I-66 and US 27 Interchange

Somerset, Kentucky

Study Date: January 12-17, 2003

VALUE ENGINEERING STUDY

for the

Kentucky Transportation Cabinet

URS CORPORATION

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Study Date: January 12-17, 2003

Final Report

January 24, 2003

URS Corporation

EXECUTIVE SUMMARY

General

The Value Engineering (VE) study for the construction of the I-66/US 27 Interchange was conducted during the period of January 13-17, 2003 in the office of the Kentucky Transportation Cabinet (KYTC), Frankfort, Kentucky. Team members were from the KYTC and team leadership was furnished by URS. The subject project was designed by Skees Engineering, under the direction and management of the KYTC.

The VE team undertook the task assignment using the value engineering work plan and approach. The work plan depends on what is commonly referred to as a "bottom up" approach. With this approach, the VE Team subdivided the project into its component parts, examines the functions and requirements, and then identified alternate approaches. The ideas that were generated from this process and chosen for full development are presented in Section 3 of this report.

However, the VE team also considered a "top down" approach where the team looks at the project as independently and objectively as possible. This approach relies on the experience and professional background of the team and tends to be highly judgmental and is difficult to verify with an analytical process. Nonetheless, the analysis and subsequent recommendations resulting from this approach are worthy of review.

The result of both approaches are recommendations for value improvement to this project. These recommendations are presented to all project stakeholders for judgment as to whether they should be implemented or not.

Significant Aspects of the Study

The KYTC studied several alternative routes for the project and, with input from public meetings and a citizen advisory council, selected Option 2 as the preferred solution. The value engineering team used Option 2 as the basis for the study. The project was in the final decision stage with contract award scheduled in 2003. Re-design costs and potential project delays were considered in the evaluation of potential proposals. The team concluded, after considerable study of the plans, that the design team had done a creditable job to this point in producing an economical project. As a result, the number of VE opportunities were limited.

Conclusion

The value engineering team found that the project had been well thought out by the Kentucky Transportation Cabinet and the design team. Due to the good work of the design team, value engineering opportunities were limited, however, the VE team developed several alternatives worthy of further consideration. There were several areas of the design in which the VE team believed that improved value was necessary. Among these are the Clifty Road flyover which connects the community separated by the interstate right of way and the WB-SB and EB-SB loops to accommodate marginal projected traffic flows.

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 original cost estimate. Where proposed alternate designs included items not in the original scope, costs from similar projects and the VE team member expertise were used. The estimates include a mark-up of 20%, consistent with the project estimate furnished to the team.

SUMMARY OF RECOMMENDATIONS

I-66 / US 27 Interchange

Rec.#	Recommendation Title / Description	1st cost savings (or cost)
1	Reduce width of Clifty Road bridge	$398,000
3	Realign Clifty Road	$1,732,275
4	Modify Interchange Loops	$1,868,000

DESIGN COMMENTS

I-66 / US 27 Interchange

2	Option #1 discussion
5	Modify grades
6	Build embankment at end of project

Acknowledgments
The team appreciates the input and able assistance of Robert Semones and Siamak Shafaghi and all the staff members of the Kentucky Transportation Cabinet who participated throughout the study. Without their assistance, this successful value engineering study would not have been possible.

Value Engineering Study - Core Team

Name	Discipline / Role	Organization	Telephone
Gary Raymer, P.E.	Construction	KYTC – D4	270-766-5066
Robert Martin, P.E.	Construction	KYTC – D4	502-348-5866
Rob Franxman, EIT	Construction	KYTC – D6	859-356-5300
Royce Meredith, EIT	Highway Design	KYTC – D5	502-935-3461
James Miracele, P.E.	Bridge Design	KYTC	502-564-4560
Joe Waits, PE, CVS	Team Leader	URS	251-666-5892
Emily Johnson	Technical Recorder	URS	913-344-1000

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

Merle Braden, PE, CVS
Value Engineering Program Manager

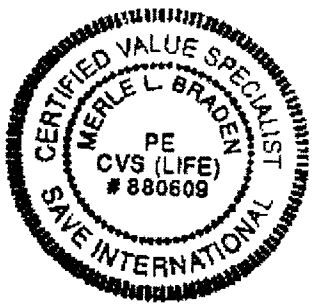


TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

This report documents the results of a value engineering study on the construction of the I-66/US 27 Interchange, Pulaski County, Kentucky. The interchange, a part of I-66 east-west corridor across the state of Kentucky, is just north of Somerset, Kentucky. The value engineering study team consisted of an interdisciplinary team of engineers from the Kentucky Transportation Cabinet was under the leadership of a professional engineer with CVS certification from URS. The names and telephone numbers of all participants in the study are listed in Appendix A.

The Job Plan

The study followed the value engineering methodology as endorsed by SAVE International, the professional organization of value engineers. This report does not include an explanation of standard 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 purpose of the report is to document only the results of 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 ides 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.

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.

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

This project consists of construction of an Interchange at the intersection of the proposed I-66 corridor and the new US Highway 27 in the vicinity of Somerset, Kentucky. This section of the I-66 corridor is a part of the east-west corridor that will run across the state of Kentucky when completed. The Interchange consists of a diamond type configuration modified by the inclusion of two loops in the northwest and southeast quadrants. The proposed loops are to accommodate the projected future traffic flow for the EB-NB and WB-SB traffic. In addition to the interchange, secondary roads will be re-routed, an access road to a landlocked property will be constructed, a connection road built off US 27, and a bridge across I-66 and ramps to provide community access across the I-66 right of way will be constructed.

SECTION 3 - VE RECOMMENDATIONS

This section contains the complete documentation of all recommendations to result from this study. Each recommendation is marked by a unique identification number. This number is assigned from the Creative Idea List and is used throughout the report to uniquely refer to a given recommendation. The parent idea, or ideas, from which the recommendation began can be determined from the Creative Idea List where the recommendation number is shown adjacent to the corresponding parent idea.

Organization of Recommendations

The recommendations presented on the following pages are organized numerically by identification number. Each recommendation is documented by a separate write-up that includes a description of the recommendation, 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.

VALUE ENGINEERING RECOMMENDATION # 1

PROJECT: I-66 and US 27 Interchange
LOCATION: Somerset, Kentucky
STUDY DATE: January 12-17, 2003

DESCRIPTIVE TITLE OF RECOMMENDATION:
Reduce Width of Clifty Road Bridges.

ORIGINAL DESIGN:
Original bridge is designed with two 12 foot lanes and 8 foot shoulders to match new Clifty Road typical.

RECOMMENDED CHANGE:
Build bridge with two 11 foot lanes and 4 foot shoulders.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$2,127,000		$2,127,000
RECOMMENDED DESIGN	$1,729,000		$1,729,000
*ESTIMATED SAVINGS OR (COST)	$398,000	$0	$398,000

*This is based on reducing to 3 TYPE 9 PCIB. If it is determined that three beams would not be adequate to support the structural load, the savings would be reduced by $ 150,552.

VALUE ENGINEERING RECOMMENDATION # 1

ADVANTAGES:

- May reduce right of way required
- Matches existing roads

DISADVANTAGES:

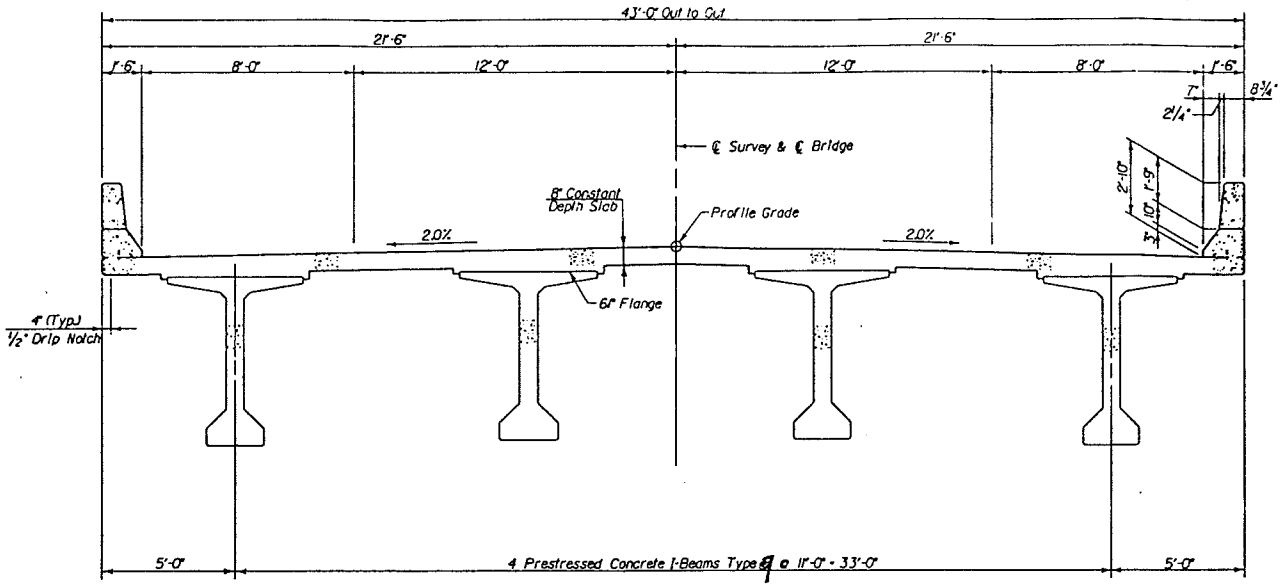
- May restrict future use
- Can't add lane

JUSTIFICATION:

The current roads this bridge is providing access to (Clifty Road, Wilson Road, Norwood Road) are currently 16 feet to 17 feet with no shoulders. Even with future development the reduced bridge width will accommodate projected traffic volumes. Studies presented at Contech Sensitive Design Training indicate no added benefits between 11 foot and 12 foot lanes for safety or capacity.

