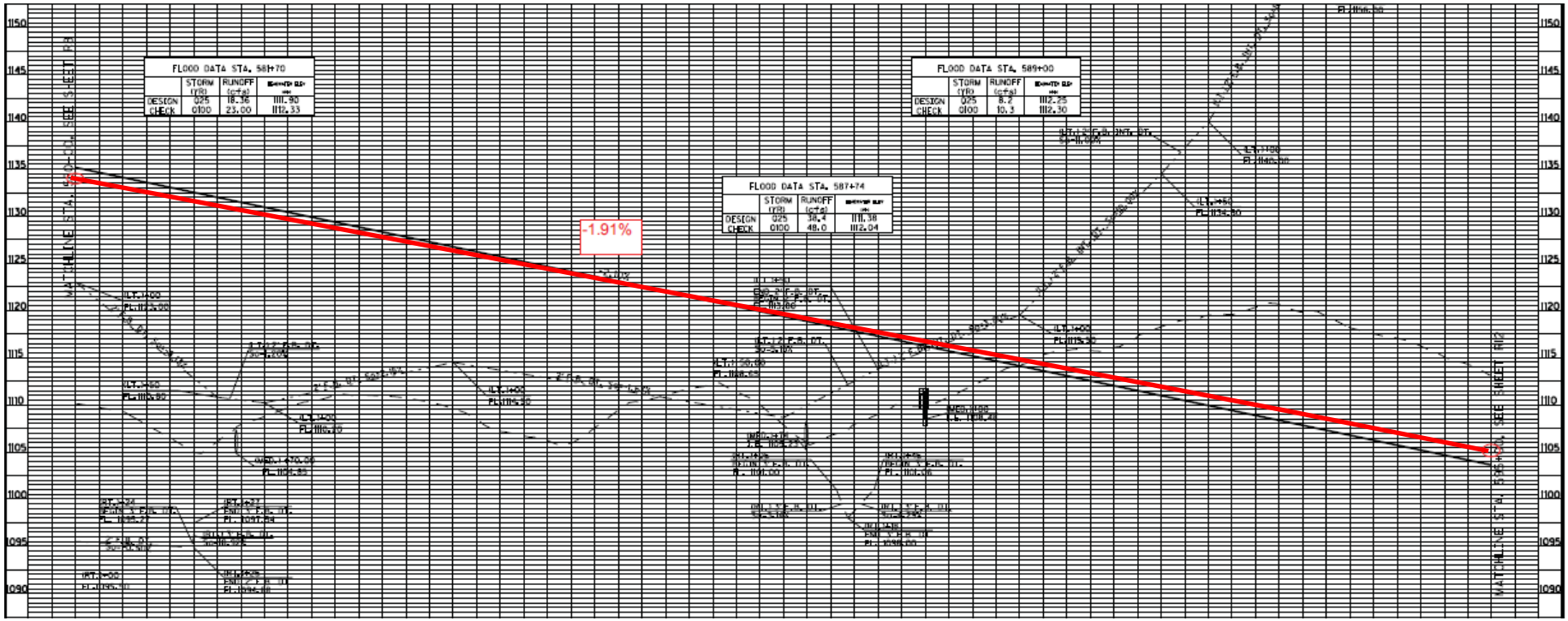

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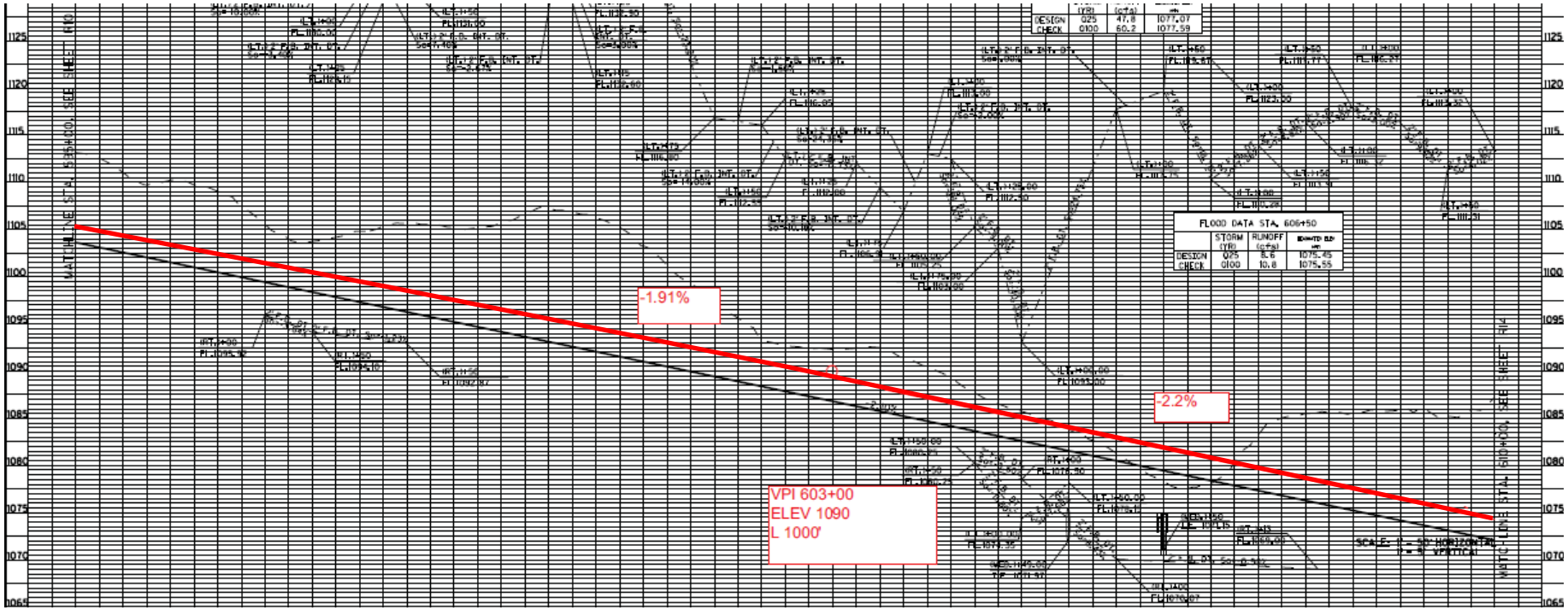

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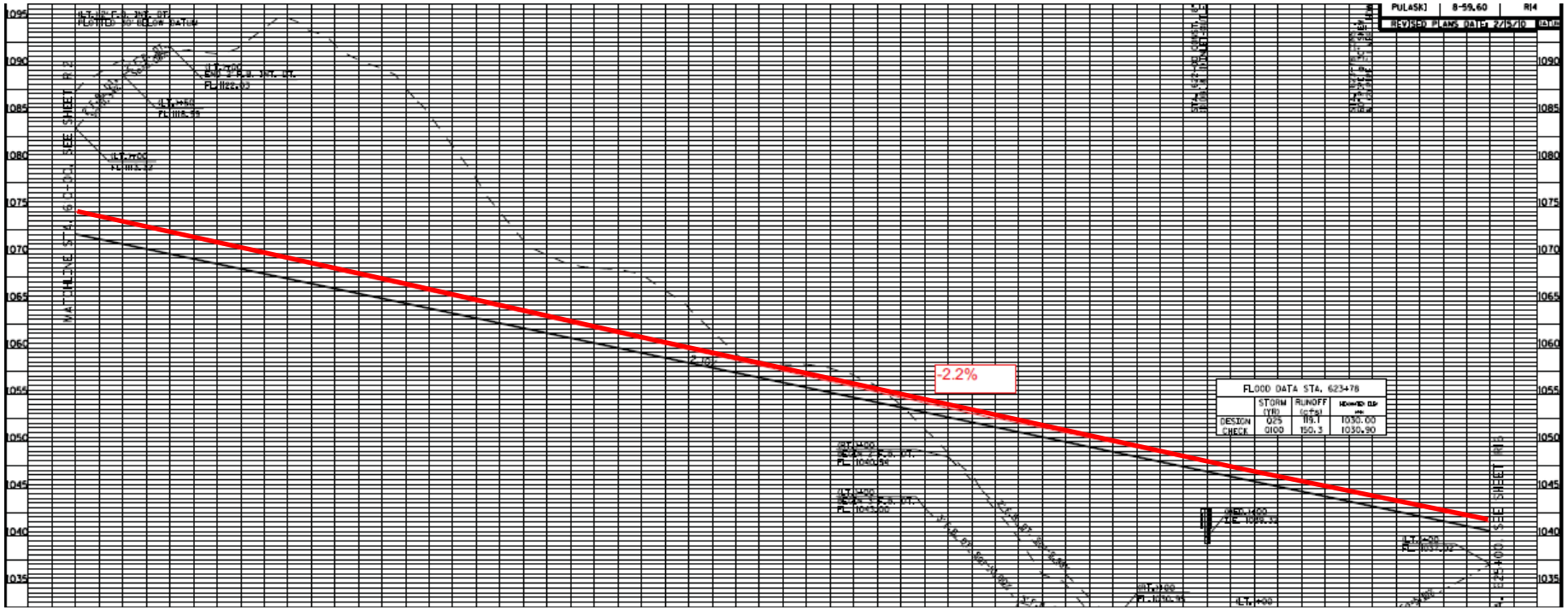

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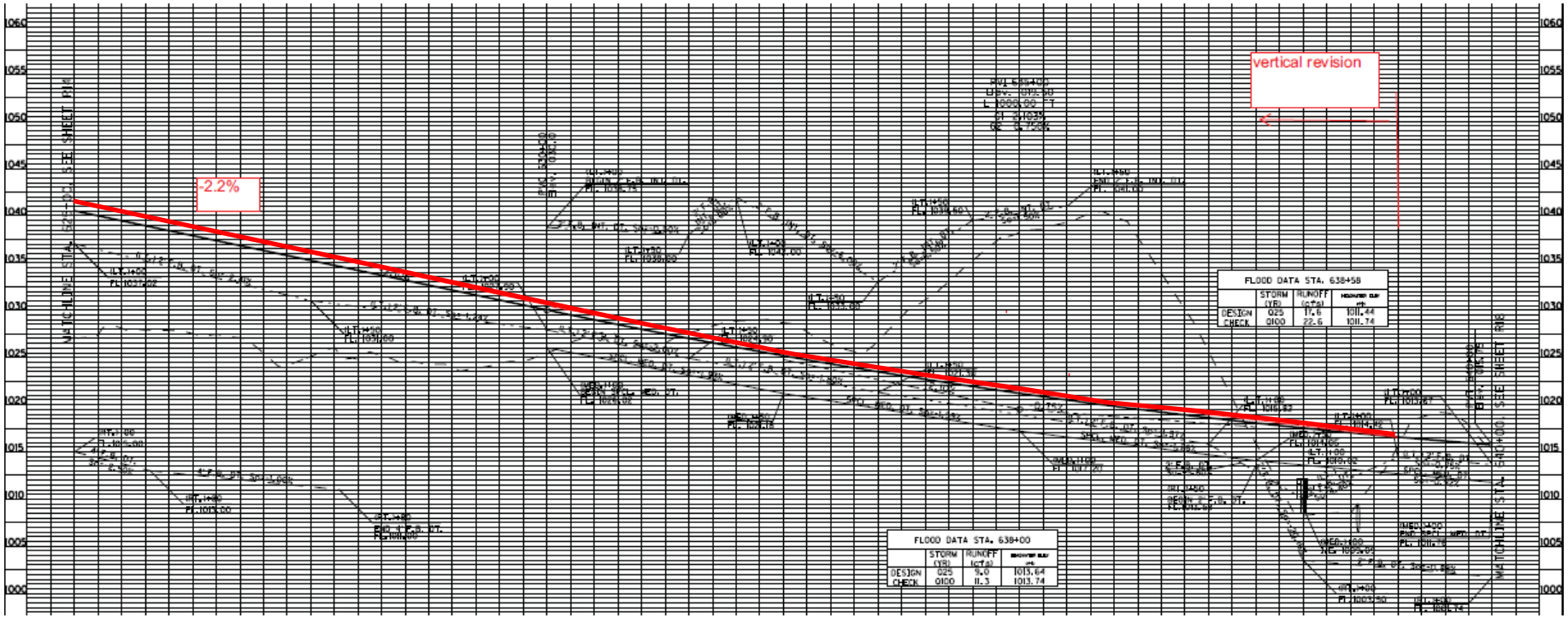

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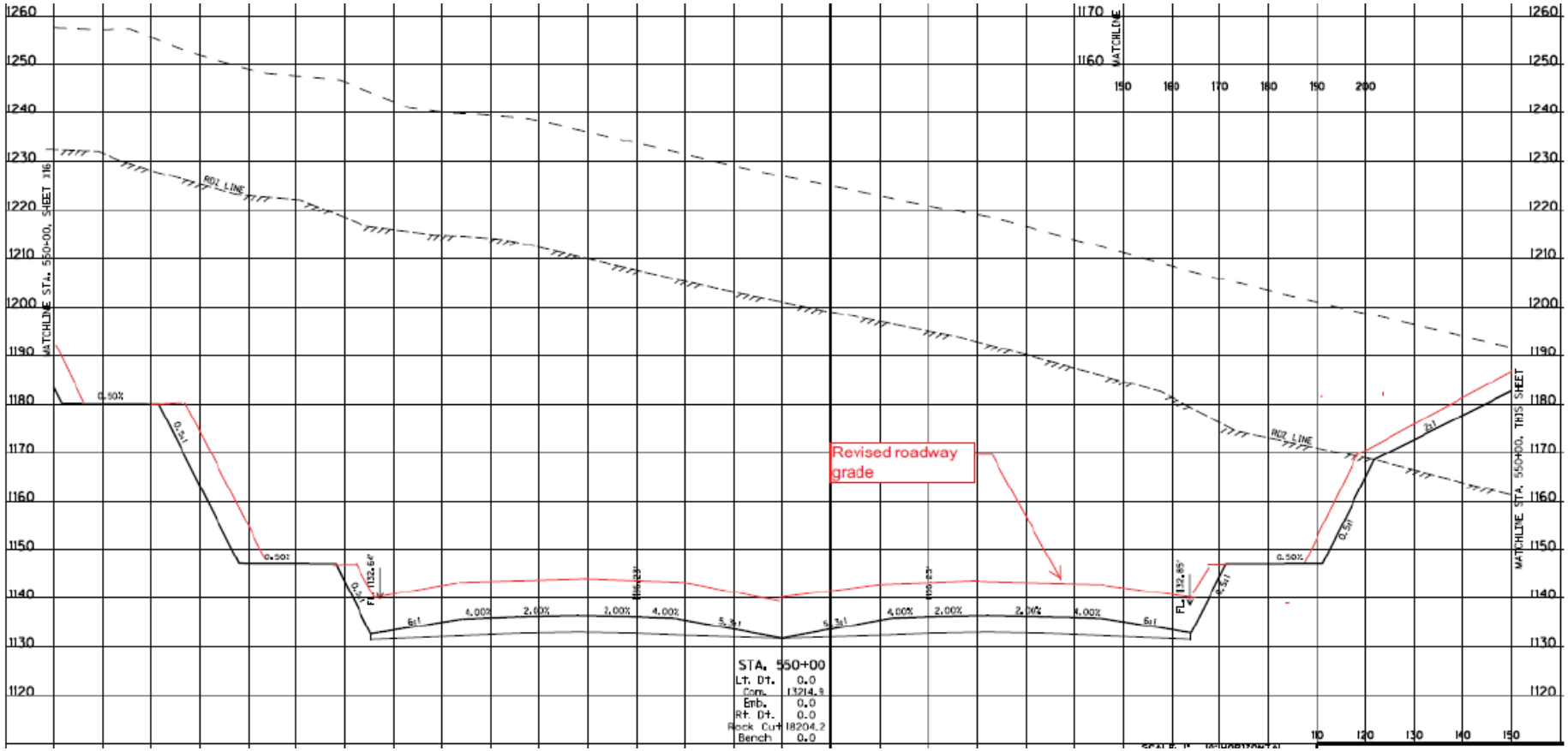


