

**I-75 @ US 41/US 76/SR 3 (Rocky Face)
Interchange Reconstruction**

NH-0000-00(931)

P.I. No. 0000931

Whitfield County

**Value Engineering Study Report
Design Development Stage**

December 2008

Design Consultants



**Kimley-Horn
and Associates, Inc.**

Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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December 1, 2008

Ms. Lisa L. Myers
Design Review Engineering Manager/VE Coordinator
GA DOT - Engineering Services
One Georgia Center – 5th Floor
Atlanta, Georgia 30308

Re: Project Number NH-0000-00(931)
I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction
PIN 0000931
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to submit four hard copies and one electronic copy of the referenced value engineering study report that took place on November 17 - 20, 2008. The objective of the VE effort was to identify opportunities to reduce costs and enhance the value of the project.

This VE workshop identified and developed several ideas which provide opportunities to improve the value of the project to GDOT. Of particular interest are those alternatives related to the new ramps and the I-75 bridge over US 41/SR 3 as detailed in the Study Results Section of this report.

We thank you for your assistance during the course of the VE team's work. Please do not hesitate to call us if you or any of the reviewers have any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

Stephen Havens, PE, PMP, CVS
Sr. Project Manager

Attachment

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EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Georgia Department of Transportation (GDOT). The subject of the study is Project NH-0000-00(931), I-75 @ US 41/US 76/SR 3 Rocky Face (P.I. No. 0000931) Interchange Reconstruction, Whitfield County, Georgia. The project is being developed for GDOT by the design team led by Kimley-Horn and Associates, Inc.

The VE workshop was conducted November 17 - 20, 2008 by a multidisciplinary team at GDOT's Atlanta Headquarters, One Georgia Center and followed the six-phase VE Job Plan:

- Information Phase
- Function Identification and Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

PROJECT DESCRIPTION

This project is located in central Whitfield County at the interchange of I-75 and US 41/SR 3. The I-75 section of the project begins at the Rocky Face northbound exit ramp just northwest of the city of Dalton and extends north for approximately 0.727 miles. The US 41/SR 3 portion of the project begins at Tibbs Road west of I-75 and extends to Old SR 3 east of I-75 for approximately 0.721 miles.

The approved design concept provides for the widening of I-75 and US 41/SR 3. The widening of I-75 will consist of an auxiliary lane northbound and accommodations for a future fourth lane in each direction. US 41/SR 3 will be widened to three 12-foot lanes in each direction with a raised median and partial curb and gutter, as well as two 12-foot left turn lanes added to both the I-75 northbound and southbound exit ramps. Collector-distributor (CD) lanes will be added parallel to I-75 to separate I-75 through traffic from both the proposed northbound exit ramp traffic and the proposed southbound exit ramp traffic. The CD lanes will be separated from the I-75 mainline by a concrete barrier wall. The existing southbound exit loop ramp will be reconstructed and modified to accommodate only an easterly movement onto US 41/SR 3. The existing southbound entrance ramp will be realigned perpendicular to US 41/SR 3 to align with the proposed southbound exit ramp. A loop ramp in the northeast quadrant of the interchange will be added to accommodate the I-75 northbound exit movement onto US 41/SR 3 westbound. The existing northbound entrance ramp from US 41/SR 3 eastbound to I-75 northbound will be relocated to make room for the new loop ramp. The existing I-75 northbound exit ramp will be retained and modified to align with the proposed I-75 northbound exit ramp accommodating the easterly movement onto US 41/SR 3.

The estimated total cost of construction is \$18,925,434. The estimated right-of-way cost is \$1,128,000 and the estimated reimbursable utilities cost is \$1,915,510 bringing the total estimated cost to \$21,968,944.

CONCERNS AND OBJECTIVES

Concerns

The project team summarized the following key design issues to the VE Team during the design overview:

- Six streams are located in the area requiring numerous mechanically stabilized earth (MSE) walls for erosion protection. The proposed design is right at the upper threshold for stream impact. The Categorical Exclusion was only recently approved on October 2, 2008. Any proposed design changes should pay close attention to the environmental commitments table.
- If the cost of widening the I-75 over US 41/SR 3 bridge structure is comparable to replacement, or even slightly less expensive, the GDOT State Bridge Maintenance Engineering Office would support replacement of the structure based upon the Bridge Condition Survey recommendations dated January 9, 2007.
- Lane lengths for deceleration and acceleration lanes may be too short; 1,500 feet is preferred.
- The proposed radius on Ramp A is very tight due to wetland and natural stream constraints. Design improvements should be considered.

Objectives

The VE team was tasked with the following key objectives:

- Suggest cost reduction ideas
- Suggest ideas to add value by improving ramp and roadway geometry

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to ramp and bridge design, ramp alignments, and turn lane geometry.

RESULTS

The VE team developed 12 cost-saving alternatives and 3 design suggestions for consideration by GDOT and the design team. If the following top 10 list of VE alternatives is accepted, a total present worth cost savings of over \$5 million could be realized.