VALUE ENGINEERING RECOMMENDATION # 1

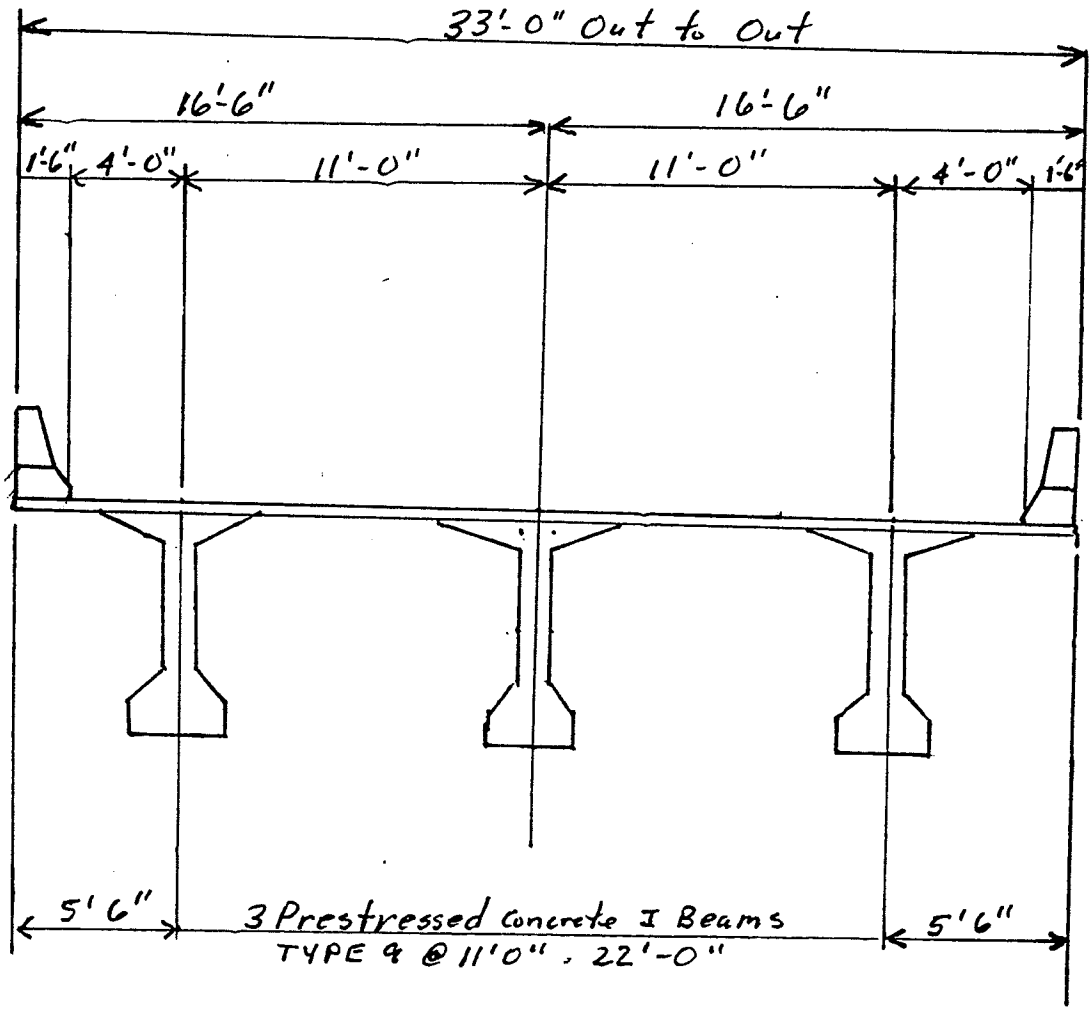
SKETCH OF ORIGINAL DESIGN



TYPICAL SECTION

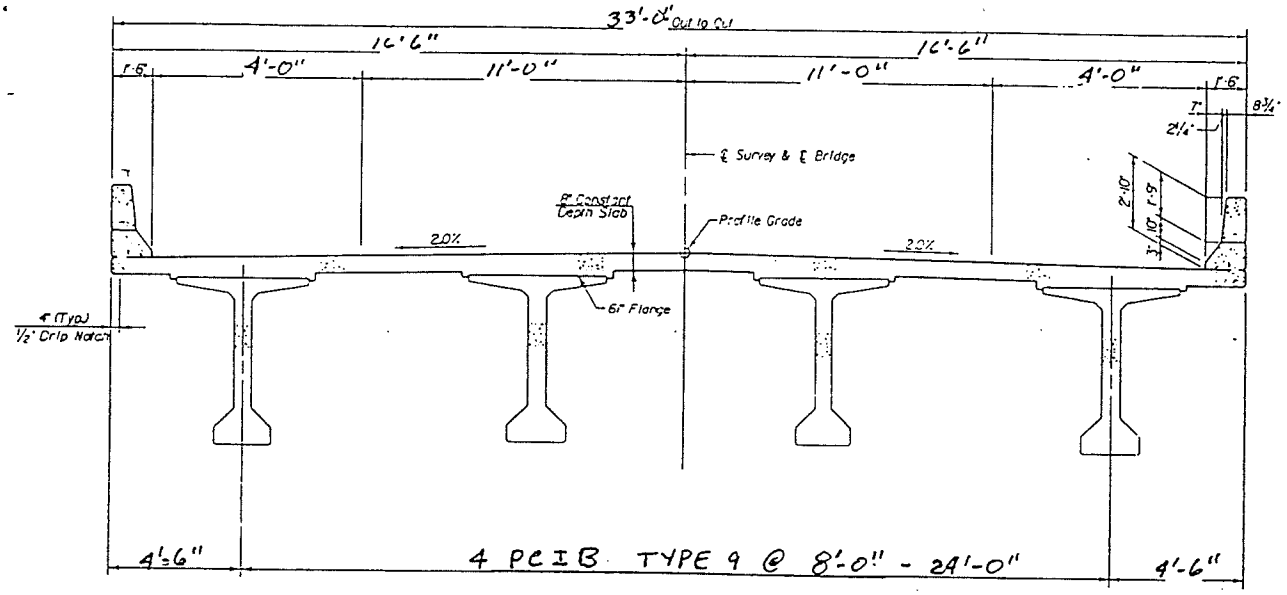
VALUE ENGINEERING RECOMMENDATION # 1

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # 1

SKETCH OF RECOMMENDED DESIGN



TYPICAL SECTION

(Alternate if three Line Type 9 beams are not adequate)

VALUE ENGINEERING RECOMMENDATION # 1

COST ESTIMATE - FIRST COST

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		$/Unit	Source Code	Num of Units	Total $	Num of Units	Total $
Concrete Class AA	CY	375.00	1	1,270	$476,250	1,090	$408,750
Reinf. Epoxy coated	lbs.	0.63	1	348,000	$219,240	298,000	$187,740
Structural Steel	lbs.	2.35	1	15,000	$35,250	11,500	$27,025
Type 9 PCIB	L.F.	170.00	1	2,950	$501,500	,212	$376,040
Masonry Coating	S.Y.	8.50	1	3,100	$26,350		$26,350
Concrete Class A	C.Y.	335.00	1	330	$110,550	255	$85,425
Concrete Class AA	C.Y.	375.00	1	20	$7,500	15	$5,625
Reinforcement	lbs.	0.57	1	55,000	$31,350	42,200	$24,054
Reinf. Epoxy coated	lbs.	0.63	1	7,000	$4,410	5,500	$3,465
Piles	L.F.	30.00	1	8,600	$258,000	6,600	$198,000
Test Piles	L.F.	38.00	1	280	$10,640		$10,640
Pile Points	EA	80.00	1	222	$17,760	172	$13,760
Foundation Prep	L.S.	50,000.00	1	1	$50,000		$50,000
Slope Protection		20.00	1	500	$10,000		$10,000
Structure Backfill	C.Y.	34.00	1	175	$5,950		$5,950
Masonry Coating	S.Y.	8.50	1	900	$7,650		$7,650
Subtotal					$1,772,400		$1,440,474
Mark-up		@	20%		$354,480		$288,095
Redesign Costs							
Total					$2,126,880		$1,728,569

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
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 # 3

PROJECT: I-66 and US 27 Interchange
LOCATION: Somerset, Kentucky
STUDY DATE: January 12-17, 2003

DESCRIPTIVE TITLE OF RECOMMENDATION:
Realign Clifty Roads

ORIGINAL DESIGN:
Reconstruct Clifty Road utilizing long bridge over I-66 and Ramp 7 in order to maintain traffic on Clifty Road and keep in approximately the same corridor.