VALUE ENGINEERING RECOMMENDATION # VE-6

CALCULATIONS

ROADWAY EXCAVATION ESTIMATED VOLUME REDUCTION

STATION	ORIGINAL FIN. GRADE ELEV.	REVISED FIN. GRADE ELEV.	ELEVATION CHANGE (FT)	EXC. AREA REDUCTION (SF)	EXCAVATION VOLUME REDUCTION (CY)
SECTION 3					
540+00.00	1107.00	1107.00	0.00		
541+00.00	1110.00	1110.08	0.08		
542+00.00	1113.00	1113.33	0.33		
543+00.00	1116.00	1116.75	0.75		
544+00.00	1119.00	1120.33	1.33		
SECTION 4					
545+00.00	1122.00	1124.08	2.08	471	
546+00.00	1125.00	1128.00	3.00	690	2150
547+00.00	1128.00	1132.00	4.00	962	3059
548+00.00	1130.91	1136.00	5.09	1283	4157
549+00.00	1133.66	1139.85	6.19	1595	5331
550+00.00	1136.23	1143.41	7.18	1832	6347
551+00.00	1138.64	1146.67	8.03	1982	7064
552+00.00	1140.87	1149.64	8.77	2069	7503
553+00.00	1142.94	1152.31	9.37	2130	7776
554+00.00	1144.83	1154.68	9.85	2053	7746
555+00.00	1146.56	1156.76	10.20	2739	8874
556+00.00	1148.11	1158.54	10.43	2319	9367
557+00.00	1149.50	1160.03	10.53	912	5984
558+00.00	1150.71	1161.22	10.51		
559+00.00	1151.75	1162.12	10.37		
560+00.00	1152.63	1162.72	10.09		
561+00.00	1153.33	1163.03	9.70		
562+00.00	1153.86	1163.04	9.18		
563+00.00	1154.23	1162.75	8.52		
564+00.00	1154.42	1162.17	7.75		
565+00.00	1154.45	1161.29	6.84		
566+00.00	1154.30	1160.12	5.82		
567+00.00	1153.98	1158.65	4.67		

VALUE ENGINEERING RECOMMENDATION # VE-6

CALCULATIONS (CONTINUED)

STATION	ORIGINAL FIN. GRADE ELEV.	REVISED FIN. GRADE ELEV.	ELEVATION CHANGE (FT)	EXC. AREA REDUCTION (SF)	EXCAVATION VOLUME REDUCTION (CY)
568+00.00	1153.49	1156.89	3.40	286	529
569+00.00	1152.84	1154.98	2.14	257	1004
570+00.00	1152.01	1153.07	1.06	170	790
571+00.00	1151.01	1151.16	0.15	21	353
572+00.00	1149.85	1149.24	-0.61		
589+00.00	1116.23	1116.76	0.53		
590+00.00	1114.12	1114.84	0.72	122	225
591+00.00	1112.02	1112.93	0.91	161	524
592+00.00	1109.92	1111.02	1.10	229	723
593+00.00	1107.82	1109.11	1.29	283	948
594+00.00	1105.71	1107.20	1.49	322	1119
595+00.00	1103.61	1105.29	1.68	348	1239
596+00.00	1101.51	1103.38	1.87	379	1346
597+00.00	1099.40	1101.47	2.07	395	1434
598+00.00	1097.30	1099.56	2.26	444	1554
599+00.00	1095.20	1097.63	2.43	504	1757
600+00.00	1093.10	1095.67	2.57	580	2008
601+00.00	1090.99	1093.69	2.70	586	2158
602+00.00	1088.89	1091.68	2.79	535	2076
603+00.00	1086.79	1089.63	2.84	529	1972
604+00.00	1084.68	1087.56	2.88	539	1979
605+00.00	1082.58	1085.46	2.88	506	1935
606+00.00	1080.48	1083.33	2.85	489	1842
607+00.00	1078.38	1081.17	2.79	478	1791
608+00.00	1076.27	1078.98	2.71	509	1828
609+00.00	1074.17	1076.78	2.61	506	1879
610+00.00	1072.07	1074.58	2.51	509	1879
611+00.00	1069.97	1072.38	2.41	527	1919
612+00.00	1067.86	1070.17	2.31	619	2123
613+00.00	1065.76	1067.97	2.21	581	2222
614+00.00	1063.66	1065.77	2.11	495	1993
615+00.00	1061.55	1063.56	2.01	397	1652
616+00.00	1059.45	1061.36	1.91	377	1434

VALUE ENGINEERING RECOMMENDATION # VE-6

CALCULATIONS (CONTINUED)

STATION	ORIGINAL FIN. GRADE ELEV.	REVISED FIN. GRADE ELEV.	ELEVATION CHANGE (FT)	EXC. AREA REDUCTION (SF)	EXCAVATION VOLUME REDUCTION (CY)
617+00.00	1057.35	1059.16	1.81	312	1277
618+00.00	1055.25	1056.95	1.70	297	1129
619+00.00	1053.14	1054.75	1.61	138	806
620+00.00	1051.04	1052.55	1.51		
630+00.00	1030.01	1030.52	0.51	43	
631+00.00	1027.98	1028.39	0.41	35	144
632+00.00	1026.08	1026.40	0.32	29	117
633+00.00	1024.31	1024.56	0.25	22	94
634+00.00	1022.68	1022.87	0.19	38	112
635+00.00	1021.19	1021.32	0.13	31	128
636+00.00	1019.83	1019.91	0.08	20	94
637+00.00	1018.61	1018.65	0.04	8	51
638+00.00	1017.52	1017.54	0.02		
639+00.00	1016.57	1016.57	0.00		
640+00.00	1015.75	1015.75	0.00		
				TOTAL =	125544

VALUE ENGINEERING RECOMMENDATION # VE-6a

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
ROADWAY EXCAVATION	CY	$11.00	1	1,627,859	$17,906,449	1,502,315	$16,525,465
CULVERT PIPE-18 INCH	LF	$40.00	1	425	$17,000	436	$17,440
CULVERT PIPE-54 INCH	LF	$100.03	1	498	$49,815	589	$58,918
CULVERT PIPE-60 INCH	LF	$120.00	8	607	$72,840	617	$74,040
Total					$18,046,104		$16,675,863

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-6b

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
ROADWAY EXCAVATION	CY	$5.00	1	1,627,859	$8,139,295	1,502,315	$7,511,575
CULVERT PIPE-18 INCH	LF	$40.00	1	425	$17,000	436	$17,440
CULVERT PIPE-54 INCH	LF	$100.03	1	498	$49,815	589	$58,918
CULVERT PIPE-60 INCH	LF	$120.00	8	607	$72,840	617	$74,040
Total					$8,278,950		$7,661,973

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-7

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a 50 ft median with cable barrier in lieu of 60 ft depressed median section through the entire Section 4.

ORIGINAL DESIGN:
The original design specifies 60 foot depressed median with no barriers in median except at bridge approaches.

RECOMMENDED CHANGE:
The VE team recommends reducing depressed median section from 60 feet wide to 50 feet wide and to add a cable barrier system throughout mainline section. This 10 foot reduction in template width will decrease both excavation and embankment volumes. The Roadside Design Guide allows the use of 50 foot median width for this type of facility with a barrier being an optional component. Due to current use of cable barrier by the KYTC on selected roadways, it would be appropriate to install barrier for this proposed project.

ADVANTAGES:
- Reduce roadway excavation
- Reduce possibility of crossover collisions
- Less total earthwork

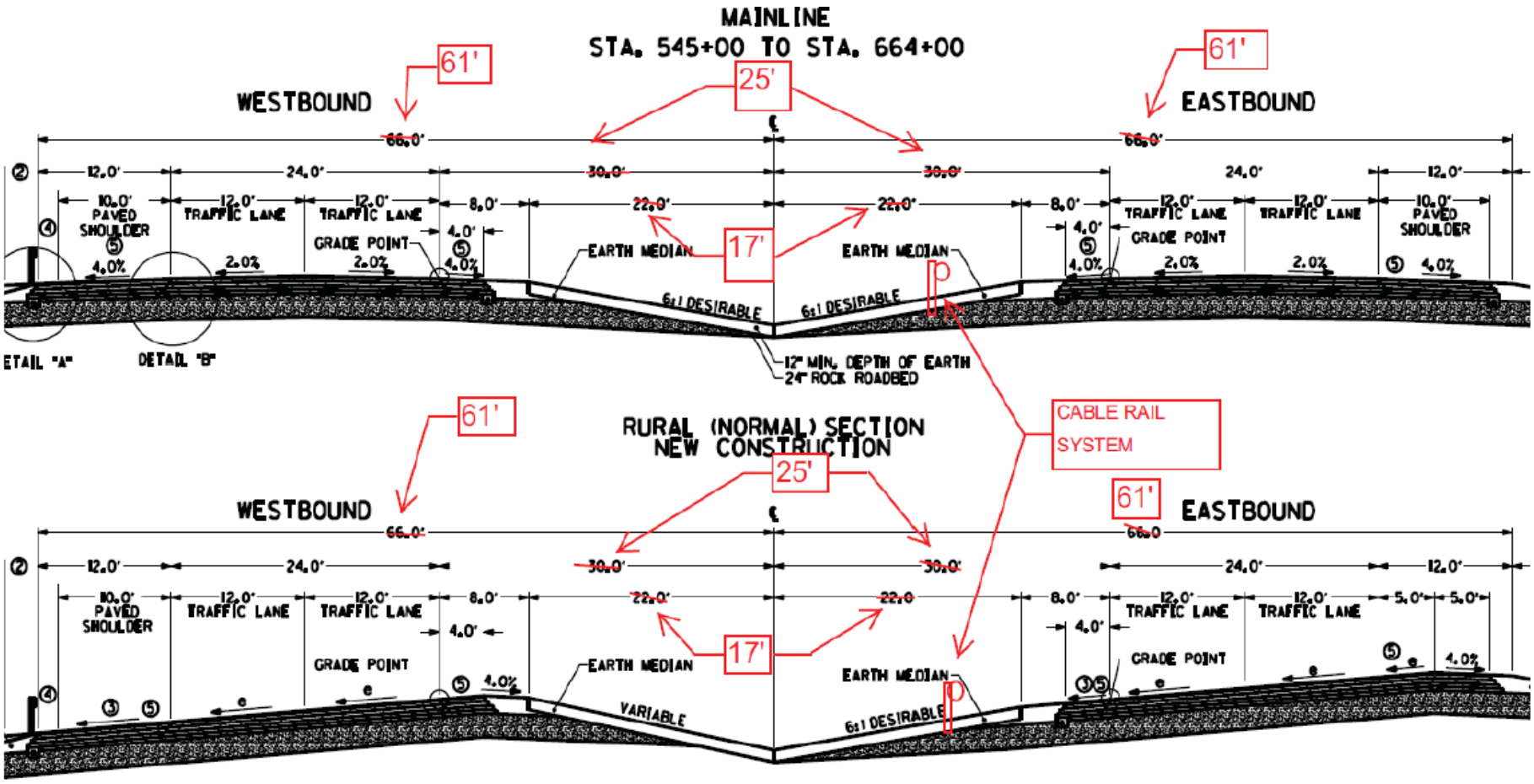
DISADVANTAGES:
- Maintenance of cable barrier
- Additional obstruction in median
- Redesign required

JUSTIFICATION:
The recommended change would reduce total earthwork (excavation and embankment) on project, which includes a quantity decrease in the major bid item of Roadway Excavation by approximately 41000 cubic yards. The installation of the cable rail system in median will potentially minimize median crossover collisions. The narrowing of median will also result in the decrease in quantities of pipe culvert cross drains and erosion control blanket.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$18,222,000	$0	$18,222,000
RECOMMENDED DESIGN	$17,904,000	$64,000	$17,968,000
ESTIMATED SAVINGS OR (COST)	$318,000	($64,000)	$254,000

VALUE ENGINEERING RECOMMENDATION # VE-7

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS

ROADWAY EXCAVATION ESTIMATED VOLUME REDUCTION

STATION	FINISHED GRADE ELEVATION	ORIGINAL GROUND ELEVATION	CUT/FILL (FT)	Decrease VOLUME RDWY. EXC. (CY)	Decrease VOLUME EMBANKMENT (CY)
545+00	1122.00	1181.4	59.4		
546+00	1125.00	1188.6	63.6	2278	0
547+00	1128.00	1202.4	74.4	2556	0
548+00	1130.91	1217.6	86.7	2983	0
549+00	1133.66	1226.5	92.8	3325	0
550+00	1136.23	1227	90.8	3400	0
551+00	1138.64	1221.5	82.9	3215	0
552+00	1140.87	1213.2	72.3	2874	0
553+00	1142.94	1206.9	64.0	2524	0
554+00	1144.83	1190.2	45.4	2025	0
555+00	1146.56	1174	27.4	1348	0
556+00	1148.11	1165.4	17.3	828	0
557+00	1149.50	1152.7	3.2	379	0
558+00	1150.71	1138	-12.7	0	176
559+00	1151.75	1123	-28.8	0	768
560+00	1152.63	1115.8	-36.8	0	1214
561+00	1153.33	1109.9	-43.4	0	1486
562+00	1153.86	1109.5	-44.4	0	1626
563+00	1154.23	1111.1	-43.1	0	1620
564+00	1154.42	1114.4	-40.0	0	1540
565+00	1154.45	1117.7	-36.8	0	1422
566+00	1154.30	1126.2	-28.1	0	1201
567+00	1153.98	1137.4	-16.6	0	827
568+00	1153.49	1150.5	-3.0	0	362
569+00	1152.84	1161.3	8.5	101	0
570+00	1152.01	1166.2	14.2	419	0
571+00	1151.01	1161.3	10.3	453	0
572+00	1149.85	1147.6	-2.3	149	0
573+00	1148.51	1129.3	-19.2	0	397
574+00	1147.00	1115.9	-31.1	0	932
575+00	1145.32	1107.4	-37.9	0	1278

VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS (CONTINUED)

STATION	FINISHED GRADE ELEVATION	ORIGINAL GROUND ELEVATION	CUT/FILL (FT)	Decrease VOLUME RDWY. EXC. (CY)	Decrease VOLUME EMBANKMENT (CY)
576+00	1143.48	1101.6	-41.9	0	1478
577+00	1141.46	1101.1	-40.4	0	1523
578+00	1139.36	1107.7	-31.7	0	1334
579+00	1137.25	1111.2	-26.1	0	1069
580+00	1135.15	1110	-25.2	0	948
581+00	1133.05	1109.3	-23.8	0	906
582+00	1130.95	1108.8	-22.2	0	850
583+00	1128.84	1111	-17.8	0	741
584+00	1126.74	1109.6	-17.1	0	648
585+00	1124.64	1106.2	-18.4	0	659
586+00	1122.53	1110.3	-12.2	0	568
587+00	1120.43	1111.4	-9.0	0	394
588+00	1118.33	1106.7	-11.6	0	383
589+00	1116.23	1109.9	-6.3	0	333
590+00	1114.12	1114.2	0.1	0	116
591+00	1112.02	1116.1	4.1	77	0
592+00	1109.92	1119.5	9.6	253	0
593+00	1107.82	1119.8	12.0	399	0
594+00	1105.71	1117.1	11.4	433	0
595+00	1103.61	1113.1	9.5	387	0
596+00	1101.51	1110.2	8.7	337	0
597+00	1099.40	1105.5	6.1	274	0
598+00	1097.30	1104.8	7.5	252	0
599+00	1095.20	1105.2	10.0	324	0
600+00	1093.10	1107.2	14.1	446	0
601+00	1090.99	1103.2	12.2	487	0
602+00	1088.89	1095.6	6.7	350	0
603+00	1086.79	1092.3	5.5	226	0
604+00	1084.68	1090.4	5.7	208	0
605+00	1082.58	1085.7	3.1	164	0
606+00	1080.48	1081.3	0.8	73	0
607+00	1078.38	1078.1	-0.3	10	0
608+00	1076.27	1085.5	9.2	166	0

VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS (CONTINUED)

STATION	FINISHED GRADE ELEVATION	ORIGINAL GROUND ELEVATION	CUT/FILL (FT)	Decrease VOLUME RDWY. EXC. (CY)	Decrease VOLUME EMBANKMENT (CY)
609+00	1074.17	1085.8	11.6	386	0
610+00	1072.07	1087.2	15.1	496	0
611+00	1069.97	1091.5	21.5	679	0
612+00	1067.86	1094	26.1	883	0
613+00	1065.76	1090.6	24.8	944	0
614+00	1063.66	1081.4	17.7	789	0
615+00	1061.55	1069.9	8.4	483	0
616+00	1059.45	1067.8	8.3	309	0
617+00	1057.35	1059.4	2.1	193	0
618+00	1055.25	1057.8	2.5	85	0
619+00	1053.14	1051.4	-1.7	15	0
620+00	1051.04	1039.7	-11.3	0	242
621+00	1048.94	1029.8	-19.1	0	564
622+00	1046.84	1027	-19.8	0	722
623+00	1044.73	1025.4	-19.3	0	725
624+00	1042.63	1026	-16.6	0	666
625+00	1040.53	1027.1	-13.4	0	557
626+00	1038.42	1027.8	-10.6	0	445
627+00	1036.32	1025.4	-10.9	0	399
628+00	1034.22	1024.8	-9.4	0	377
629+00	1032.12	1023.9	-8.2	0	327
630+00	1030.01	1025.5	-4.5	0	236
631+00	1027.98	1026.1	-1.9	0	118
632+00	1026.08	1028.9	2.8	17	0
633+00	1024.31	1026.4	2.1	91	0
634+00	1022.68	1031.1	8.4	195	0
635+00	1021.19	1038.2	17.0	471	0
636+00	1019.83	1039.9	20.1	687	0
637+00	1018.61	1025.6	7.0	501	0
638+00	1017.52	1008.3	-9.2	0	41
639+00	1016.57	1015.5	-1.1	0	191
640+00	1015.75	1015.1	-0.6	0	32
641+00	1015.00	1012.6	-2.4	0	56

VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS (CONTINUED)

STATION	FINISHED GRADE ELEVATION	ORIGINAL GROUND ELEVATION	CUT/FILL (FT)	Decrease VOLUME RDWY. EXC. (CY)	Decrease VOLUME EMBANKMENT (CY)
642+00	1014.25	1006	-8.3	0	197
643+00	1013.50	990	-23.5	0	588
644+00	1012.75	990.9	-21.9	0	840
645+00	1012.00	993.7	-18.3	0	744
646+00	1011.25	1001.1	-10.2	0	527
647+00	1010.50	1003.4	-7.1	0	319
648+00	1009.75	1015	5.3	0	34
649+00	1009.00	1013.8	4.8	186	0
650+00	1008.25	1002.5	-5.8	0	18
651+00	1007.50	1002.9	-4.6	0	192
652+00	1006.75	1000.5	-6.3	0	201
653+00	1006.00	999.8	-6.2	0	231
654+00	1005.25	1001.8	-3.5	0	179
655+00	1004.50	996.6	-7.9	0	210
656+00	1003.75	997.9	-5.9	0	255
657+00	1003.00	993.8	-9.2	0	279
658+00	1002.25	992.8	-9.5	0	345
659+00	1001.50	991.8	-9.7	0	355
660+00	1000.75	980.4	-20.4	0	556
661+00	1000.00	977.1	-22.9	0	801
662+00	999.25	974.8	-24.5	0	877
663+00	998.50	968	-30.5	0	1018
664+00	997.75	965.3	-32.5	0	1166
665+00	997.00	959.8	-37.2	0	1290
666+00	996.25	957.7	-38.6	0	1403
667+00	995.66	952.7	-43.0	0	1509
668+00	995.40	948.7	-46.7	0	1660
669+00	995.46	945.6	-49.9	0	1788
670+00	995.85	939.5	-56.4	0	1967

VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS (CONTINUED)

STATION	FINISHED GRADE ELEVATION	ORIGINAL GROUND ELEVATION	CUT/FILL (FT)	Decrease VOLUME RDWY. EXC. (CY)	Decrease VOLUME EMBANKMENT (CY)
671+00	996.41	942.9	-53.5	0	2034
672+00	996.96	942.4	-54.6	0	2001
673+00	997.51	952.4	-45.1	0	1846
			TOTALS =	41133	57924
				CY EXC Decrease	CY EMB Decrease

VALUE ENGINEERING RECOMMENDATION # VE-7a

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
ROADWAY EXCAVATION	CY	$11.00	1	1,627,859	$17,906,449	1,586,726	$17,453,986
HIGH TENSION CABLE-ROPE BARRIER	LF	$13.00	2			11,900	$154,700
CULVERT PIPE-18 INCH	LF	$40.00	1	425	$17,000	375	$15,000
CULVERT PIPE-30 INCH	LF	$56.24	1	713	$40,099	693	$38,974
CULVERT PIPE-36 INCH	LF	$81.36	1	857	$69,726	827	$67,285
CULVERT PIPE-42 INCH	LF	$87.98	1	329	$28,945	319	$28,066
CULVERT PIPE-54 INCH	LF	$100.03	1	498	$49,815	488	$48,815
CULVERT PIPE-60 INCH	LF	$120.00	8	607	$72,840	587	$70,440
EROSION CONTROL BLANKET	SY	$0.79	1	46,666	$36,866	33,444	$26,421
Total					$18,221,740		$17,903,686

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-7b

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
ROADWAY EXCAVATION	CY	$5.00	1	1,627,859	$8,139,295	1,586,726	$7,933,630
HIGH TENSION CABLE-ROPE BARRIER	LF	$13.00	2			11,900	$154,700
CULVERT PIPE-18 INCH	LF	$40.00	1	425	$17,000	375	$15,000
CULVERT PIPE-30 INCH	LF	$56.24	1	713	$40,099	693	$38,974
CULVERT PIPE-36 INCH	LF	$81.36	1	857	$69,726	827	$67,285
CULVERT PIPE-42 INCH	LF	$87.98	1	329	$28,945	319	$28,066
CULVERT PIPE-54 INCH	LF	$100.03	1	498	$49,815	488	$48,815
CULVERT PIPE-60 INCH	LF	$120.00	8	607	$72,840	587	$70,440
EROSION CONTROL BLANKET	SY	$0.79	1	46,666	$36,866	33,444	$26,421
Total					$8,454,586		$8,383,330

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-7

COST ESTIMATE - O & M (LIFE CYCLE) COST

PRESENT WORTH METHOD
LIFE CYCLE PERIOD (YEARS) = 20
ANNUAL PERCENTAGE RATE = 6%

O&M Costs. Single Expenditure	In the Yr	PW Factor	Original Design		Recommended Design	
			Est $	PW $	Est $	PW $
Subtotal Single Life Cycle O&M Costs				$0		$0
O&M Costs. Annual Continuous Costs	For How Many Yrs	PW Factor	Original Design		Recommended Design	
			Est $	PW $	Est $	PW $
Maintenance	25	12.7834			$5,000	$63,917
Subtotal Annual Life Cycle Costs				$0		$63,917
Total Life Cycle O&M Costs				$0		$64,000

VALUE ENGINEERING RECOMMENDATION # VE-8

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize the rock roadbed for drainage and eliminate edge drains.

ORIGINAL DESIGN:
The original design specifies 4-inch perforated pipe pavement edge drain system for mainline and ramps throughout project.

RECOMMENDED CHANGE:
The VE team recommends eliminating edge drain system and using Crushed Stone Base in lieu of Dense Graded Aggregate base in the pavement structure. Proposed asphalt curing seal on dense graded aggregate layer can also be deleted.

ADVANTAGES:

- Decrease work items for pipe & headwalls, and eliminate curing seal
- Eliminate future maintenance of drain outlets

DISADVANTAGES:

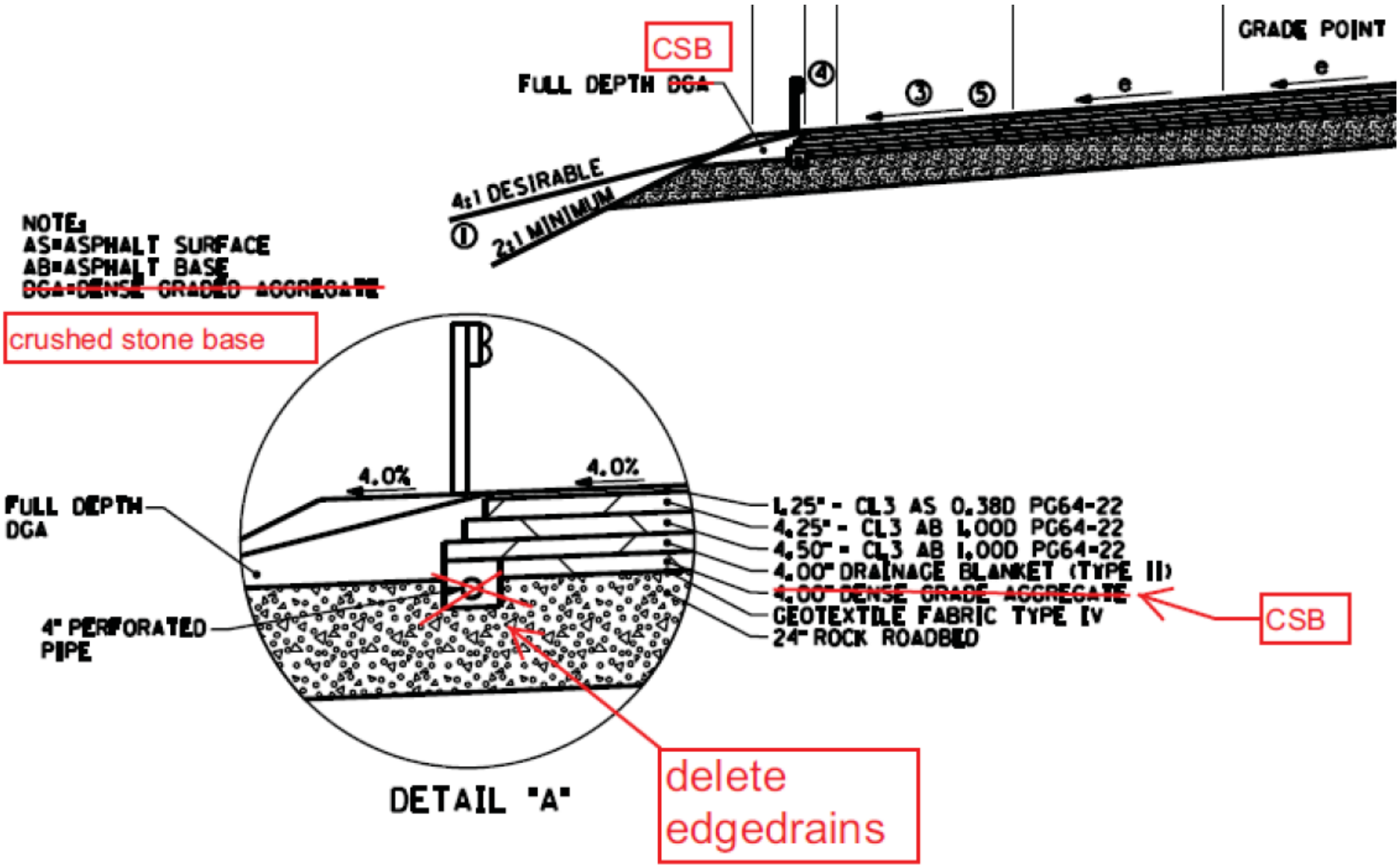
- Less redundancy/efficiency of pavement drainage
- Need approval from Pavement Design Branch
- Eliminating edge drains will result in approximately 25 ft of additional aggregate median

JUSTIFICATION:
The recommended change reduces all work related to edge drain system thereby decreasing overall construction time and project cost. The change from dense graded aggregate base to crushed stone base will have little or no cost implications. Water in pavement can still migrate through drainage blanket, crushed stone base, and rock roadbed.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$331,000	$0	$331,000
RECOMMENDED DESIGN	$34,000	$0	$34,000
ESTIMATED SAVINGS OR (COST)	$297,000	$0	$297,000

VALUE ENGINEERING RECOMMENDATION # VE-8

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-8

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
PERFORATED PIPE-4 INCH	LF	$5.18	1	42,600	$220,668	2,742	$14,204
NON-PERFORATED PIPE-4 INCH	LF	$8.79	1	2,270	$19,953	1,250	$10,988
PERFORATED PIPE HEADWALL TY 2-4 INCH	EA	$380.28	1	125	$47,535	23	$8,746
ASPHALT CURING SEAL	TON	$380.66	1	113	$43,015		
Total					$331,171		$33,938

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-9

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a wagon box for the new proposed Coleman Road alignment crossing in lieu of a twin bridge structures.

ORIGINAL DESIGN:
The original design specifies utilizing twin bridge structures (each structure 136 feet long) over the proposed re-alignment of Coleman Road at mainline station 574+00. The total re-alignment length of Coleman road is 2,950 feet. From the proposed plans provided to the VE team, the proposed estimate for the re-alignment of Coleman Road comes to a total of $1,346,840. Subtracting the cost of the twin bridge structures on mainline over proposed Coleman Road is a total of $830,000 for both, with the cost of each structure being $415,000/bridge ($69.35/SF). Taking the cost difference of the twin bridge structures yields a difference of $516,840 for the proposed Coleman Road, which equates to $175.20/ft over a length of 2,950 feet. The total estimate of $516,840 is for all construction items supplied and depicted on the estimate supplied to the VE team but does not include any potential right of way and/or utilities.

RECOMMENDED CHANGE:
The VE team recommends utilizing a wagon box approximately 300 feet long for the new proposed Coleman Road alignment under the mainline in lieu of twin bridges. This recommendation involves eliminating the twin bridge structures on mainline over proposed Coleman Road and constructing a wagon box under mainline on proposed Coleman Road as presented on the current design. The estimated cost of the wagon box per linear foot is $2,000/ft supplied to the VE team from previous estimates received from the design team.