RECOMMENDED CHANGE:
Move Clifty Road Corridor to the west side of the church into "shorter" structure and construct less overall new roadway.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$3,450,000	$113,768	$3,563,768
RECOMMENDED DESIGN	$1,717,726	$19,826	$1,737,552
ESTIMATED SAVINGS OR (COST)	$1,732,275	$23,943	$1,756,218

VALUE ENGINEERING RECOMMENDATION # 3

ADVANTAGES:

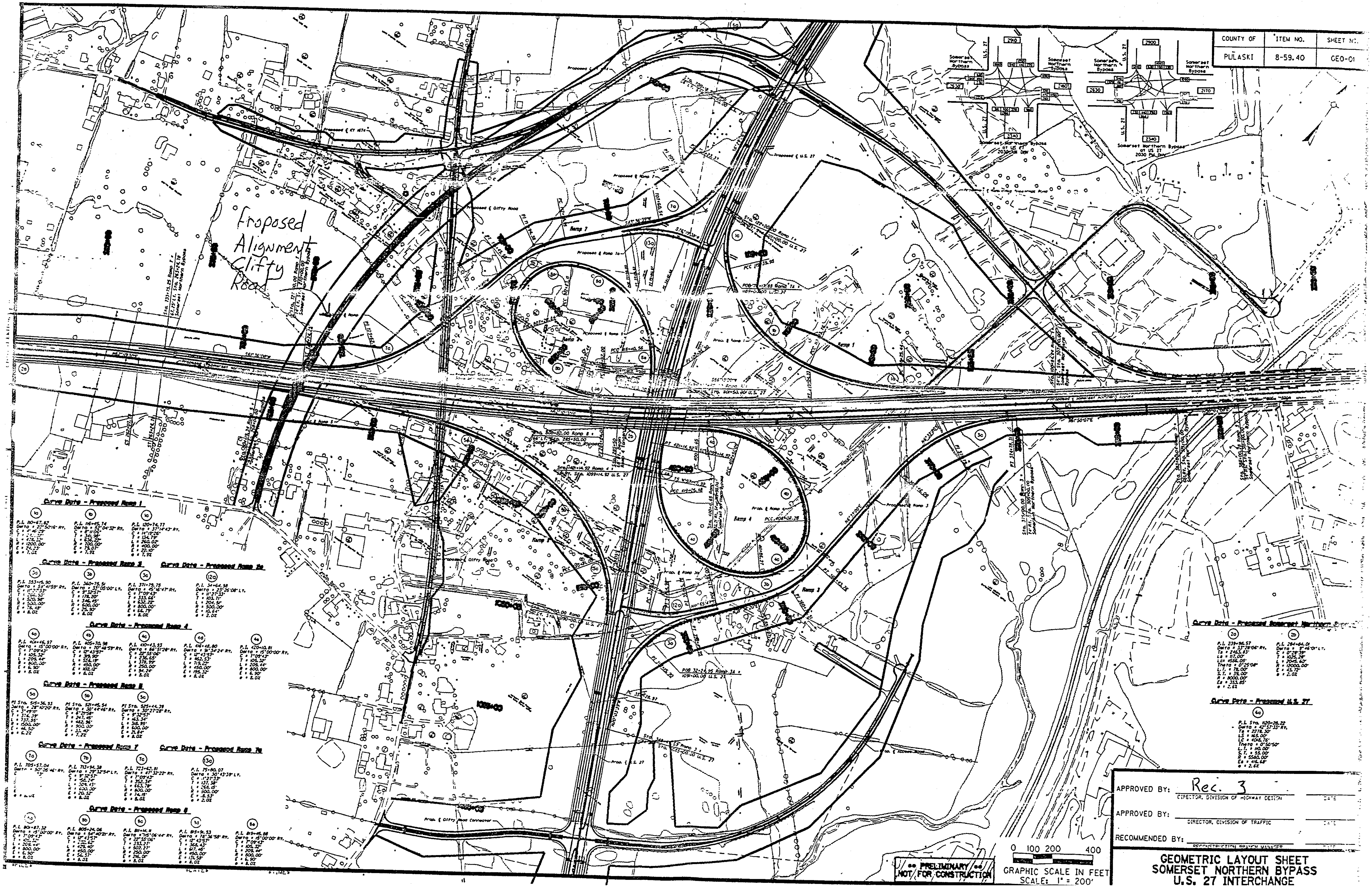
- Eliminates bridge structures.
- Connects community.
- Simplifies construction.
- Less initial construction costs and shorter structure will result in reduced future maintenance costs.
- Citizens expressed concern about minimizing construction in the area of the church. This proposal eliminates any major work in front of the church and embankment at end bent is reduced by approximately 11 feet, further minimizing disturbance limits and aesthetics.
- Provides access for neighborhoods on north side to the church with corridor shifted 650 feet to the west.
- A future extension of this alignment to connect with the "Clifty Road Connector" to create a "Loop Road scenario" is still viable. This option would be very difficult with the present plan.

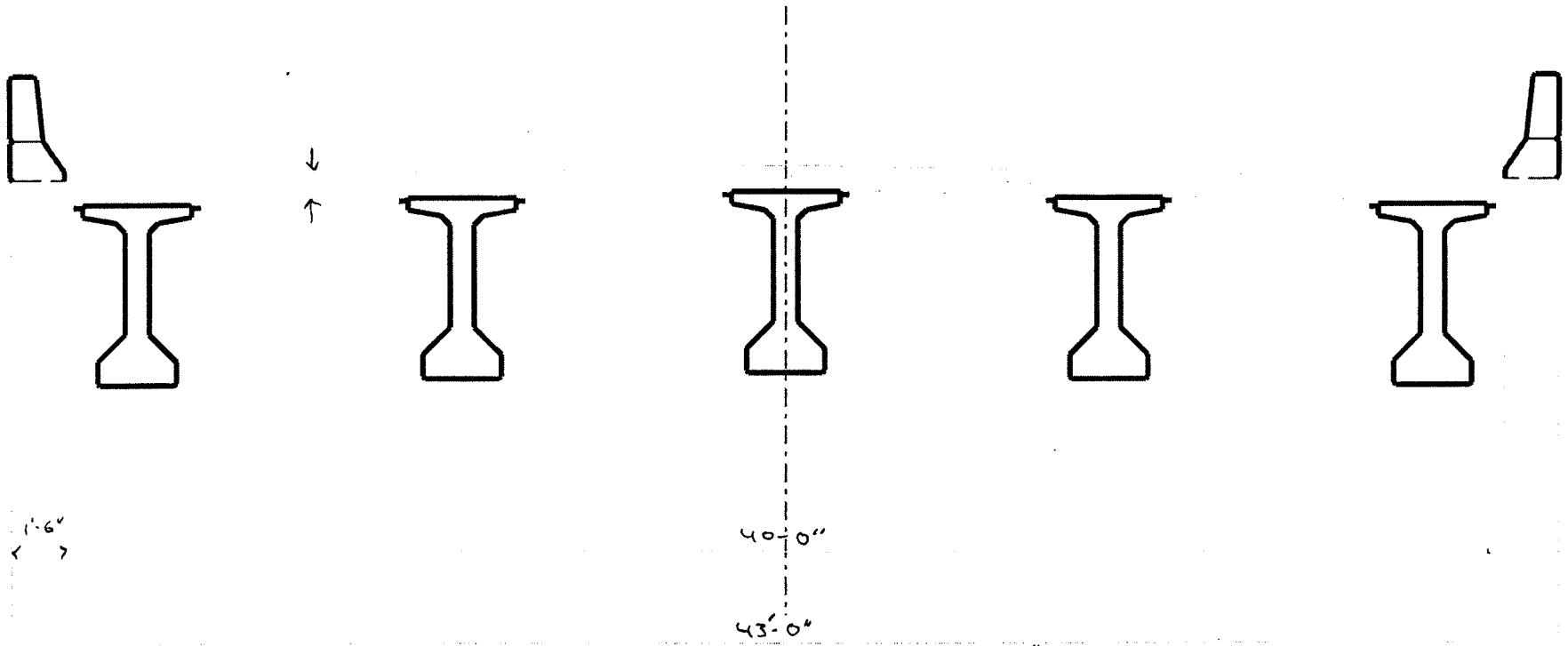
DISADVANTAGES:

- Slightly increases travel distance.
- Roadway does not stay "exactly in same place in front of church.
- Intersections for Norwood and Wilson not "improved".

JUSTIFICATION:

The "function of maintaining local access from the north to south for Clifty Road is met, with the corridor remaining in the area of the church while eliminating major construction and disruption at the church. Cost savings are significant.


COUNTY OF
PULASKI
ITEM NO.
8-59.40
SHEET NO.
GEO-01
Proposed Alignment Clifty Road
Curve Data - Proposed Ramp 1
Curve Data - Proposed Ramp 3
Curve Data - Proposed Ramp 3a
Curve Data - Proposed Ramp 4
Curve Data - Proposed Ramp 5
Curve Data - Proposed Ramp 7
Curve Data - Proposed Ramp 7a
Curve Data - Proposed Ramp 8
Curve Data - Proposed U.S. 27
Ramp 1
Ramp 3
Ramp 4
Ramp 7
APPROVED BY: Rec. 3
DIRECTOR, DIVISION OF HIGHWAY DESIGN
DATE
APPROVED BY:
DIRECTOR, DIVISION OF TRAFFIC
DATE
RECOMMENDED BY:
DATE
GEOMETRIC LAYOUT SHEET
SOMERSET NORTHERN BYPASS
U.S. 27 INTERCHANGE
0 100 200 400
GRAPHIC SCALE IN FEET
SCALE: 1" = 200'
** PRELIMINARY **
NOT FOR CONSTRUCTION



TYPICAL SECTION

NEW Structure

Clifty Road

...\Desktop\VESomersetpci84.dgn Jan. 16, 2003 14:30:19

Rec. 3

VALUE ENGINEERING RECOMMENDATION # 3

CALCULATIONS

"Shortened Structure"
length = 321 feet
=> 40 x 321 = 12,840 sq/ft
width = 40 feet

Average price is $65 per sq/ft
= $ 834,600

Height of Emb @ church side — Plan y 23 feet @624 + 00 (end bent)
(profile)

Proposed y 12 feet @ end bent
x-section 270 + 00

Roadway
As proposed

US 27 to Clifty (Ky 1674)	=	3271
Relocated Clifty	=	3050
		6321 feet

6321 x 24 / 9 x 17.50 = $ 294,980
6321 x 4 / 9 x 15.00 = 42,140
$ 337,120

Change = 3762 feet
3762 x 24 / 9 x 17.50 = $ 175,560
3762 x 4 / 9 x 15.00 = 25,080
$ 200,640

Excavation:

69015 (Ky 1674)
88640 (Clifty)

Reduced by 1/3 due to length change => 106,000 C.Y. reduction

VALUE ENGINEERING RECOMMENDATION # 3

COST ESTIMATE - FIRST COST

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		$/Unit	Source Code	Num of Units	Total $	Num of Units	Total $
Bridge over I-66 and Ramp 7	L.S.	2,000,000.00	1	1	$2,000,000	1	$834,600
Roadway excavation	C.Y.	3.41	1	157,655	$537,604	105,630	$360,198
Clifty Road surface	S.Y.	17.50	1	16,856	$294,980	10,032	$175,560
Clifty Road shoulder	S.Y.	15.00	1	2,809	$42,135	1,672	$25,080
Additional Right of Way	Acres	8,000			$0	4.5	$36,000
Subtotal					$2,874,719		$1431,438
Mark-up		@	20%		$574,944		$286,288
Redesign Costs							
Total					$3,449,662		$1,717,726

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # 3

COST ESTIMATE - O & M (LIFE CYCLE) COST

PRESENT WORTH METHOD
LIFE CYCLE PERIOD (YEARS) =60
ANNUAL PERCENTAGE RATE = 6%

O&M Costs. Single Expenditures.	In The Yr	PW Factor	Original Design		Recommended Design	
			Est $	PW $	Est $	PW $
Deck Replacement	60	0.0303	1,118,800	$33,900	513,600	$15,562
Deck Overlay	15	0.4173	14,860	$6,201	6,420	$2,679
Deck Overlay	30	0.1741	14,860	$2,587	6,420	$1,118
Deck Overlay	45	0.0727	14,860	$1,080	6,420	$467
Sub Total of Single Life Cycle O&M Costs (PW $)				$43,768		$19,826
O&M Costs. Continuous at Regular Intervals. Show as an Annual Expense.	For How Many Yrs	PW Factor	Original Design		Recommended Design	
			Est $	PW $	Est $	PW $
Sub Tot of Annual Life Cycle O&M Costs (PW $)						
Totals for Life Cycle O&M Costs (PW $)				$43,768		$19,826

VALUE ENGINEERING RECOMMENDATION # 4

PROJECT: I-66 and US 27 Interchange
LOCATION: Somerset, Kentucky
STUDY DATE: January 12-17, 2003

DESCRIPTIVE TITLE OF RECOMMENDATION:
Modify Interchange Loops

ORIGINAL DESIGN:
The interchange of I-66 and US 27 is designed as a four quadrant partial cloverleaf with loops in the north-west and south-east quadrants. The interchange scheme is designed to eliminate left turn movements on exit ramps by routing them 270 degrees through the loop.

RECOMMENDED CHANGE:
Design the Interchange as a two quadrant diagonally opposite partial clover leaf with loops carrying all of the exiting traffic in the north-west and south-east quadrants. The loops will contain a right only lane and dual lefts for entry onto US 27.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$15,647,000		$15,647,000
RECOMMENDED DESIGN	$13,779,000		$13,779,000
ESTIMATED SAVINGS OR (COST)	$1,868,000	$0	$1,868,000

VALUE ENGINEERING RECOMMENDATION # 4

ADVANTAGES:

- Reduces right of way
- The change will eliminate the exit ramps in the southwest and northeast quadrants. The elimination of these ramps will also allow the elimination of the acceleration lanes on US 27 for these ramps which become turn lanes. The elimination of the acceleration lanes will allow the construction of typical right turn lanes and eliminate weaving sections in these areas improving the safety of US 27 near the I-66 interchange.
- The elimination of the exit ramp in the southwest quadrant would allow for the Clifty Road overpass at I-66 to be shortened. As well, the elimination of this ramp will reduce the impact on the church in this area.
- The change will allow left turns from the exit ramps; however, by positioning the left turns on the loop ramp the left turn volumes will be cut in half compared to that of a diamond interchange, while maintaining the same signal timing.
- By eliminating the ramps in the north-east and south-west quadrants the right of way acquisitions should be reduced and less impact should be made in these areas.
- Improvement of the interchange would be fairly straightforward if the ramps become necessary at a later date.

DISADVANTAGES:

- The exit ramps may contain slightly less storage area for the dual left movement than the right turns from the exit ramps would be able to accommodate.

JUSTIFICATION:

The elimination of the ramps in the southwest and northeast quadrants will result in significant earthwork deductions while still providing adequate levels of service throughout the interchange. The bridge for Clifty Road will be able to be shortened, and less right of way will be required. These changes should result in significant changes.

Figure 1

COUNTY OF	ITEM
PULASKI	8-55

SKEES ENGINEERING, INC.

PREPARED BY _____ DATE _____
CHECKED BY _____ DATE _____
APPROVED BY _____ DATE _____

Cell Library: kyfc.cel
Cell Name: sp
MDN: 2003 16.681 MES
SHEETS

Curve Data - Proposed Ramp 1

(1c) P.I. 110+67.62 | Delta = 32°50'16" Rt. | D = 4°46'29" | T = 242.58' | L = 478.37' | R = 1200.00' | E = 24.33' | e = 1.01

(1b) P.I. 116+65.74 | Delta = 52°04'32" Rt. | D = 11°28'45" | T = 346.98' | L = 636.26' | R = 500.00' | E = 78.07' | e = 1.01

(1c) P.I. 120+74.77 | Delta = 37°14'43" Rt. | D = 6°29'58" | T = 174.79' | L = 260.02' | R = 900.00' | E = 22.10' | e = 1.01

Curve Data - Proposed Ramp 2

(2a) P.I. 353+15.90 | Delta = 59°41'59" Rt. | D = 11°27'33" | T = 286.83' | L = 520.98' | R = 500.00' | E = 74.48' | e = 2.02

(2b) P.I. 360+75.56 | Delta = 33°05'00" Lt. | D = 7°57'33" | T = 178.20' | L = 346.68' | R = 720.00' | E = 21.90' | e = 1.01

(2c) P.I. 371+78.75 | Delta = 45°16'47" Rt. | D = 11°27'33" | T = 213.63' | L = 430.20' | R = 500.00' | E = 66.79' | e = 2.02

Curve Data - Proposed Ramp 2a

(2a) P.I. 34+64.98 | Delta = 23°26'08" Lt. | D = 11°27'33" | T = 103.71' | L = 204.64' | R = 500.00' | E = 10.64' | e = 2.02

Curve Data - Proposed Ramp 4

(4a) P.I. 404+46.97 | Delta = 15°00'00" Rt. | D = 7°09'43" | T = 105.32' | L = 209.44' | R = 800.00' | E = 6.90' | e = 1.01