ADVANTAGES:
- Reduced construction cost
- Common practice for low volume roads under major arterials
- Ease of construction
- Reduced construction duration

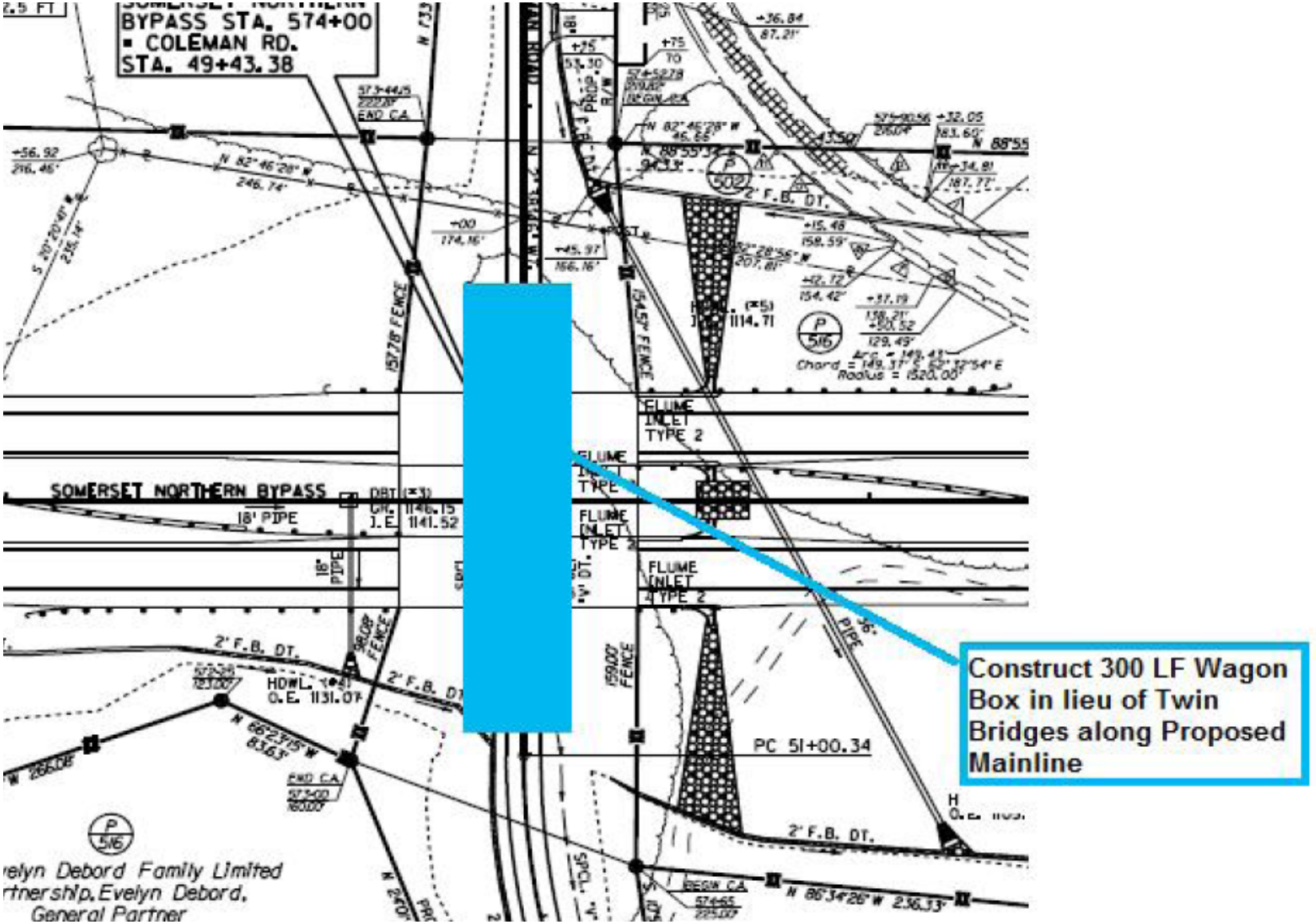
DISADVANTAGES:
- None

JUSTIFICATION:
The wagon box will still serve the purpose and need of the project by allowing traffic to pass thru the wagon box under the mainline with no disruption to the flow of traffic. Substituting the wagon box in lieu of the twin bridge structures has the potential to save the Commonwealth of Kentucky construction money to be used on similar projects.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$1,388,000	$0	$1,388,000
RECOMMENDED DESIGN	$1,117,000	$0	$1,117,000
ESTIMATED SAVINGS OR (COST)	$271,000	$0	$271,000

VALUE ENGINEERING RECOMMENDATION # VE-9

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-9

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
Wagon Box	LF	$2,000	1			300	$600,000
Proposed Coleman Road	LF	$175.20	1	2,950	$516,840	2,950	$516,840
Mainline Twin Bridges	EA	$415,000	1	2	$830,000		
Guardrail - Steel W Beam - S Face	LF	$9.66	1	200	$1,932		
Guardrail - Steel W Beam - D Face	LF	$27.37	1	275	$7,527		
Guardrail Connector to Bridge End Ty A	EA	$2,500	1	4	$10,000		
Crash Cushion Type IX-A	EA	$4,500	1	2	$9,000		
Guardrail End Treatment Type 2A	EA	$452.98	1	2	$906		
Guardrail Connector to Bridge End Type A-1	EA	$661.95	1	2	$1,324		
Guardrail End Treatment Type 4A	EA	$1,493.29	1	2	$2,987		
Flume Inlet Type 2	EA	$3,795.23	1	2	$7,590		
Total					$1,388,106		$1,116,840

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-10

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a wagon box askew to the mainline along existing Coleman Road alignment in lieu of crossing Coleman Road with twin bridge structures and realigning Coleman Road.

ORIGINAL DESIGN:
The original design specifies utilizing twin bridge structures (each structure 136 feet long) over the proposed re-alignment of Coleman Road at mainline station 574+00. The total re-alignment length of Coleman road is 2,950 feet. From the proposed plans provided to the VE team, the proposed estimate for the re-alignment of Coleman Road comes to a total of $1,346,840. Subtracting the cost of the twin bridge structures on mainline over proposed Coleman Road is a total of $830,000 for both with the cost of each structure being $415,000/bridge ($69.35/SF). Taking out the cost of the twin bridge structures yields a difference of $516,840 for the proposed Coleman Road, which equates to $175.20/ft over a length of 2,950 feet. The total estimate of $516,840 is for all construction items supplied and depicted on the estimate supplied to the VE team but does not include any potential right of way and/or utilities.

RECOMMENDED CHANGE:
The VE team recommends utilizing a wagon box approximately 375 feet long under the mainline along the existing Coleman Road alignment in lieu of twin bridges. This recommendation involves eliminating the twin bridge structures on mainline over existing Coleman Road and constructing a wagon box under mainline on existing Coleman Road and re-aligning approximately 500 feet of Coleman Road from the end of the wagon box to tie to the existing road. The estimated cost of the wagon box per linear foot is $2,000/ft supplied to the VE team from previous estimates received from the design team.

ADVANTAGES:
- Reduced construction material
- Potential eliminates utility relocation (if necessary)
- Common practice for low volume roads under major arterials
- Ease of construction
- Reduced construction duration
- Reduced right of way

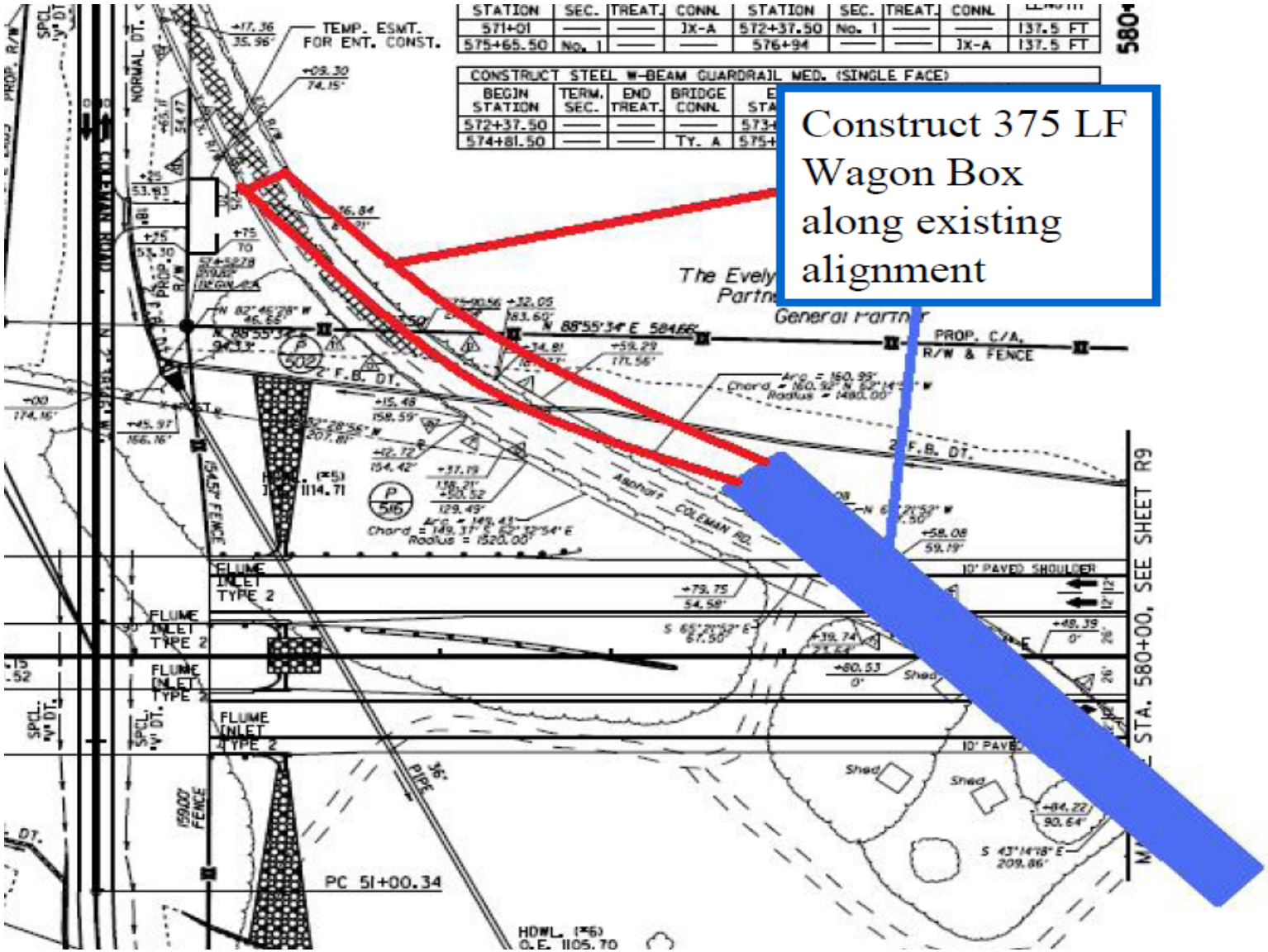
DISADVANTAGES:
- Temporary detour/diversion may be needed during construction

JUSTIFICATION:
The wagon box will still serve the purpose and need of the project by allowing traffic to pass thru the wagon box under the mainline with no disruption to the flow of traffic. Substituting the wagon box in lieu of the twin bridge structures has the potential to save the Commonwealth of Kentucky construction money to be used on similar projects.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$1,388,000	$0	$1,388,000
RECOMMENDED DESIGN	$838,000	$0	$838,000
ESTIMATED SAVINGS OR (COST)	$550,000	$0	$550,000

VALUE ENGINEERING RECOMMENDATION # VE-10

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-10

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
Wagon Box	LF	$2,000.00	1			375	$750,000
Proposed Coleman Road	LF	$175.20	1	2,950	$516,840	500	$87,600
Mainline Twin Bridges	EA	$415,000	1	2	$830,000		
Guardrail - Steel W Beam - S Face	LF	$9.66	1	200	$1,932		
Guardrail - Steel W Beam - D Face	LF	$27.37	1	275	$7,527		
Guardrail Connector to Bridge End Ty A	EA	$2,500.00	1	4	$10,000		
Crash Cushion Type IX-A	EA	$4,500.00	1	2	$9,000		
Guardrail End Treatment Type 2A	EA	$452.98	1	2	$906		
Guardrail Connector to Bridge End Type A-1	EA	$661.95	1	2	$1,324		
Guardrail End Treatment Type 4A	EA	$1,493.29	1	2	$2,987		
Flume Inlet Type 2	EA	$3,795.23	1	2	$7,590		
Total					$1,388,106		$837,600

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-11

DESCRIPTIVE TITLE OF RECOMMENDATION:
Move location of proposed twin bridges to the existing location of Coleman Road in lieu of realigning Coleman Road.

ORIGINAL DESIGN:
The original design specifies utilizing two twin bridge structures (each structure 136 feet long) over the proposed re-alignment of Coleman Road at mainline station 574+00. The total re-alignment length of Coleman road is 2,950 feet. From the proposed plans provided to the VE team, the proposed estimate for the re-alignment of Coleman Road comes to a total of $1,346,840. Subtracting the cost of the two twin bridge structures on mainline over proposed Coleman Road is a total of $830,000 for both, with the cost of each twin bridge structure being $415,000/bridge (approximately $69.35/SF). Taking out the cost of the twin bridge structures yields a difference of $516,840 for the proposed Coleman Road, which equates to $175.20/ft over a length of 2,950 feet. The total estimate of $516,840 is for all construction items supplied and depicted on the estimate supplied to the VE team but does not include any potential right of way and/or utilities.

RECOMMENDED CHANGE:
The VE team recommends moving the location of the proposed twin bridges to the existing location of Coleman Road at approximate station 579+10. This recommendation involves constructing the bridges over existing Coleman Road which will not require any relocation to Coleman Road or require any additional right of way and/or utility relocation outside the mainline disturbed limits.

ADVANTAGES:
- Reduced construction material
- No utility relocation(s) necessary beyond mainline disturbed limits (if any)
- No disruption to Coleman Road (low volume road)
- Right of Way beyond mainline disturbed limits will not be necessary

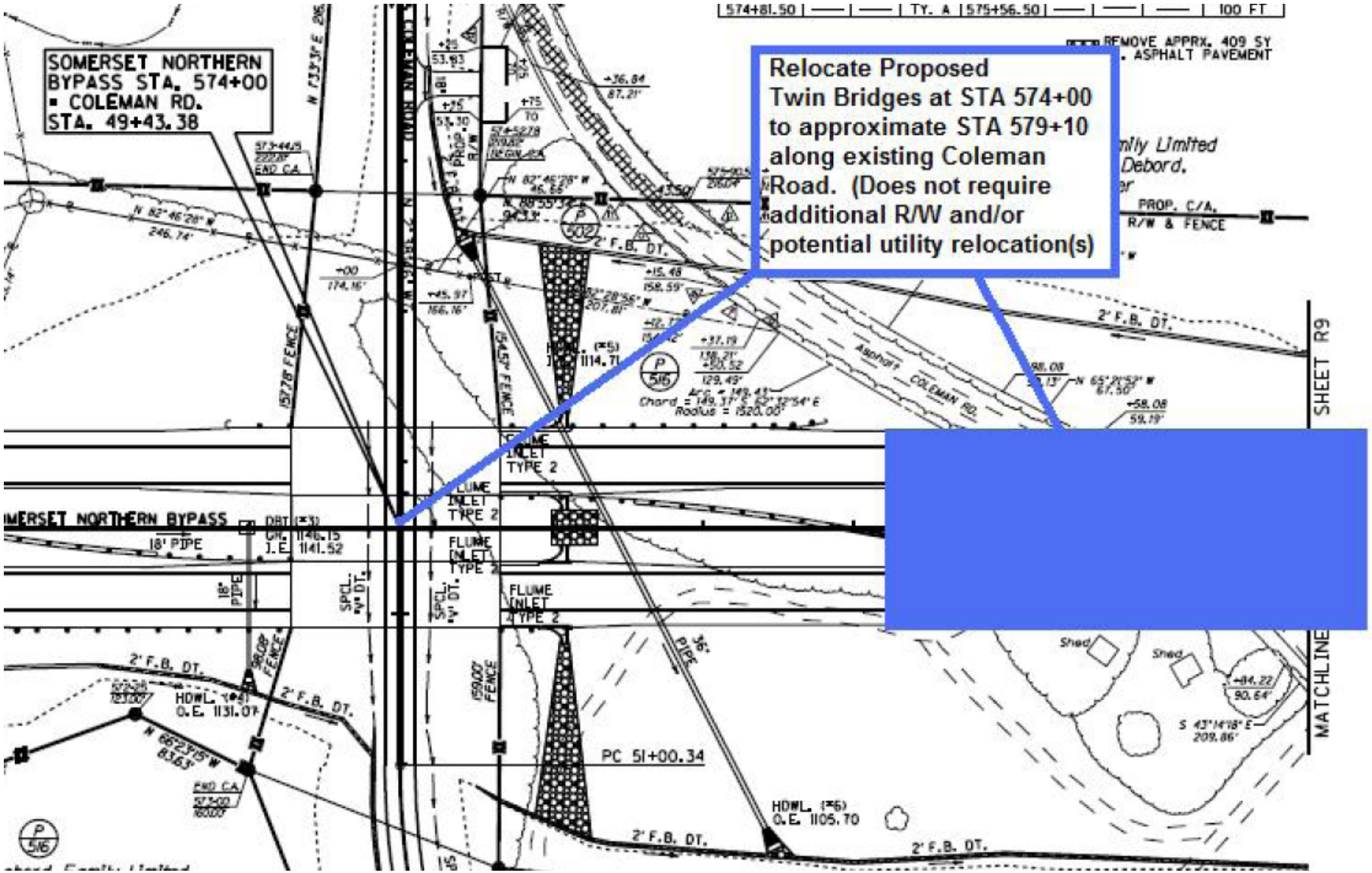
DISADVANTAGES:
- Existing Coleman Road is skewed at relocated crossing causing potential increase in structure length at new crossing

JUSTIFICATION:
The relocation of the twin bridges will still serve the purpose and need of the project by allowing traffic to pass under the mainline bridge with no disruption to the flow of traffic. By relocating the proposed structures will not require additional right of way and/or utility relocation(s) with the re-alignment of Coleman Road as currently presented on the proposed design. Relocating the twin bridges has the potential to save the Commonwealth of Kentucky construction money to be used on similar projects.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$1,347,000	$0	$1,347,000
RECOMMENDED DESIGN	$1,068,000	$0	$1,068,000
ESTIMATED SAVINGS OR (COST)	$279,000	$0	$279,000

VALUE ENGINEERING RECOMMENDATION # VE-11

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-11

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
Proposed Coleman Road	LF	$175.20	1	2,950	$516,840		
Mainline Twin Bridges	EA	$415,000	1	2	$830,000		
Relocated Mainline Twin Bridges (175 LF x 44 LF)	SF	$69.35	1			15,400	$1,067,990
Total					$1,346,840		$1,067,990

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-12

DESCRIPTIVE TITLE OF RECOMMENDATION:
On the abandoned piece of Coleman Road, leave existing pavement in place in lieu of removing pavement.