(4b) P.I. 405+76.98 | Delta = 70°49'59" Rt. | D = 12°43'57" | T = 374.90' | L = 556.18' | R = 450.00' | E = 102.12' | e = 2.02

(4c) P.I. 410+43.93 | Delta = 86°51'28" Rt. | D = 25°47'55" | T = 556.65' | L = 678.79' | R = 222.50' | E = 94.24' | e = 2.02

(4d) P.I. 416+48.80 | Delta = 91°54'24" Rt. | D = 11°27'33" | T = 513.22' | L = 716.32' | R = 500.00' | E = 196.32' | e = 3.02

(4e) P.I. 420+40.81 | Delta = 15°00'00" Rt. | D = 7°09'43" | T = 105.32' | L = 209.44' | R = 800.00' | E = 6.90' | e = 1.01

Curve Data - Proposed Ramp 5

(5a) P.I. Sta. 268+36.93 | Delta = 28°10'20" Rt. | D = 5°27'05" | T = 376.39' | L = 737.56' | R = 1500.00' | E = 46.50' | e = 2.02

(5b) P.I. Sta. 271+45.54 | Delta = 30°44'46" Rt. | D = 5°27'05" | T = 247.49' | L = 482.96' | R = 1050.00' | E = 29.40' | e = 1.01

(5c) P.I. Sta. 275+44.39 | Delta = 30°27'28" Rt. | D = 8°35'52" | T = 153.34' | L = 316.99' | R = 666.50' | E = 17.84' | e = 1.01

Curve Data - Proposed Ramp 7

(7a) P.I. 705+57.04 | Delta = 50°05'46" Rt. | D = 9°33'13" | T = 423.12' | L = 837.17' | R = 600.00' | E = 51.90' | e = 2.02

(7b) P.I. 713+94.38 | Delta = 27°32'54" Lt. | D = 9°33'13" | T = 208.24' | L = 408.43' | R = 600.00' | E = 24.53' | e = 2.02

(7c) P.I. 723+62.81 | Delta = 47°32'22" Rt. | D = 7°09'43" | T = 350.13' | L = 663.78' | R = 800.00' | E = 74.13' | e = 2.02

Curve Data - Proposed Ramp 7a

(7a) P.I. 75+80.03 | Delta = 30°43'39" Lt. | D = 11°27'33" | T = 137.34' | L = 268.15' | R = 500.00' | E = 18.23' | e = 2.02

Curve Data - Proposed Ramp 8

(8a) P.I. 80+97.39 | Delta = 15°00'00" Rt. | D = 7°09'43" | T = 105.32' | L = 209.44' | R = 800.00' | E = 6.90' | e = 1.01

(8b) P.I. 805+24.06 | Delta = 54°40'21" Rt. | D = 19°43'57" | T = 332.52' | L = 626.40' | R = 290.00' | E = 50.53' | e = 3.02

(8c) P.I. 811+14.41 | Delta = 115°06'44" Rt. | D = 22°55'06" | T = 1161.21' | L = 1401.44' | R = 250.00' | E = 716.04' | e = 8.02

(8d) P.I. 815+91.53 | Delta = 36°36'58" Rt. | D = 19°43'57" | T = 368.43' | L = 717.44' | R = 290.00' | E = 115.58' | e = 3.02

(8e) P.I. 819+45.88 | Delta = 15°00'00" Rt. | D = 7°09'43" | T = 105.32' | L = 209.44' | R = 800.00' | E = 6.90' | e = 1.01

Cell Library: kyfc.cel
Cell Name: sp
MDN: 2003 16.681 MES
SHEETS

APPROVED BY: Figure 1
DIRECTOR, DIVISION OF HIGHWAY DESIGN

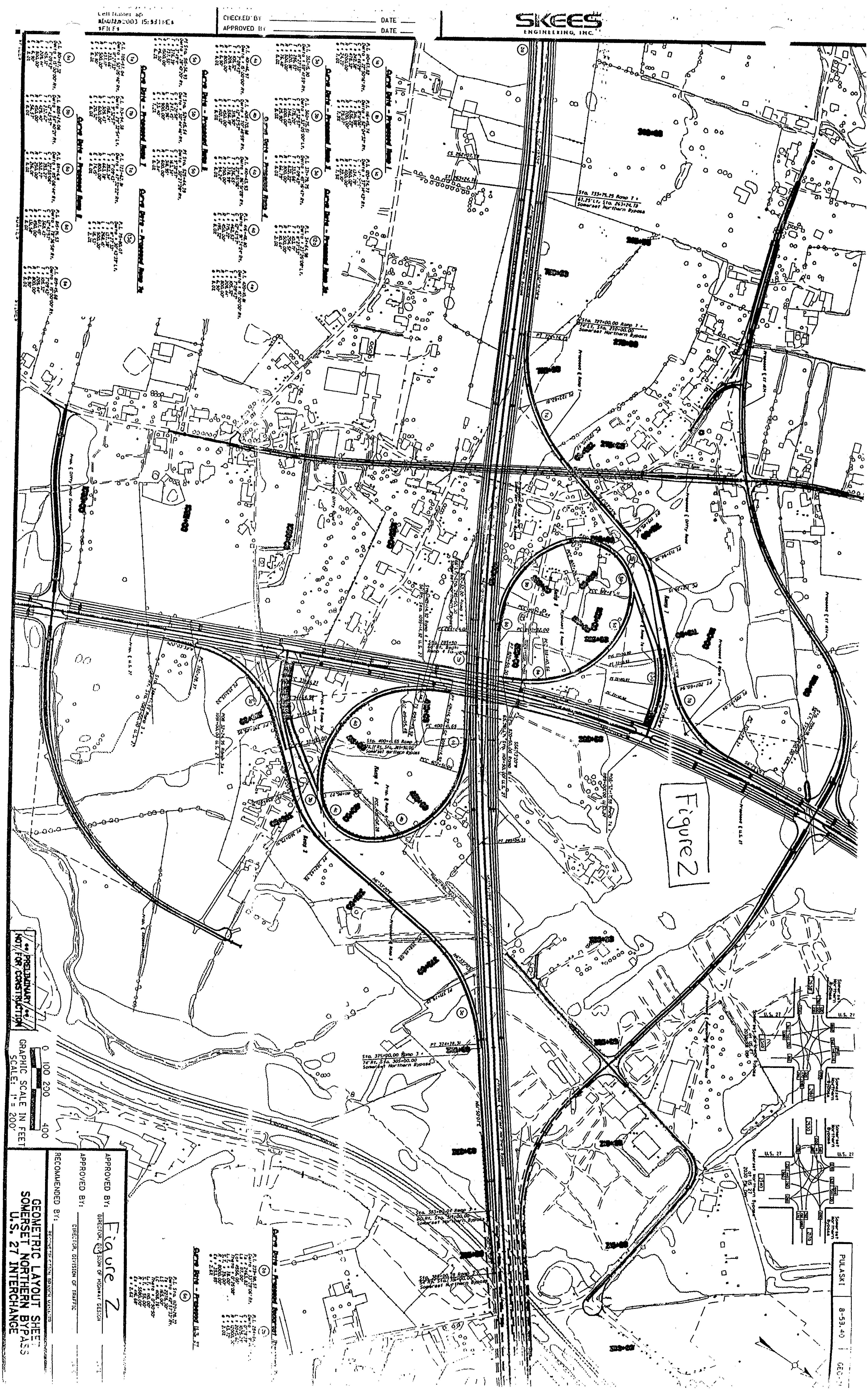
APPROVED BY: _____
DIRECTOR, DIVISION OF TRAFFIC

RECOMMENDED BY: _____
DISTRICT ENGINEER

0 100 200 400
GRAPHIC SCALE IN FEET
SCALE: 1" = 200'

PRELIMINARY NOT FOR CONSTRUCTION

GEOMETRIC LAYOUT SH
SOMERSET NORTHERN B
U.S. 27 INTERCHAN



CHECKED BY DATE
APPROVED BY DATE
SKEES
ENGINEERING, INC.
Figure 2
PRELIMINARY
NOT FOR CONSTRUCTION
0 100 200 400
GRAPHIC SCALE IN FEET
SCALE: 1" = 200'
RECOMMENDED BY:
APPROVED BY:
DIRECTOR, DIVISION OF TRAFFIC
APPROVED BY:
DIRECTOR, DIVISION OF HIGHWAY DESIGN
Figure 2
GEOMETRIC LAYOUT SHEET
SOMERSET NORTHERN BYPASS
U.S. 27 INTERCHANGE
PULASKI
8-53.40
U.S. 27
Somerset Northern Bypass

VALUE ENGINEERING RECOMMENDATION # 4

CALCULATIONS

Earthwork Calculations:

Original Amount For I-66 & US 27 Interchange

	Cut	Fill
	1,583,259	1,229,928
Minus ramps I+5	539,302	14,625
	1,043,957 CY	1,215,303 CY
Add ramps 8A & 4A	22,545 CY	62,684
	1,066,502 CY	1,277,987 CY
Need Borrow	211,485 CY	
	1,277,987 CY	

Savings

Original	-	New		
1,583,259	-	1,277,987	=	305,272 CY

Ramp 8A Excavation Calculations

Station on Ramp 7A	Area of Section	
73+62	181 SY cut	
		9591 CY cut
75+00	236 SY cut	
		7310 CY cut
76+00	194 SY cut	
		4471 CY cut
77+00	69 SY cut	
		1173 CY cut
77+50	0	

Station on Ramp 7

* 100' between 77+50 & 710+50

710+50	45 SY Fill	765 SY Fill
		0 SY
711+50	0 SY	
		0 SY
712+50	0 SY	
		0 SY
713+50	0 SY	
		0 SY
714+50	0 SY	

Total cut = 22,545 CY

Total fill = 765 CY

Ramp 4A Excavation Calculations

Stations on Ramp 3A	Area of Section	
32+69	83 SY Fill	
		4884 CY Fill
34+00	139 SY Fill	
		5729 CY Fill
35+00	198 SY Fill	
		7871 CY Fill
36+00	265 SY Fill	
		11,305 CY Fill
37+00	400 SY Fill	

Stations on Ramp 3

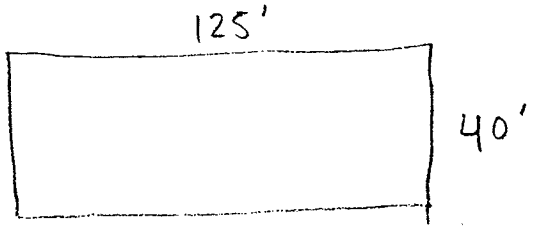
* 100' between 37+00 & 357+00 — 13090 CY Fill

357+00	370 SY Fill	
		9180 CY Fill
358+00	170 SY Fill	
		4420 CY Fill
359+00	90 SY Fill	
		2720 CY Fill
360+00	70 SY Fill	
		1955 CY Fill
361+00	45 SY Fill	
		765 CY Fill
362+00	0 SY	

Total Fill = 61,919 CY

Clifty Rd. Bridge Estimated Savings.

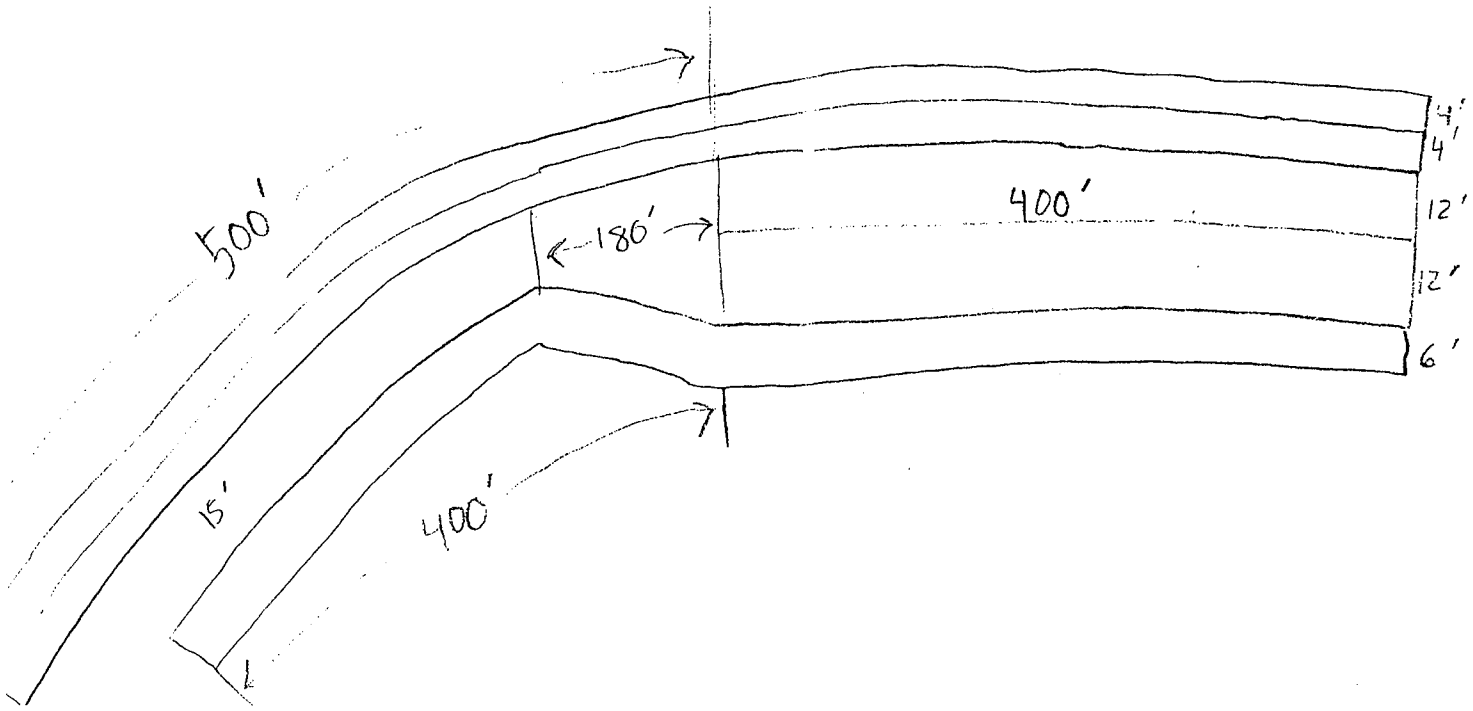
- By Eliminating ramp 5 the length of the clifty rd. Bridge by 125'.



5000 sf reduction.

5000' x $55.50 = $277,500

Estimate calculations for ramps 8A + 4A.



Shoulder	800 SY			
Lanes	450 SY	390 SY	1066 SY	= 1906
Shoulder	533 SY			

VALUE ENGINEERING RECOMMENDATION # 4

COST ESTIMATE - FIRST COST

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		$/Unit	Source Code	Num of Units	Total $	Num of Units	Total $
Roadway Excavation	C.Y.	3.61	1	2,954,083	$10,664,240	2,648,811	$9,562,208
Surfacing Ramp 1					$0		$0
Lanes	S.Y.	35.50	1	3,527	$125,209		$0
Shoulder	S.Y.	23.50	1	2,351	$55,249		$0
Sufacing Ramp 5					$0		$0
Lanes	S.Y.	35.50	1	3,802	$134,971		$0
Shoulder	S.Y.	23.50	1	2,534	$59,549		$0
Surfacing Ramp 8A					$0		$0
Lanes	S.Y.	35.50	1		$0	1,906	$67,663
Shoulder	S.Y.	23.50	1		$0	1,333	$31,326
Surfacing Ramp 4A					$0		$0
Lanes	S.Y.	35.50	1		$0	1,906	$67,663
Shoulder	S.Y.	23.50	1		$0	1,333	$31,326
Clifty Road Bridge	L.S.	2,000,000	1	1	$2,000,000	1	$1,722,500
Subtotal					$13,039,217		$11,482,685
Mark-up		@	20%		$2,607,843		$2,296,537
Redesign Costs							
Total					$15,647,060		$13,779,222

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
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 # 2

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Option # 1 discussion

COMMENTARY:
During discussion of Option # 1, the VE team noted eliminating Clifty Bridgee over I-66 would save a significant amount (~8-10%) of project costs up front and reduces ongoing inspection and maintenance costs without a significant adverse effect on community. Access from one affected area to the other is well maintained using Clifty connector and new US 27. Therefore, Community cohesion is maintained.

VALUE ENGINEERING DESIGN COMMENT # 5

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Modify Grades

COMMENTARY:

Summaries for the preliminary earth work quantities have been reviewed and due to the lack of geotechnical information , it is difficult to make any detailed suggestions about improvements to the grades. However, several items were observed which may provide a savings as more information becomes available.

1. From the summaries, it appears that the quantities calculated for the ramps overlap the US 27 quantities. This has resulted in approximately 200,000 C.Y. overestimation of the excavation.
2. At this time, it is believed an insufficient quantity of rock is available to provide a rock road bed for I-66 and the ramps and various collectors. From the cost estimate, no item has been established for any chemical stabilization of the soil or a drainage blanket. When geotechnical information does become available, reconsideration of the grades for Ramp 1,5,7, and 8 may provide area to gain rock or reduce the amount of waste as required.
3. With the large amount of waste material projected at this time, it is suggested the two 7 foot by 5 foot culverts located under Ramp 3 and Ramp 4 be connected. This would be an excellent area to fill and eliminate the guardrail required along Ramp 4.

VALUE ENGINEERING DESIGN COMMENT # 6

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Build embankment at end of project

COMMENTARY:
Project appears to end at station 313+00, the bridge for the next section over the railroad and existing US 27 is at approximate station 314+50. This probably has been taken into consideration but all of the embankment on the west side of this future bridge needs to be built with project, especially since this is a waste section.

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

Workshop Attendance												
Attendees				Participation								
				Meetings			Study Sessions					
Name	Organization and Address (Organization first, with complete address underneath)	Tel # and FAX. (Tel first with FAX underneath)	Role in wk shop	Intro	Mid Wk Rev	Out Brief	Day 1	Day 2	Day 3	Day 4	Day 5 *
Gary Raymer	Kentucky Transportation Cabinet-D4	270-766-5066	Team Member					X	X	X	
Royce Meredith	Kentucky Transportation Cabinet-D5	503-367-6411	Team Member					X	X	X	
Rob Martin	Kentucky Transportation Cabinet-D4	502-348-5866	Team Member					X	X	X	
James Miracle	Kentucky Transportation Cabinet-C.O. Bridges	502-564-4560	Team Member					X	X	X	
Joe Waits	URS	251-666-5892	Team Leader					X	X	X	
Rob Franxman	Kentucky Transportation Cabinet-D6	859-356-5300	Team Member					X	X	X	
Emily Johnson	URS	913-344-1000	VE Tech Recorder					X	X	X	

* Day 5 was cancelled due to weather conditions.

Value Engineering Pre-Study Meeting

January 13, 2003
I-66 / US 27 Interchange

A meeting was held at District 8 offices on Monday, January 13, 2003, for the purpose of briefing the VE team on the I-66 / US 27 Interchange project. After the briefing by the project manager and the design team, the VE team toured the project site.

The following people attended:

Name	Affiliation	Phone No.
Gary Raymer	KYTC	270-766-5066
Rob Martin	KYTC	502-348-5866
Rob Franxman	KYTC D-6	859-356-5300
Royce Meredith	KYTC D-5	502-935-3461
Wallace Bennett	T.H.E.	859-263-0009
Clyde Brown	T.H.E.	859-263-0009
Joe Waits	URS	251-666-5892
Siamak Shafaghi	KYTC	502-564-3280
Robert Semones	KYTC	502-564-3280
David Beattie	KYTC D-8	
Mike Bruce	JDQ	270-926-1808
Kenneth W. Young	American Engineers, Inc.	270-651-7220
Steve McDevitt	Skees Engineering Inc.	502-254-2344
Robert Parbs	Florence & Hutchinson, Inc.	270-444-9691
Steven Criswell	KYTC- C.O. Construction	502-564-4780
Alvin Dodson	KYTC D-8 RIW	606-677-4017

APPENDIX B
Cost Information

KENTUCKY TRANSPORTATION CABINET

Department of Highways
COST ESTIMATE
PRELIMINARY LINE AND GRADE STAGE

TD61-402
Rev. 12-77

Pulaski County
UPN: Fed. No.: Item No. 8-59.20
Road Name: Interstate 66 Interchange with Relocated US 27
From: Sta 251+00 (East of Witson Road)
To: Sta 313+00 (West of Norfolk Southern Railroad)
Net Length, Miles: 1.12 Type of Construction: Grade, Drain, & Surfacing Class of Road: Freeway

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE*	AMOUNT
	SURFACING				
	I-66 MAINLINE				
	Travel Lanes	40207	Sq.Yd.	$35.50	$1,427,348.50
	Shoulder	17817	Sq.Yd.	$23.50	$418,699.50
	U.S. 27				
	Travel Lanes	39467	Sq.Yd.	$35.50	$1,401,078.50
	Shoulder	14988	Sq.Yd.	$23.50	$352,218.00
	RAMPS				
	Travel Lanes	23822	Sq.Yd.	$35.50	$845,681.00
	Shoulder	15185	Sq.Yd.	$23.50	$356,847.50
	Racetrack Road Paving	12750	Sq.Yd.	$19.00	$242,250.00
	Racetrack Road Shoulder	9050	Sq.Yd.	$15.00	$135,750.00
	Clifty Road Paving	4505	Sq.Yd.	$17.50	$78,837.50
	Clifty Road Shoulder	2662	Sq.Yd.	$15.00	$39,930.00
	Clifty Road Connector 10+00 - 22+99.63	3713	Sq.Yd.	$17.50	$64,977.50
	Clifty Road connector 10+00 - 22+99.63	2308	Sq.Yd.	$15.00	$34,620.00
	Access Road Extension Paving 22+99.63 - 51+50	7467	Sq.Yd.	$17.50	$130,672.50
	Access Road Extension Shoulder 22+99.63 - 51+50	4978	Sq.Yd.	$15.00	$74,670.00
	Subtotal				$5,603,581
	DRAINAGE ITEMS				
461	Culvert Pipe - 18 in	2050	Lin. Ft.	$52.33	$107,277
464	Culvert Pipe - 24 in	970	Lin. Ft.	$55.12	$53,466
466	Culvert Pipe - 30 in	1490	Lin. Ft.	$49.81	$74,217
468	Culvert Pipe - 36 in	340	Lin. Ft.	$71.77	$24,402
469	Culvert Pipe - 42 in	410	Lin. Ft.	$80.43	$32,976
470	Culvert Pipe - 48 in	470	Lin. Ft.	$75.55	$35,509
472	Culvert Pipe - 60 in	420	Lin. Ft.	$123.42	$51,836
xxxx	5' x 7' BOX CULVERT @ Ramp 3 Sta. 309+00	1	Lump Sum		$107,000
xxxx	5' x 7' BOX CULVERT @ Ramp 4 Sta. 414+00	1	Lump Sum		$88,000
xxxx	5' x 7' BOX CULVERT @ Access Road Sta.29+50	1	Lump Sum		$117,000
521	Storm Sewer Pipe - 15 in		Lin. Ft.	$32.09	
522	Storm Sewer Pipe - 18 in		Lin. Ft.	$38.76	
524	Storm Sewer Pipe - 24 in		Lin. Ft.	$45.10	
526	Storm Sewer Pipe - 30 in		Lin. Ft.	$47.70	
981	Slotted Drain Pipe - 15 in		Lin. Ft.	$99.20	
1000	Perforated Pipe - 4 in		Lin. Ft.	$4.34	
1001	Perforated Pipe - 6 in	24800	Lin. Ft.	$5.92	$146,816
1010	Non-Perforated Pipe - 4 in		Lin. Ft.	$9.64	
1011	Non-Perforated Pipe - 6 in		Lin. Ft.	$9.28	
1310	Removing Pipe		Lin. Ft.	$11.50	
1391	Metal End Section Type 3 - 18 in		Each	$676.74	
1432	Sloped Box Inlet Type 1 - 15 in		Each	$1,253.56	
1450	S&F Box Inlet Outlet 18 in	12	Each	$2,065.18	$24,782

October 8, 2002

KENTUCKY TRANSPORTATION CABINET

Department of Highways
COST ESTIMATE
PRELIMINARY LINE AND GRADE STAGE

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Rev. 12-77

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Net Length, Miles: 1.12 Type of Construction: Grade, Drain, & Surfacing Class of Road: Freeway

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE*	AMOUNT
1451	S&F Box Inlet Outlet 24 in	4	Each	$2,390.31	$9,561
1452	S&F Box Inlet Outlet 30 in	5	Each	$2,977.00	$14,885
1453	S&F Box Inlet Outlet 36 in	2	Each	$3,227.54	$6,455
1480	Curb Box Inlet Type B	4	Each	$3,450.45	$13,802
1517	Drop Box Inlet Type 5F	17	Each	$3,320.83	$56,454
1585	Removing Drop Box Inlet		Each	$293.75	
1741	6 in Cored Hole Drainage Box Collector		Each	$150	
1756	Manhole Type A		Each	$1,625.00	
8100	Concrete - Class A	56	Cu.Yd	$353.99	$19,774
8150	Steel Reinforcement	3446	LB	$0.64	$2,205
	Perforated Pipe Headwall		Each	$453.51	
	Remove and Reset 4 in Perforated Pipe Headwall		Each	$453.51	
	Subtotal				$986,417
	MISCELLANEOUS ITEMS				
3	Crushed Stone Base		Ton	$8.40	
1709	Adjusting Catch Basin		Each	$216.67	
1825	Island Curb and Gutter		Lin.Ft.	$14.10	
1845	Island Integral Curb		Lin.Ft.	$31.00	
2200	I-66 Roadway Excavation	2,954,083	Cu.Yd.	$3.61	$10,664,240
2255	Removing Fence		Lin.Ft.	$2.38	
2259	R/W Fence-Temporary		Lin.Ft.	$3.11	
2262	R/W Fence-Woven Wire Type 1	11600	Lin.Ft.	$4.24	$49,184
2351	Guardrail - Steel W Beam - S Face	12748	Lin.Ft.	$10.05	$128,117
2360	Guardrail Terminal Section No. 1		Each	$44.77	
2363	Guardrail Conn. to Bridge End Type A	12	Each	$605.64	$7,268
2367	Guardrail End Treatment Type 1		Each	$2,723.62	
2369	Guardrail End Treatment Type 2A	9	Each	$469.97	$4,230
2373	Guardrail End Treatment Type 3	3	Each	$512.94	$1,539
2391	Guardrail End Treatment Type 4A	16	Each	$1,485.52	$23,768
2365	Crash Cushion Type IX-A	2	Each	$5,315.84	$10,632
2381	Removing Guardrail		Lin.Ft.	$1.98	
2383	Removing and Resetting Guardrail		Lin.Ft.	$6.71	
2387	Guardrail Conn. to Bridge End Type A-1	2	Each	$278.56	$557
2545	Clearing and Grubbing (205ac @ $3142/ac)	1	Lump Sum	$644,110.00	$644,110
2555	Concrete-Class B		Cu.Yd.	$381.70	
2585	Edge Key		Lin.Ft.	$31.10	
2676	Mobilization for Asphalt Pavement Milling and Texturing		Lump Sum	$928.78	
2677	Asphalt Pavement Milling and Texturing		Ton	$17.45	
2690	Safeloading		Cu.Yd.	$113.70	
2726	Staking	1	Lump Sum	$5,000.00	$5,000
xxx	Concrete Median Barrier Type 14C	350	Lin.Ft.	$44.35	$15,523
	Traffic Signals	4	Each	$45,000.00	$180,000
	Critical Path Management	1	Lump Sum	$9,070.29	$9,070
	Subtotal				$11,743,238
	STRUCTURES				
xxx	Construct I66 Bridge over US 27	1	Lump Sum	$2,100,000	$2,300,000
xxx	Construct Clifty Road over I66	1	Lump Sum	$1,500,000	$1,500,000
xxx	Construct Clifty Road over Ramp 7	1	Lump Sum	$500,000	$500,000