ORIGINAL DESIGN:
The original design specifies that Coleman Road will be realigned so the new twin bridge structures will intersect at a 90 degree angle. This will shorten the length of the bridge structures, but it will require additional new pavement for Coleman Road. The portion of Coleman Road that will be abandoned after the realignment is scheduled to be removed. The area of removed pavement, approximately 1,382 SQ YD, will have seeding and protection applied to control erosion.

RECOMMENDED CHANGE:
The VE team recommends leaving this portion of abandoned pavement in place in lieu of removing the pavement. Approximately 1,382 SY of pavement would not be demolished and the same quantity of seeding and protection would not be needed. A visual delineation from the active Coleman Road should be made to prevent travelers from accidently traveling onto this abandoned piece of roadway.

ADVANTAGES:
- Reduce material removal
- Reduce seeding and protection application
- Reduce construction duration

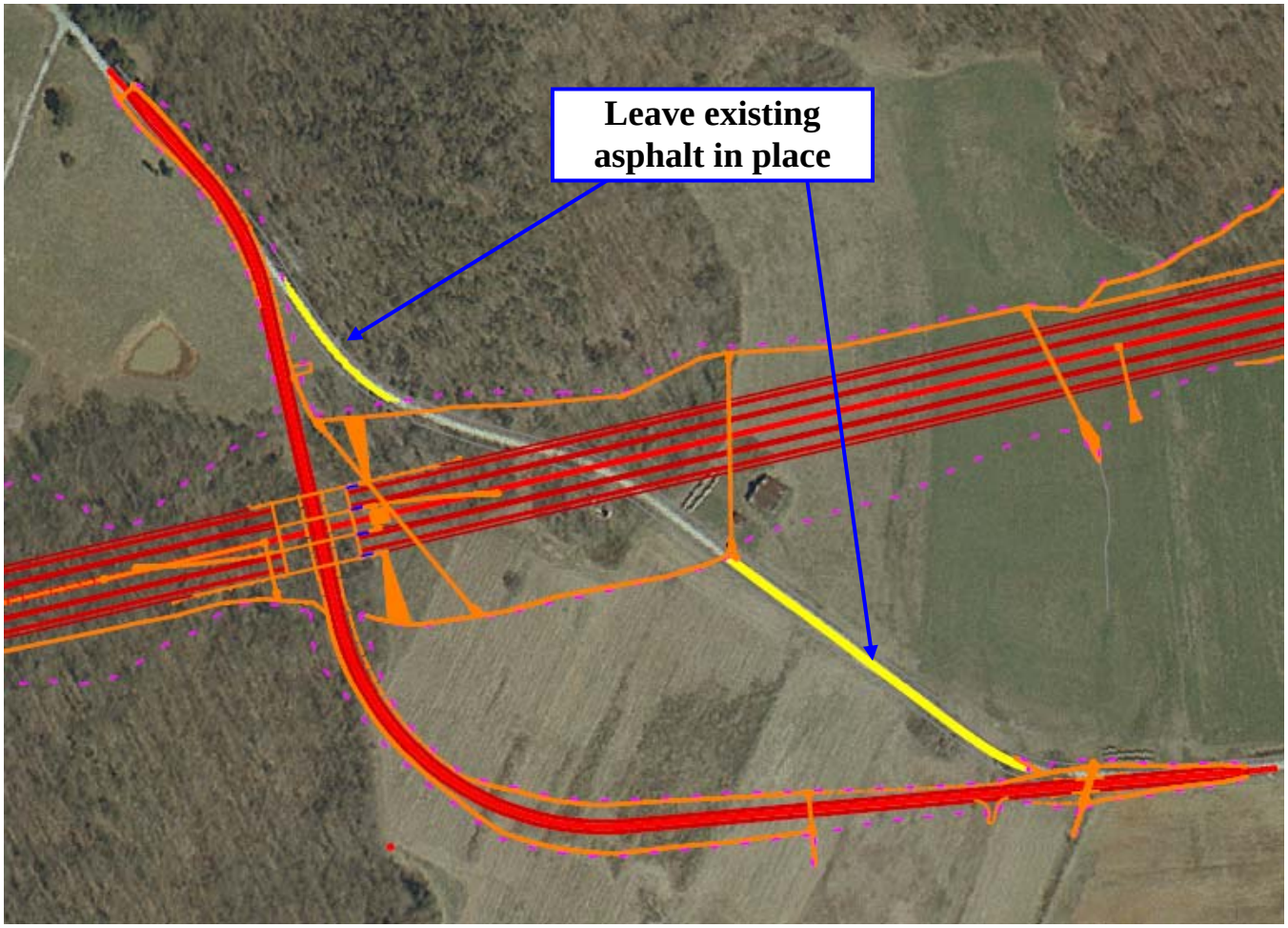
DISADVANTAGES:
- Abandoned roadway may confuse travelers
- May not be as aesthetically pleasing
- May not be as environmentally friendly
- Land owner may want pavement removed

JUSTIFICATION:
The abandoned section of Coleman Roadway is not intended for any further use or function. The VE team recommends leaving the pavement in place, because it does not need to be disturbed. If this pavement is removed, seeding and protection from erosion becomes required. Although the cost savings is relatively minor at $18,000, this recommendation is easy to implement and would eliminate construction work and the associated duration.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$18,000	$0	$18,000
RECOMMENDED DESIGN	$0	$0	$0
ESTIMATED SAVINGS OR (COST)	$18,000	$0	$18,000

VALUE ENGINEERING RECOMMENDATION # VE-12

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-12

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
2091 Remove Pavement	SY	$13.00	1	1,382	$17,966		
5985 Seeding & Protection	SY	$0.38	1	1,382	$525		
Total					$18,491		$0

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-13

DESCRIPTIVE TITLE OF RECOMMENDATION:
Only construct one bi-directional ramp (along Ramp 4) intersecting with KY-80 in lieu of two ramps.

ORIGINAL DESIGN:
The original design specifies constructing two ramps, Ramp 1 and Ramp 4, respectfully to tie to KY-80. The total cost for Ramp 1 (WB on ramp) is $1,156,922 and the cost for Ramp 4 (EB off ramp) is $500,194. Ramp 4 contains a proposed single 13' x 5' reinforced concrete box culvert (RCBC) with an estimated cost of $169,000, while Ramp 1 contains a proposed double 12' x 6' (RCBC) with an estimated cost of $587,000. Ramp 1's baseline length is 1,867 feet, while Ramp 4's baseline length is 1,442 feet. In comparison per square foot, Ramp 1 costs $41.31/square foot while Ramp 4 costs $23.13/square foot. The difference in costs is primarily related to the double RCBC under Ramp 1.

RECOMMENDED CHANGE:
The VE team recommends constructing a bi-directional two way ramp along Ramp 4 and not constructing Ramp 1 until a possible future project. Ramp 4 will provide access for westbound motorists to access the bypass by entering and exiting at Ramp 4 and crossing over the median to proceed into the westbound lanes. All motorists along KY-80 will enter and exit the bypass at the same point.

ADVANTAGES:
- Reduced construction cost with removal of Ramp 1
- Less disturbed area and less temporary erosion control measures, less project construction time and material
- Stockpile material at proposed Ramp 1

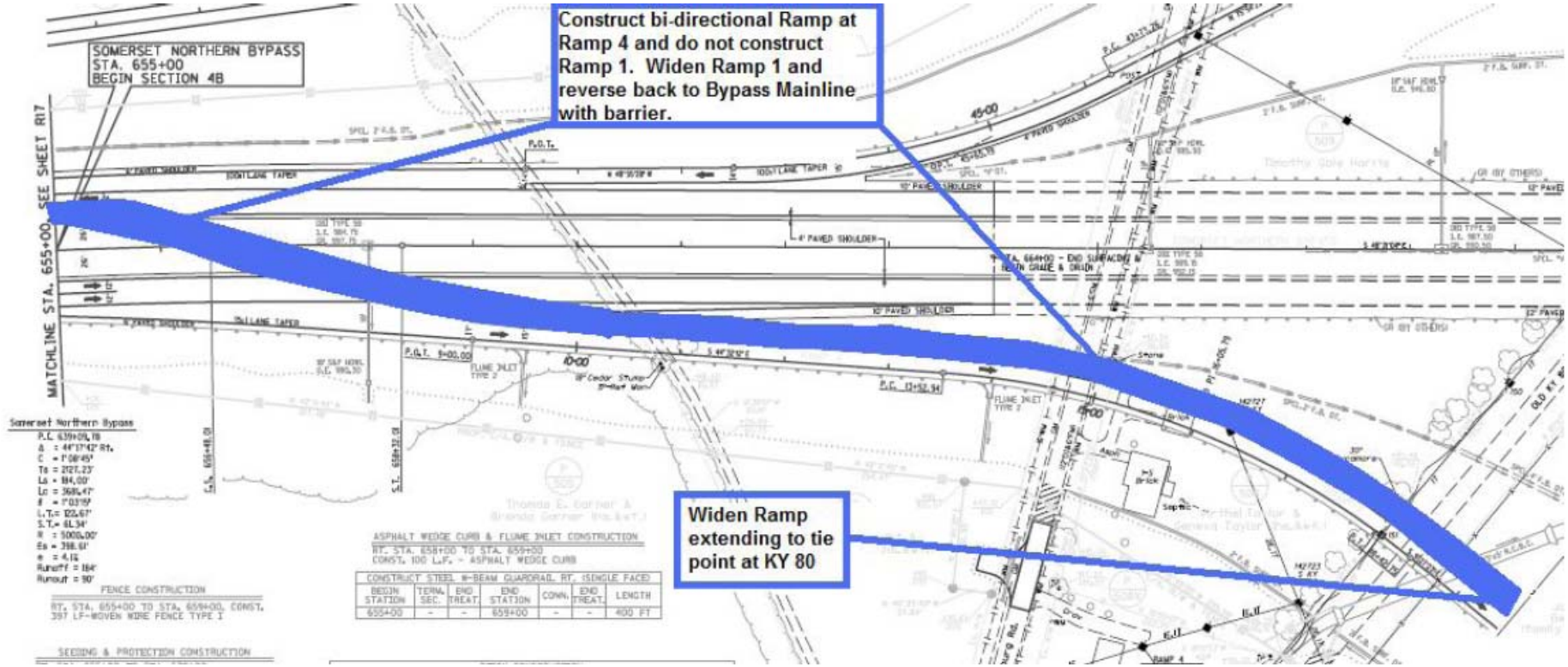
DISADVANTAGES:
- Median barrier will have to be removed when bypass is extended
- Bi-directional ramp may contradict driver expectation
- Median pavement for crossover will be removed in the future

JUSTIFICATION:
By widening Ramp 4 to 2 lanes separated by a median barrier will reduce increased cost associated with all proposed items relating to Ramp 1 which can be incorporated into a future phase. With the construction of Ramp 1 at a later date will allow the contractor to stock pile excess material on site at the proposed Ramp 1 location.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$1,657,000	$0	$1,657,000
RECOMMENDED DESIGN	$1,231,000	$0	$1,231,000
ESTIMATED SAVINGS OR (COST)	$426,000	$0	$426,000

VALUE ENGINEERING RECOMMENDATION # VE-13

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-13

COST ESTIMATE - FIRST COST

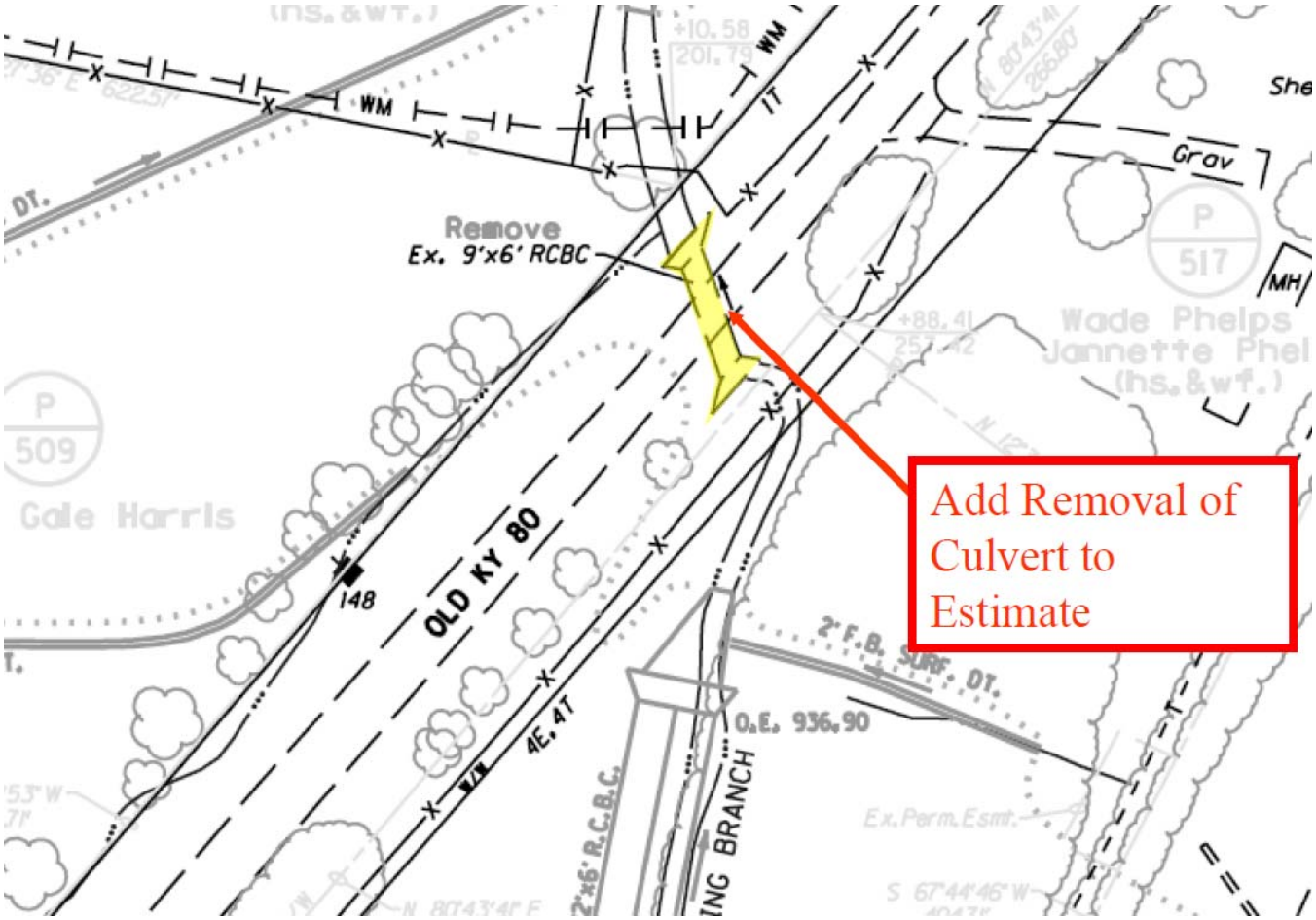
Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
Proposed Ramp 1	LS	$1,156,922	1	1	$1,156,922		
Proposed Ramp 4	LS	$500,194	1	1	$500,194		
Widen (Bidirectional) Ramp 4	SF	$23.13	1			24,600	$568,998
Median Barrier	LF	$50.00	1			2,050	$102,500
Crash Cushion	EA	$4,500.00	1			2	$9,000
Proposed Ramp 4	LS	$500,194	1			1	$500,194
Incidentals	LS	$50,000	1			1	$50,000
Total					$1,657,116		$1,230,692

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING DESIGN COMMENT # VE-14

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Add bid item to the cost estimate to remove the existing 9'x6' reinforced concrete box culvert on Old KY-80 between the mainline and Ramp 1 on Section 4B.

COMMENTARY:
Add bid item to the cost estimate to remove the existing 9'x 6' reinforced concrete box culvert (RCBC) on old KY-80 between the mainline and Ramp1 on Section 4B and update overall cost estimate to reflect the removal.



VALUE ENGINEERING RECOMMENDATION # VE-15

DESCRIPTIVE TITLE OF RECOMMENDATION:
Do not construct the double reinforced box culvert at STA 672+54 in the Section 4B project.

ORIGINAL DESIGN:
The original design specifies to construct a double 12' X 6' box culvert at Station 672+54. The plans show a Grade and Drain section only from Station 664+00 to Station 674+60. This section would be paved when the interchange over KY-80 is constructed for the future extension of I-66 towards London, KY.

RECOMMENDED CHANGE:
The VE team recommends eliminating the construction of this box culvert from the current project and place the construction in the future I-66 extension project.

ADVANTAGES:

- Eliminates 460' of disturbance to Big Spring Branch thereby reducing the amount of in-lieu of fees required
- Reduces the cumulative amount of disturbance of Big Spring Branch to under 500' and eliminating the need for a higher level of USACE permit
- Eliminates future maintenance on the box culvert
- Reduces the budget on a project that is currently under programmed and in need of funding
- Consistent with previous comments made in the KYTC Joint Inspection on 12/23/08

DISADVANTAGES:

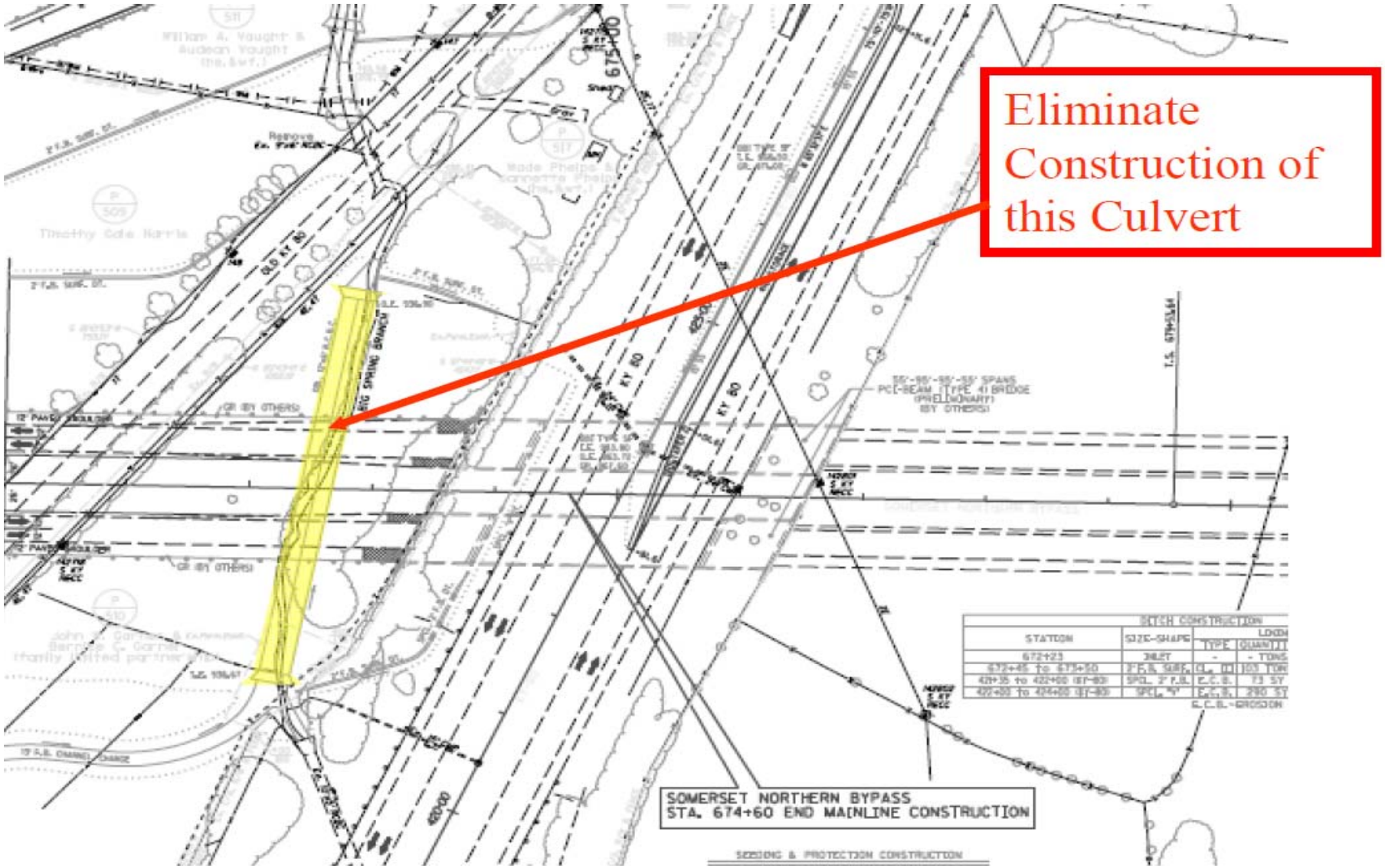
- Would reduce the area available to waste excess excavation
- Transfers the cost of the construction to the future I-66 project

JUSTIFICATION:
The recommended change is justified since the only need for the box culvert is if and when the extension of I-66 toward London is constructed. Given the uncertainty of that project, it is possible it will never be constructed; therefore postponing the construction of the box culvert is a reasonable approach to reduce the cost of the current project which is under programmed anyway. It also will lessen the environmental impact to Big Spring Branch and the required mitigation costs for the current project.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$892,000	$0	$892,000
RECOMMENDED DESIGN	$0	$0	$0
ESTIMATED SAVINGS OR (COST)	$892,000	$0	$892,000

VALUE ENGINEERING RECOMMENDATION # VE-15

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-15

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
Structures Box Culvert Sta. 672+54	1	$892,000	1	1	$892,000		
Total					$892,000		$0

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-16

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize Tensar Geogrids to decrease the required asphalt pavement thickness.

ORIGINAL DESIGN:
The original design specifies using a pavement design that consists of 1.25" asphalt surface, 8.75" asphalt base, 4" drainage blanket, and 4" DGA with Type IV filter fabric over 24" rock roadbed.

RECOMMENDED CHANGE:
The VE team recommends using Tensar TX 5 Geogrid to reduce the amount of asphalt base needed. The use of geogrid reduces the thickness of the asphalt base by 2.75" and increases the DGA base by 3".

ADVANTAGES:

- Allows more DGA to be used in exchange of asphalt, thus reducing the cost

DISADVANTAGES:

- Installation of geogrid is fairly new to the KYTC and requires close supervision
- Use of geogrid by a contractor that is unfamiliar with it could cause problems

JUSTIFICATION:
The use of geogrid is gaining widespread acceptance as an effective way to reduce the pavement depth required on a project. Kentucky does not have a tremendous amount of experience using geogrid although its use has increased. The use of geogrid on this project will reduce the pavement construction costs.

SUMMARY OF COST ANALYSIS			
	First Cost	Operations & Maintenance (Present Worth)	Total Life Cycle Cost (Present Worth)
ORIGINAL DESIGN	$2,205,000	$0	$2,205,000
RECOMMENDED DESIGN	$1,865,000	$0	$1,865,000
ESTIMATED SAVINGS OR (COST)	$340,000	$0	$340,000

VALUE ENGINEERING RECOMMENDATION # VE-16

PHOTOGRAPHS OF RECOMMENDED DESIGN

VALUE ENGINEERING RECOMMENDATION # VE-16

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Quantity	Total $	Quantity	Total $
DGA	Ton	$18.02	1	25,353	$456,861	44,368	$799,511
CL4 AB 1.00D PG64-22	Ton	$65.00	1	24,871	$1,616,615	9,672	$628,680
CL3 AB 1.00D PG64-22	Ton	$54.44	1	2,411	$131,255	938	$51,065
TX 5 Geogrid	SY	$3.50	6			110,230	$385,805
Total					$2,204,731		$1,865,061

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Avg. Unit Bid
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING DESIGN COMMENT # VE-17

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Eliminate $275,216.30 from the cost estimate for Granular Embankment since there is available rock on the project.

COMMENTARY:
The construction cost estimate provided by the Project Team included a bid item for Granular Embankment (22,394 CY @ $12.29 = $275,216.30). However, per Section 7.2 of the Geotechnical Engineering Report for Section 4 (page 11), the intent for the granular embankment is the limestone from the roadway excavation. The cross sections show these areas labeled as limestone fill but also included a bid item in the estimate.

Removing the bid item from the estimate and general summary will ensure the contractor does not bid and get paid twice for the same work item thus saving the Cabinet approximately $275,000.

VALUE ENGINEERING DESIGN COMMENT # VE-18

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize side slopes of 4:1 in lieu of 2:1 to eliminate guardrail where applicable on Ramps 4 and 1 in section 4B (KY-80 interchange).

COMMENTARY:
The project has excess excavation that needs to be wasted along the corridor to reduce costs associated with hauling it off-site. The current plans show 2:1 side slopes and guardrail on Ramp 1 and Ramp 4 in Section 4B. An effective way to eliminate some of the excess excavation and eliminate the need for guardrail is flattening the proposed 2:1 slope to 4:1. This benefits the project by reducing the costs of the excavation and guardrail.

One trade-off is the potential impact to right of way and utilities. Therefore, careful consideration to balance the cost of all these items will be needed to develop a cost effective solution.

VALUE ENGINEERING DESIGN COMMENT # VE-19

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize flatter than 4:1 side slopes where possible to waste excess material, and utilize surface or field ditches off of the embankment to waste excess material.

COMMENTARY:
The project has excess excavation that needs to be wasted along the corridor to reduce costs associated with hauling it off-site. The current plans show both 2:1 and 4:1 side in both Section 4A and 4B. An effective way to eliminate some of the excess excavation is flattening the proposed slopes greater than 4:1 and/or creating false cuts to waste the material. Stockpiling or building berms on parcels purchased for excess material storage will help reduce the amount that needs to be hauled off-site. This benefits the project by reducing the cost of excavation.

One trade-off is the potential impact to right of way and utilities. Therefore, careful consideration to balance the cost of all these items will be needed to develop a cost effective solution.

VALUE ENGINEERING DESIGN COMMENT # VE-20

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Waste excess material around the Buzzard Knob landlocked parcel with an easement or property purchase.

COMMENTARY:
The project has excess excavation that needs to be wasted along the corridor to reduce costs associated with hauling it off-site. An effective way to eliminate some of the excess excavation is flattening the proposed side slopes and/or creating false cuts to waste the material. Stockpiling or building berms on excess storage areas or land locked properties will help reduce the amount that needs to be hauled off-site. This benefits the project by reducing the cost of excavation.

One example of this opportunity is the landlocked parcel (Parcel 502 – Charles Rimer) near the beginning of the project. Fortuitously, this parcel is also adjacent to the area where we have the largest excavation thus reducing the haul distance.

VALUE ENGINEERING DESIGN COMMENT # VE-21

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Verify existing utilities along Barnesburg Road can remain in place under Ramp 4, mainline, and Ramp 1 with up to an additional 30 feet of fill.

COMMENTARY:
Based on the current plans, the fill heights over Barnesburg Road exceed 30' for the project. More specifically, the fill height is as follows:

Roadway	Station	Fill Height
Ramp 1	43+00	30'
Mainline (I-66)	665+00	35'
Ramp 4	15+00	35'

During the in-briefing there was mention that the existing utilities along Barnesburg Road would remain in-place (Barnesburg Road is the old KY-80 and has several utilities along the corridor). The high fills will make future maintenance on the line extremely difficult even using a split casing pipe. It is recommended to hold a utility coordination meeting and discuss the project impact with specific attention to the Barnesburg Road section to verify the utilities can remain in place.

According to KYTC Project Manger, Tom Clouse, utilities along Barnesburg Road WILL have to be relocated with this project. When the Department was considering a wagon box for Barnesburg, they were attempting to make it wide enough to not disturb the many existing utilities along this route. While KYTC could do that, the utility companies did not agree that this approach would eliminate the need to relocate their lines. Their contention was that they would be unable to bring the necessary equipment into the wagon box to perform maintenance work on the lines. The bottom line is that the utilities will be relocated along Barnesburg regardless of whether we construct a wagon box or just construct the fill as currently shown on the plans.

VALUE ENGINEERING DESIGN COMMENT # VE-22

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Reevaluate the alternative analysis cost study including the cost of ROW necessary for the Frontage Road.

COMMENTARY:
The Project Team provided a cost comparison for the frontage road between KY-1317 and KY-80 versus providing access under I-66. However, it was not clear if the overall total cost of the frontage road was considered in the comparison. More specifically, it needs to be confirmed if the associated cost of right of way and utilities were considered in the comparison. The VE team recommends the Project Team verify that these other costs were considered in the analysis.

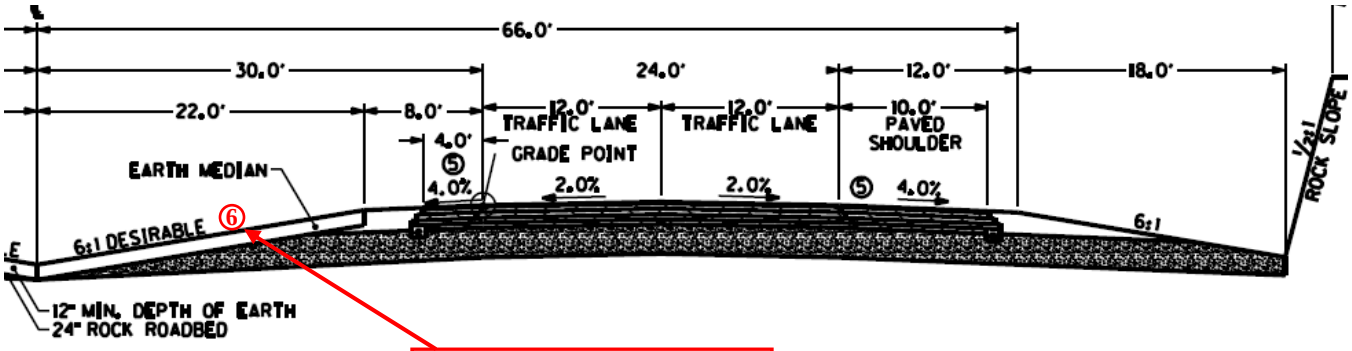
From a cursory review, the cost estimates used for roadway excavation to do the comparison was a different cost ($5.50/CY) than the total project cost estimate used ($11.00/CY). Additionally, the wagon box proposed on Barnesburg Road was a continuous structure instead of three separate structures under Ramp 1, Ramp 4, and the mainline. This will reduce the cost of the wagon box significantly. If the utilities under Barnesburg Road will require relocation regardless, due to the high fill, it seems that eliminating the frontage road has strong merit.

VALUE ENGINEERING DESIGN COMMENT # VE-23

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Label the location of Note 6 on the typical section plan.

COMMENTARY:
Note 6 on the typical sections indicates that earth refill shall be soil suitable for establishing vegetation and must be free of stones 1 inch or greater in overall dimension. The VE team assumes this note applies to the median section of the typical section, but the number 6 is not identified on the plans. The VE team suggests including the number 6 on the plans or eliminating the 6 from the note.