October 8, 2002

KENTUCKY TRANSPORTATION CABINET

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To: Sta 313+00 (West of Norfolk Southern Railroad)
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ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE*	AMOUNT
	Subtotal				$4,300,000
	MAINTENANCE OF TRAFFIC PLANS				
1984	Delineator for Barrier - White		Each	$7.18	
1985	Delineator for Barrier - Yellow		Each	$6.49	
2003	Relocate Temporary Concrete Median Barrier		Lin.Ft.	$5.00	
2562	Signs		Sq.Ft.	$5.95	
2650	Maintain & Control Traffic	1	Lump Sum	$100,000.00	$100,000
2671	Variable Message Sign - Portable 3 Line	2	Each	$8,228.50	$16,457
2775	Flashing Arrow	2	Each	$1,398.82	$2,798
2894	Crash Cushion Type VI-T		Each	$11,162.83	
2898	Relocate Crash Cushion		Each	$2,241.50	
3171	Concrete Barrier Wall Type 9T (Temporary)		Lin.Ft.	$52.01	
3225	Tubular Markers		Each	$70.85	
4935	Temporary Signal		Lump Sum	$11,125	
6511	Pave. Striping - Temp. Paint - 6 in		Lin.Ft.	$0.17	
6531	Pave. Striping Removal - 6 in		Lin.Ft.	$0.51	
6550	Pave. Striping - Temp. Remov. Tape - W		Lin.Ft.	$1.20	
6551	Pave. Striping - Temp. Remov. Tape - Y		Lin.Ft.	$1.22	
6585	Pavement Marker Type IVA - M W - Temporary		Each	$3.68	
6586	Pavement Marker Type IVA - M Y - Temporary		Each	$3.46	
6600	Remove Pavement Marker Type V		Each	$11.71	
	Lane Closure		Each	$2,267.57	
	Replacing Damaged Crash Cushions Type VI-T		Each	$9,614.51	
	Subtotal				$119,255
	SIGNING				$125,000
6405	SBM Aluminum Panel Signs		Sq.Ft.	$15.47	
6406	SBM Alum Sheet Signs 0.08 in		Sq.Ft.	$16.61	
6407	SBM Alum Sheet Signs 0.125 in		Sq.Ft.	$16.56	
6411	Steel Post Type 2		Lin.Ft.	$4.21	
6412	Steel Post Mile Markers		Each	$112.73	
6415	OSS Galv Steel Cantilever		Each	$8,611.11	
6440	GMSS Galv Steel Type B		LB	$1.22	
6451	Remove Sign Support Beam		Each	$184.50	
6490	Class A Concrete for Signs		Cu.Yd.	$433.09	
6491	Steel Reinforcement for Signs		LB	$1.27	
	Subtotal				$125,000
	LIGHTING				
xxx	Lighting	1	Lump Sum	$250,000.00	$250,000
	STRIPING				
6514	Pave. Striping - Permanent Paint - 4 in (Y)	13832	Lin.Ft.	$0.20	$2,766
6514	Pave. Striping - Permanent Paint - 4 in (W)	33518	Lin.Ft.	$0.20	$6,704
6515	Pave. Striping - Permanent Paint - 6 in		Lin.Ft.	$0.21	
6542	Pave. Striping - Thermo - 6 in - W	31626	Lin.Ft.	$0.65	$20,557
6543	Pave. Striping - Thermo - 6 in - Y	27492	Lin.Ft.	$0.64	$17,595
6546	Pave. Striping - Thermo - 12 in - W		Lin.Ft.	$2.17	
6591	Pavement Marker Type V - B Y	246	Each	$21.61	$5,316
6592	Pavement Marker Type V - B W/R	384	Each	$26.11	$10,026

KENTUCKY TRANSPORTATION CABINET

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To: Sta 313+00 (West of Norfolk Southern Railroad)
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ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE*	AMOUNT
6593	Pavement Marker Type V - B Y/R	388	Each	$25.74	$9,987
	Delineator Post Bases		Each	$7.21	
	Remove & Reset Delineator Post		Each	$18.05	
	Subtotal				$72,951
	EROSION CONTROL PLANS				$65,000
2165	Removing Paved Ditch		Sq.Yd.	$4.08	
2223	Granular Embankment (for Sinkholes)		Cu.Yd.	$10.11	
2469	Clean Sinkhole		Each	$725.00	
2484	Channel Lining Class III (from Pipe Summary & General Summary)		Ton	$20.50	
2599	Fabric-Geotextile Type IV (for Sinkholes)		Sq.Yd.	$1.14	
2701	Temporary Silt Fence		Lin.Ft.	$1.96	
2704	Silt Trap, Type B		Each	$341.64	
2705	Rock Silt Check Type II		Each	$121.67	
2707	Clean Silt Trap, Type B		Each	$88.78	
2708	Clean Rock Silt Check Type II		Each	$30.08	
2709	Clean Temporary Silt Fence		Lin.Ft.	$0.46	
5950	Erosion Control Blanket		Sq.Yd.	$1.41	
5953	Temporary Seeding and Protection		Sq.Yd.	$0.44	
5966	Topdressing Fertilizer		Ton	$372.48	
5985	Seeding and Protection		Sq.Yd.	$0.34	
5989	Special Seeding Crown Vetch		Sq.Yd.	$0.31	
	Subtotal				$65,000
				Subtotal	$23,265,442
2568	Mobilization (3%)	1	Lump Sum		$697,963
2569	Demobillization (1 1/2%)	1	Lump Sum		$348,982
				Project Subtotal	$24,312,387
Cost per Mile Grade, Drain & Surfacing		$7,114,312		+15% Engr. & Contg.	$3,646,858
				Grand Total	**$27,959,245**

Estimated by: _____ Date _____
Checked by: _____ Date _____

* Unit prices are based on KYDOH 2001 average unit bid prices when available.

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October 8, 2002

APPENDIX C
Function Analysis

FUNCTION ANALYSIS						
ITEM	**FUNCTION VERB**	**NOUN**	**TYPE**	**COST**	**WORTH**	**C/W**
Roadway Excavation	Establish	Grade	B	10,664,240	8,500,000	1.25
Surfacing	Support	Load	B	5,603,581	5,000,000	1.12
Drainage	Remove	Water	B	986,417	986,417	1.00
Structures	Span	Obstruction	B	4,300,000	1,500,000	2.87
MOT	Maintain	Traffic	B	119,225	119,225	1.00
Signing	Provide	Information	B	125,000	125,000	1.00
Lighting	Illuminate	Area	B	250,000	250,000	1.00
Striding	Identify	Lanes	B	72,591	72,951	1.00

APPENDIX D
Creative Idea List and Evaluation

List of CREATIVE IDEAS			
ID #	**Name of Idea / description**	**TM Resp.**	**Develop Status**
1	Reduce width of Clifty Road Bridges	Gary	Develop
2	Prefer Option # 1	Jim	Make Design Comment
3	Realign Clifty Road	Rob M.	Develop
4	Eliminate Loops	Rob F.	Develop
5	Investigate grades	Rob M.	Make Design Comment
6	Build embankments at project end for future bridges	Gary	Make Design Comment

END OF REPORT

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