⑥ EARTH REFILL SHALL BE SOIL SUITABLE FOR ESTABLISHING VEGETATION AND MUST BE FREE OF STONES 1 INCH OR GREATER IN IN OVERALL DIMENSION. ENGINEER WILL BASE ACCEPTANCE OF REFILL MATERIAL BY VISUAL INSPECTION. CONTRACTOR SHALL CONDUCT OPERATIONS TO OBTAIN STOCKPILE AVAILABLE TOPSOIL WITHIN CONSTRUCTION LIMITS TO BE USED FOR THIS REFILL. NO DIRECT PAYMENT WILL BE MADE FOR PROVIDING AND PLACEMENT OF REFILL MATERIAL; ALL EXCAVATION (INCLUDING BORROW IF NECESSARY), HANDLING, STOCKPILING, PLACEMENT, ETC. NECESSARY TO PROVIDE SUITABLE MATERIAL TO REFILL MEDIAN TO DIMENSIONS SHOWN ON TYPICAL SECTIONS ARE INCIDENTAL TO THE CONTRACT EARTHWORK ITEM\ (ROADWAY EXCAVATION OR EMBANKMENT-IN-PLACE).



VALUE ENGINEERING DESIGN COMMENT # VE-24

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize Class IV aggregate channel lining in lieu of Class II and Class III aggregate channel lining.

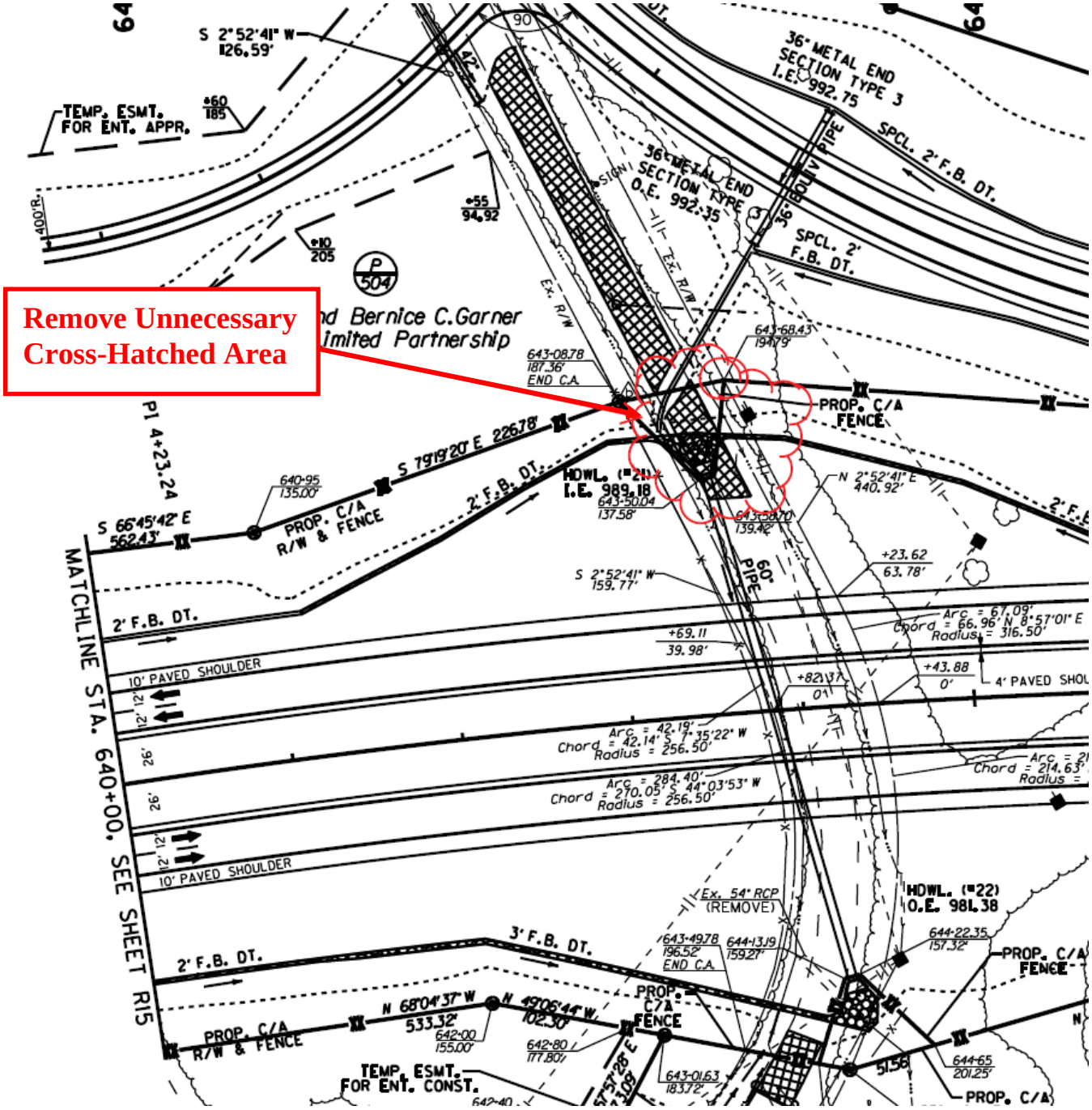
COMMENTARY:

Due to the availability of rock on project site, it is recommended that the plan quantity of Class II and Class III Channel Lining be converted to equivalent quantity of Class IV Channel Lining and be added to plan quantity for the Class IV. The bid items for Class II and Class III would then be deleted. This recommendation is in accordance with previous Project Team Meeting notes.

VALUE ENGINEERING DESIGN COMMENT # VE-25

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Delete pavement removal within disturbed limits from plans.

COMMENTARY:
Only pavement removal outside of disturbed limits is to be cross-hatched and referenced for separate payment on plans. See Plan Sheet R17.



VALUE ENGINEERING DESIGN COMMENT # VE-26

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize new design policy for the left turn taper along KY-80 per KYTC policy.

COMMENTARY:
Utilize new design policy for the left turn taper along KY-80 per KYTC policy and update all applicable cross sections, quantities, estimate, striping and/or signing. Please refer to Design Memo 03-09 to be properly analyzed from a traffic perspective where large turning volumes require further investigation that are not applicable to the design memo.

VALUE ENGINEERING DESIGN COMMENT # VE-27

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Combine drainage structures where plausible and verify maintenance access requirements for cross drains per chapter DR 707-4 of the drainage manual.

COMMENTARY:
Combine drainage structures where plausible and verify maintenance access requirements for cross drains per DR 707-4 (Maximum Access Point Spacing) in the new drainage manual found in DR 700 - Inlets and Storm Sewers Chapter. Also, update all plans, summary sheets, profiles, pipe sections, quantities, etc., where applicable.

VALUE ENGINEERING DESIGN COMMENT # VE-28

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Add typical sections for grade and drain section station limits at the end of project.

COMMENTARY:
Add typical sections for grade and drain section station limits at the end of project. Update all plan, cross sections, pipe sections, quantities, summary sheets, etc., where applicable.

VALUE ENGINEERING DESIGN COMMENT # VE-29

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Display design speed for Coleman Road, KY-1317, and Barnesburg Road on typical sections.

COMMENTARY:
Display design speed for Coleman Road, KY-1317, and Barnesburg Road on typical sections as well as on the curve data for each respective plan sheet relating to each approach.

VALUE ENGINEERING DESIGN COMMENT # VE-30

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Label all radii on the plans (bullet nose, entrances, etc.).

COMMENTARY:
It was noted that the radii for the entrances, median noses etc were not labeled. It would be helpful to the contractor to label these for constructability purposes and to ensure they are built to the KYTC's specifications.

VALUE ENGINEERING DESIGN COMMENT # VE-31

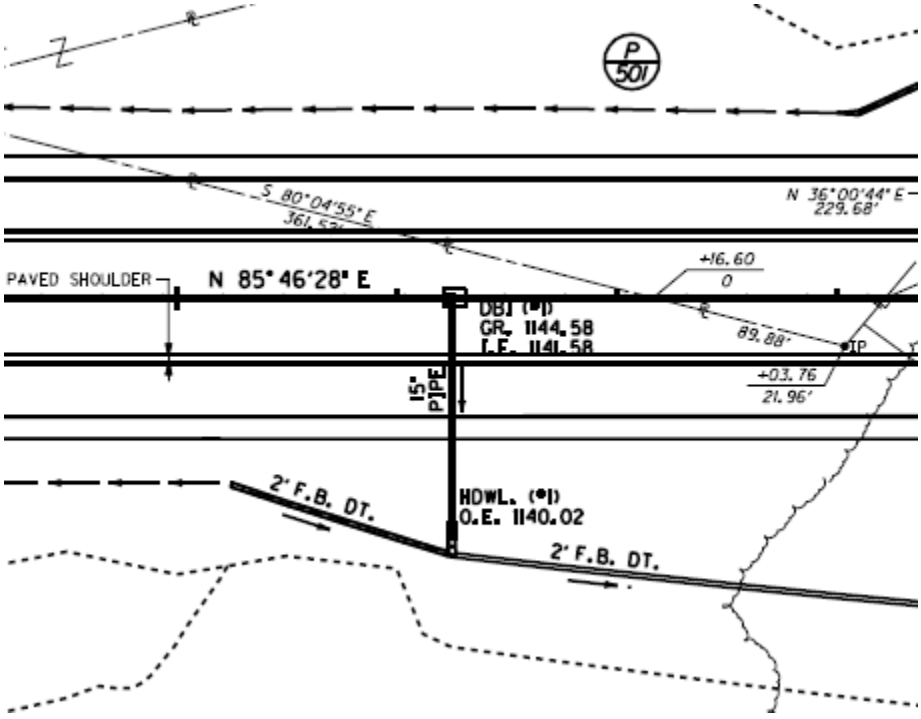
DESCRIPTIVE TITLE OF DESIGN COMMENT:
Increase the length of the bridge over KY-80 to span the Big Spring Branch in lieu of constructing a double 12'x 6' box culvert at Sta. 672+54.

COMMENTARY:
Value Engineering Recommendation VE-15 recommends eliminating the construction of the double 12' X 6' box culvert at Sta. 672+54 on this project. The future I-66 project toward London will require a new bridge to be constructed over KY-80 and the completion of the interchange. During the preparation of the Advance Situation Folder for that future project, the possibility of lengthening the bridge over KY-80 to span Big Spring Branch should be explored. The existing Big Spring Branch could be relocated closer to KY-80 to reduce the length of the tail span. The project team should weigh the balance between cost and environmental impact during this analysis phase.

VALUE ENGINEERING DESIGN COMMENT # VE-32

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize 18” diameter minimum cross drain in lieu of 15” diameter cross drain to meet KYTC design guide lines (DR-06.240 Culvert Pipe).

COMMENTARY:
It was noted that at Station 556+25, the proposed design includes a 15” pipe under the mainline. Based on the Drainage Manual and common practice, pipes greater than 15” are used under the mainline pavements for maintenance considerations. It was noted that some states are moving to a minimum of 24” under interstate pavements.



APPENDICES

The appendices in this report contain backup information supporting the body of the report, and the mechanics of the workshop. The following appendices are included.

CONTENTS

APPENDIX A
Participants

APPENDIX A - Participants

Workshop Attendance

Attendees				Participation						
				Meetings		Study Sessions				
Name	**Organization and Address (Organization first, with complete address underneath)**	**Tel # and Email (Tel first with Email underneath)**	**Role in wk shop**	**Intro**	**Out Brief**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Michael Baase	KYTC 200 Mero Street Frankfort, KY 40602	502-564-4780 Michael.baase@ky.gov	Owner Construction	X	X					
Boday Borres	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Boday.borres@ky.gov	Owner Observer	X	X					
Tom Clouse	KYTC – District 8 1660 South Highway 27 Somerset, KY 42501	606-677-4017 Tom.clouse@ky.gov	KYTC Project Manager	X	X		X			
Greg Groves	URS Corporation 325 W. Main Street, Suite 1200 Lousiville, KY 40202	502-569-2301 Greg_Groves@urscorp.com	VE Roadway Designer	X	X	X	X	X	X	X
Bill Gulick	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 bgulick@ky.gov	Owner Representative		X					
Dave Heil	T.H.E. Engineers, Inc. 973 Beasley Street, Suite 130 Lexington, KY 40509	859-263-0009 dave@theengrs.com	Design Team Consultant	X	X					
Steve James	American Engineers Inc. 250 Nelson Miller Parkway Louisville, KY 40223	502-245-3813 sjames@aei.cc	Design Team Roadway Designer	X						
Rodney Little	KYTC – Highway Design Quality Assurance Branch	606-677-4017 Charles.little@ky.gov	VE Construction	X	X	X	X	X	X	X
Ken Ott	American Engineers Inc. 250 Nelson Miller Parkway Louisville, KY 40223	502-245-3813 kott@aei.cc	Design Team Consultant	X						
Jeremy Peavie	T.H.E. Engineers, Inc. 973 Beasley Street, Suite 130 Lexington, KY 40509	859-263-0009 jeremy@theengrs.com	Design Team Consultant	X	X					
Ben Pierce	American Engineers Inc. 2500 Nelson Miller Parkway Louisville, KY 40223	502-245-3813 bpierce@aei.cc	Design Team Roadway Designer	X	X					
Ben Quinn Jr.	American Engineers Inc. 2500 Nelson Miller Parkway Louisville, KY 40223	502-245-3813 benq@aei.cc	Design Team Consultant	X	X					
Kyle Schafersman	URS Corporation 8300 College Boulevard, Suite 200 Overland Park, KS 66210	913-344-1019 Kyle_Schafersman@urscorp.com	VE Team Leader	X	X	X	X	X	X	X
Siamak Shafaghi	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Siamak.shafaghi@ky.gov	Owner VE Coordinator	X	X	X	X	X	X	X

Workshop Attendance

Attendees				Participation						
				Meetings		Study Sessions				
Name	**Organization and Address (Organization first, with complete address underneath)**	**Tel # and Email (Tel first with Email underneath)**	**Role in wk shop**	**Intro**	**Out Brief**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Mitch Thomas	URS Corporation 325 W. Main Street, Suite 1200 Lousiville, KY 40202	502-569-2301 Mitch_Thomas@urscorp.com	VE Roadway Designer	X	X	X	X	X	X	X

Workshop Attendance

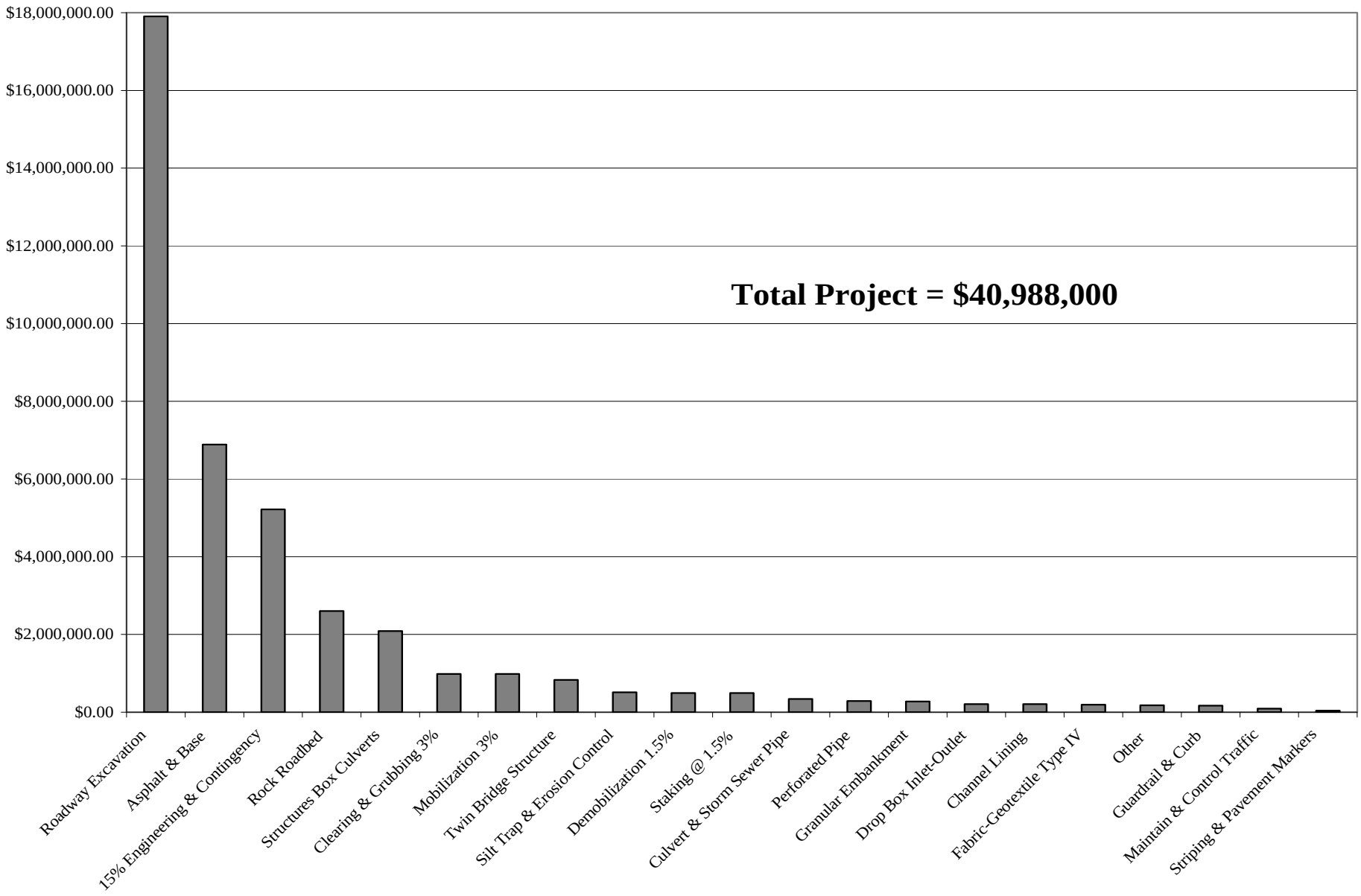
Attendees				Participation						
				Meetings		Study Sessions				
Name	Organization and Address (Organization first, with complete address underneath)	Tel # and Email (Tel first with Email underneath)	Role in wk shop	Intro	Out Brief	Day 1	Day 2	Day 3	Day 4	Day 5
Kyle Schafersman	URS Corporation 8300 College Boulevard, Suite 200 Overland Park, KS 66210	913-344-1019 Kyle_Schafersman@urscorp.com	VE Team Leader	X		X				
Mitch Thomas	URS 325 W Main St, St 1200 Lville, KY 40202	502-569-2301 mitch_thomas@urscorp.com	Roadway	X		X				
Greg Groves	URS Corporation 325 W. main Street 40202	502 569-2301 greg-groves@urscorp.com	Roadway	X		X				
Bobby Barnes	KYTC - CO Design - QAB 200 Mero St. Frankfort, Ky 40602	(502) 564-2280 bobby.barnes@ky.gov	Observer	X						
Michael Baase	KYTC - CO Const. 200 Mero St Frankfort, KY 40602	502 564 4780 michael.baase@ky.gov	Const. Rep Observer	X		X				
Steve James	AEI 250 Nelson Miller Pkwy Louisville, Ky. 40223	(502) 245-3813 sjames@aei.cc	Rdwy Design	X		X				
Siamak Shafaghi	KYTC, Design	siamak.shafaghi@ky.gov	VE Coordinator	X		X				
Dave Heil	THE Engineers, Inc 973 Beasley St, Ste 130 Lexington, KY 40509	859-263-0609 dave@theengrs.com	Design Consultant	X		X				
Ben Pierce	AEI 9500 Nelson Miller Pkwy Louisville KY 40223	(502) 245-3813 bpierce@aei.cc	Roadway design	X		X				
Ben Quinn Jr.	AEI 2500 Nelson Miller Lou. 40223	245-3813 Benq@AEI.cc	Design Consultant	X		X				
Ken Ott	AEI 2500 Nelson Miller Pkwy Lou. 40223	(502) 245-3813 kott@aei.cc	Bridge Des. Consultant	X		X				
Tom Clouse	KYTC District 8 1660 S. Hwy 27 Somerset, Ky. 42501	606-677-4017 Tom.Clouse@Ky.Gov	KYTC Project Manager	X		X				

Workshop Attendance										
Attendees				Participation						
				Meetings		Study Sessions				
Name	Organization and Address (Organization first, with complete address underneath)	Tel # and Email (Tel first with Email underneath)	Role in wk shop	Intro	Out Brief	Day 1	Day 2	Day 3	Day 4	Day 5
Rodney Little	KYTC Highway Design - Quality Assurance Branch	606-677-4017 Charles.Little@ky.gov	Hwy. Design QA	X		X				
Jeremy Pennington	THE Engineering, Inc. 973 Beasley St., St 130 Lexington, KY 40505	859-263-0080 Jeremy@thetengineering.com	Design Consultant	X		X				

APPENDIX B
Cost Information

APPENDIX B - Cost Information

Cost Model - Total Project



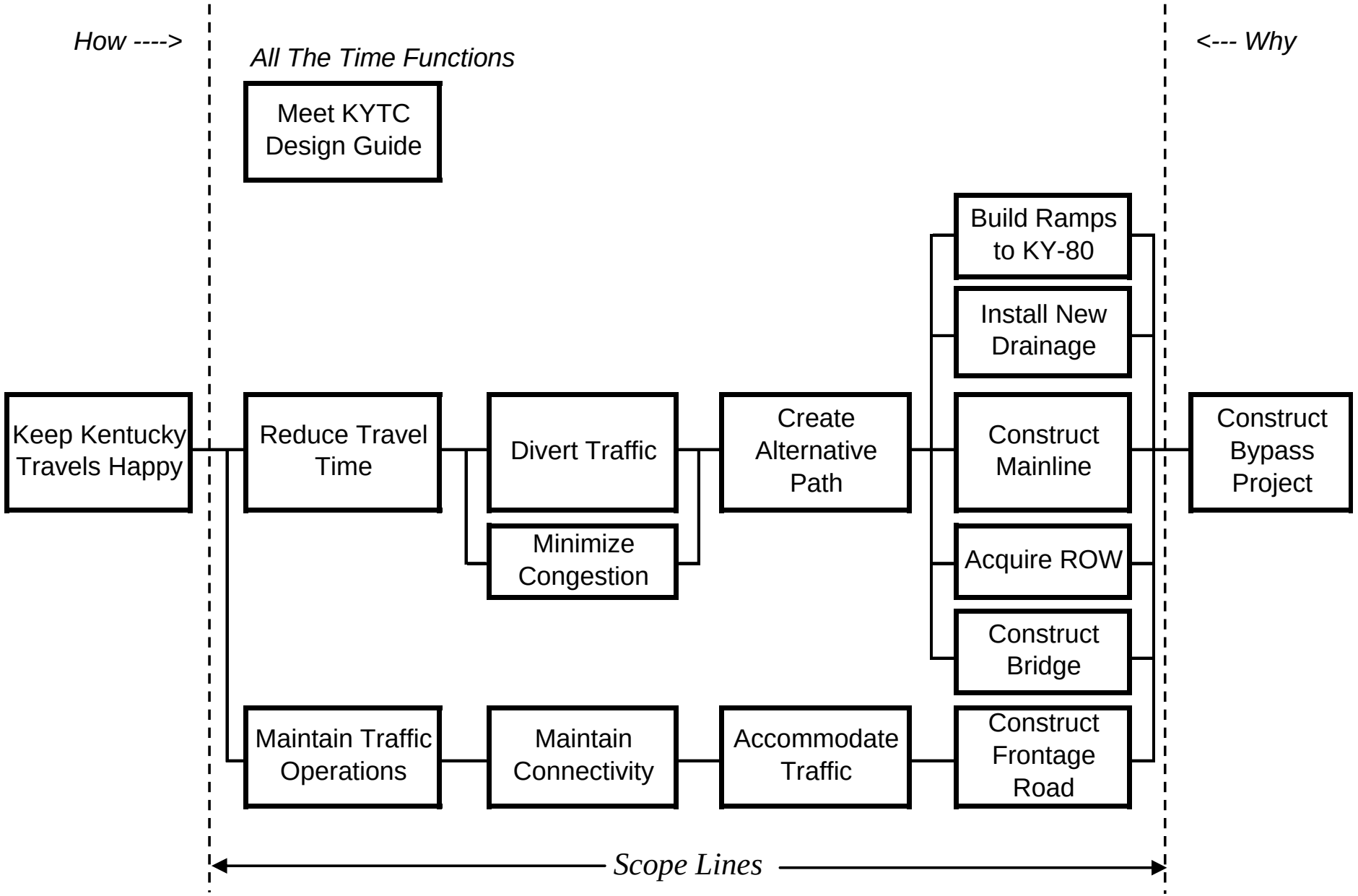
APPENDIX C
Function Analysis

APPENDIX C - Function Analysis

Function Model

Item	Cost	Function
Total Project	$40,987,906.12	Reduce downtown traffic Speed bypass traffic
Roadway Excavation	$17,906,449.00	Correspond with adjacent project Accommodate topographical conditions
Asphalt & Base	$6,885,339.44	Utilize most common material type
15% Engineering & Contingency	$5,217,835.93	Design project Account for unknown conditions
Rock Roadbed	$2,604,625.00	Utilize available rock material
Structures Box Culverts	$2,088,000.00	Convey large drainage under road
Clearing & Grubbing 3%	$984,497.34	Clear site Remove trees
Mobilization 3%	$984,497.34	Mobilize equipment and staff
Twin Bridge Structure	$830,000.00	Span Coleman Road Maintain traffic on Coleman Road
Silt Trap & Erosion Control	$511,514.97	Protect environment Meet regulations and laws
Demobilization 1.5%	$492,248.67	Remove equipment and staff
Staking @ 1.5%	$492,248.67	Survey site Control grade construction
Culvert & Storm Sewer Pipe	$342,305.75	Convey drainage under road
Perforated Pipe	$288,363.70	Ensure pavement drainage
Granular Embankment	$275,216.30	Prevent embankment saturation Stabilize embankment
Drop Box Inlet-Outlet	$207,238.95	Drain stormwater
Channel Lining	$205,798.91	Prevent channel erosion
Fabric-Geotextile Type IV	$192,822.34	Stabilize roadbed
Other	$178,415.95	Accommodate various project needs
Guardrail & Curb	$169,168.38	Meet current design standards
Maintain & Control Traffic	$92,000.00	Maintain traffic Control traffic
Striping & Pavement Markers	$39,319.47	Delineate travel lanes

FAST Diagram



APPENDIX D
Creative Idea List and Evaluation

APPENDIX D - Creative Idea List and Evaluation

List of Creative Ideas			
ID #	**Name of Idea / Description**	**Develop Status**	**TM Resp.**
1	Revise profile grade in order to minimize excavation	1	R. Little
2	Revise profile grade at the second vertical tangent in order to minimize excavation	4	
3	Utilize the rock roadbed for drainage and eliminate edge drains	2	R. Little
4	Utilize CSB without edge drains in lieu of DGA with edge drains	4	
5	Utilize $5/CY unit price for excavation in lieu of $11/CY	DC	R. Little
6	Eliminate $2,604,625 from cost estimate for Rock Roadbed	DC	R. Little
7	Do not construct the double RC Box Culvert at STA 672+54 in the Section 4B project	1	G. Groves
8	Eliminate $275,216.30 from the cost estimate for Granular Embankment since there is available rock on site	DC	G. Groves
9	Add bid item to the cost estimate for granular pile core	DC	R. Little
10	Add bid item to the cost estimate to remove the existing 9'x6' RCBC on Old KY-80 between the mainline and Ramp 1 on Section 4B	DC	M. Thomas
11	Reduce the cost of clear & grub from $987,070.44 to approximately $300,000 and include number in cost estimate total	DC	K. Schafersman
12	Include the omitted unit prices for Guardrail Connector to Bridge End Type A, Crash Cushion Type IX-A, and Culvert Pipe-60 Inch	DC	K. Schafersman
13	Bridge Coleman Road over the mainline in lieu of bridging the mainline over Coleman Road	3	M. Thomas
14	Utilize a wagon box for the new proposed Coleman Road alignment crossing in lieu of a twin bridge structures	1	M. Thomas
15	Utilize a wagon box askew to the mainline along the existing Coleman Road alignment in lieu of crossing Coleman Road with twin bridge structures and realigning Coleman Road	1	M. Thomas
16	Move location of proposed twin bridges to the existing location of Coleman Road in lieu of realigning Coleman Road	2	M. Thomas
17	Utilize Tensar Geogrids to decrease the asphalt pavement thickness	1	G. Groves
18	Utilize sideslopes of 4:1 in lieu of 2:1 to eliminate guardrail where applicable on ramps 4 and 1 in section 4B (KY-80 interchange)	DC	G. Groves
19	Revise KY-80 left turn lane tapers to account for new design policy	DC	M. Thomas
20	Utilize a wagon box for Barnesburg Road and KY-1317 under the mainline to eliminate the Frontage Road	3	M. Thomas
21	Increase the length of the bridge over KY-80 to span the Big Spring Branch in lieu of constructing a double 12'x6' box culvert	DC	G. Groves
22	Combine drainage structures where plausible and verify access requirements for long pipes	DC	M. Thomas
23	Utilize Class IV aggregate channel lining in lieu of Class II and III aggregate channel lining	DC	R. Little
24	Utilize a 50 ft median with cable barrier in lieu of 60 ft depressed median section through the entire Section 4	1	R. Little

List of Creative Ideas			
ID #	**Name of Idea / Description**	**Develop Status**	**TM Resp.**
25	Utilize a 20 ft median with a concrete barrier wall in lieu of a 60 ft depressed median section through the entire Section 4	4	
26	Utilize a ditch back slope of 5:1 for 6 ft and 6:1 for 12 ft of fore slope in lieu of 18 ft of 6:1 fore slope within the beginning cut section (STA 545 to STA 558)	4	
27	Evaluate the no-build alternative	4	
28	Utilize a traditional 4-lane roadway in leiu of a 4-lane freeway standards	4	
29	Only construct 2-lane roadway with future expansion possibility to a 4-lane roadway	4	
30	Utilize flatter than 4:1 sideslopes where possible to waste excess material, and utilize surface or field ditches off of the embankment to waste excess material	DC	G. Groves
31	Reevaluate the alternative analysis cost study including the cost of ROW necessary for the Frontage Road	DC	G. Groves
32	Utilize 18” diameter minimum cross drain in lieu of 15” diameter cross drain to meet KYTC design guides (DR-06.240 Culvert Pipe)	DC	G. Groves
33	Waste excess material around the Buzzard Knob land locked parcel with an easement or property purchase	DC	G. Groves
34	Reduce the width of the overburden bench to a maximum of 15 ft each	4	
35	Label the location of note 6 on the typical section plan	DC	K. Schafersman
36	Add typical section for grade and drain section at the end of project location	DC	M. Thomas
37	Display design speed on the typical sections for Coleman Road, KY-1317, and Barnesburg Road	DC	M. Thomas
38	Label all radii on the plans (bullet nose, etc.)	DC	M. Thomas
39	Verify existing utilities along Barnesburg Road can remain in place under Ramp 4, mainline, and Ramp 1 with up to an additional 30 feet of fill	DC	G. Groves
40	Pavement removal within disturbed limits needs to be removed from the plans	DC	R. Little
41	On the abandoned piece of Coleman Road, leave existing pavement in place in lieu of removing pavement	2	K. Schafersman
42	Only construct one temporarily bi-directional ramp attaching to KY-80 in lieu of two ramps attaching to KY-80	2	M. Thomas

Development Status Legend:

1: Idea is considered by the VE team to be the best value enhancement possibility and is currently being developed as a VE recommendation

2: Idea is considered by the VE team to be a good value enhancement possibility and will be developed as a VE recommendation after all the “1s” have been developed

3: Idea is considered by the VE team to be of marginal value enhancement possibility and may be developed as a VE recommendation after all the “1s” and “2s” have been developed

4: Idea was not considered to enhance the value of the project and has been eliminated from further consideration by the VE team

DC: Idea is being developed as a Value Engineering Design Comment to the designers with no easily quantifiable cost associated

END OF REPORT

This report was compiled and edited by:
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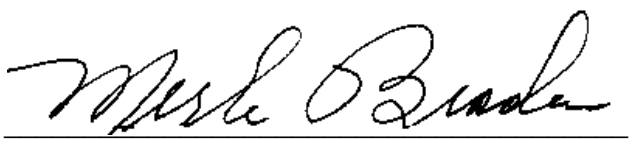

Approved by Merle Braden, PE, CVS-Life (URS)