- Eliminate sidewalks on US 41/SR 3 between Ramps G and F and North Tibbs Road to save \$1,184 (Alt. No. R-6).
- Construct all new ramps using asphalt pavement in lieu of Portland cement concrete to save \$312,030 (Alt. No. R-7).
- Eliminate Ramp A by making Ramp B three lanes including two left turn lanes onto US 41/SR 3 to save \$1,316,168 (Alt. No. R-10).
- Reduce guard railing to save \$26,722 (Alt. No. R-15).
- Add a left-turn lane to Ramp E and eliminate Ramp F to save \$2,602,994 (Alt. No. R-18).
- Revise the envelope on MSE Wall #6 to save \$56,869 (Alt. No. S-2)
- Build the I-75 bridges to accommodate the inside shoulder while retaining a 12 foot gap to save \$295,342 (Alt. No. S-3).
- Make the typical section of US 41/SR 3 narrower under the I-75 bridge only to save \$1,094,985 (Alt. No. S-4).
- Eliminate provisions for a fourth lane on the I-75 Bridge to save \$480,685 (Alt. No. S-5).

- Provide convenience access to Ramp G from North Tibbs Road (“short-cut”) for an additional cost of \$10,000 (Alt. No. R-5)

IMPLEMENTATION

This VE report is a formalization of the draft materials provided to the project team during the out-briefing discussion which occurred on November 20, 2008. The Summary of VE Alternatives worksheet following this narrative outlines the alternatives and design suggestions developed by the VE team. Some of the alternatives are mutually exclusive or interrelated, so that addition of all project cost savings does not equal total savings for the project. A full listing of the ideas considered by the VE team can be found on the Creative Idea Listing in the Value Analysis and Conclusions section of the report.

STUDY RESULTS

INTRODUCTION

The results are the major feature of this value engineering study conducted on P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction, since they portray the benefits that can be realized by GDOT and Whitfield County. The results will directly affect the project design and will require careful coordination between GDOT and Kimley-Horn and Associates, Inc. to determine the disposition of each alternative.

During the course of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical feasibility, applicability to the project, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (without cost estimates). For each alternative developed, the following information has been provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design, if appropriate;
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

The capital cost comparisons for each alternative use unit quantities from the Estimate Report for file "000931 NHS-0000-00(931)," prepared by District 6, GDOT, not dated. If unit quantities were not available, GDOT databases were consulted. A composite markup of 10.0%, as described in the Value Analysis and Conclusions section of the report, was used to generate the project cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons may include: improve circulation, reduce maintenance, improve durability, improve safety, and reduce project risk. In addition, some ideas cannot be quantified in terms of cost with the design information provided. These are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value analysis process and facilitate referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings table. The Alt. No. includes a prefix that refers to one of the major project elements:

PROJECT ELEMENT	PRINCIPLE
Roadway	R
Structures	S
Maintenance of Traffic	M

Summaries of the alternatives are provided on the Summary of Value Engineering Alternatives table. The table is divided into project elements for the reviewer's convenience and is used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows the Summary of Value Engineering Alternatives tables.

KEY ISSUES

The project team summarized the following key design issues to the VE Team during the design overview:

- Six streams are located in the area requiring numerous MSE walls for erosion protection. The proposed design is right at the upper threshold for stream impact. The Categorical Exclusion was only recently approved on October 2, 2008. Any proposed design changes should pay close attention to the environmental commitments table.
- If the cost of widening the I-75 over US 41/SR 3 bridge structure is comparable to replacement, or even slightly cheaper, the GDOT State Bridge Maintenance Engineering Office would support replacement of the structure based upon the Bridge Condition Survey recommendations dated January 9, 2007.
- Lane lengths for deceleration and acceleration lanes may be too short; 1,500 feet is preferred.
- The proposed radius on Ramp A is very tight due to wetland and natural stream constraints. Other design improvements should be considered.
- The grade on I-75 will need to be raised 3 feet in order to provide the required overpass clearance for US 41/SR 3.
- Weaving movements must be minimized to improve safety.
- A design exception is required for substandard shoulders and horizontal clearance under the I-75 overpass. A slight profile grade change along US 41/SR 3 will be required to maintain minimum vertical clearance under the I-75 overpass bridge.

STUDY OBJECTIVES

The VE team was tasked with the following key objectives:

- Suggest cost reduction ideas
- Suggest ideas to add value by improving ramp and roadway geometry

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to ramp and bridge design, ramp alignments, and turn lane geometry.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 12 alternatives and 3 design suggestions for consideration by the project team. Several of the design suggestions have cost savings potential which should be easy to quantify as the project development effort progresses. The greatest opportunity for cost reduction and added value centers on ramp and turning lanes design, and bridge width requirements.

Each of the aforementioned alternatives should be given careful consideration for the potential cost savings and/or value improvement that they offer compared to the tradeoffs.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the project team should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are “mutually exclusive,” so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated, thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

GDOT and Kimley-Horn should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)** ALTERNATIVE NO.: **R-2**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

DESCRIPTION: **RETAIN A PORTION OF THE EXISTING RAMP B TO BE USED IN THE NEW DESIGN** SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (See attached sketch)

The original design proposes to replace the existing Ramp B with a new ramp using concrete pavement.

ALTERNATIVE: (See attached sketch)

Retain a portion of the existing Ramp B for the new design. Use asphalt concrete pavement to match the retained portion of Ramp B. Additionally, start the US 41/SR 3 westbound traffic merge from three to two lanes before its merge with Ramp B traffic entering US 41.

ADVANTAGES:

- Reduces construction cost
- Easier maintenance of traffic (MOT) for construction of Ramp B

DISADVANTAGES:

- Less capacity due to shorter weave on US 41/SR 3

DISCUSSION:

It is possible to retain a portion of the existing Ramp B and construct the remainder using asphaltic pavement to save construction costs. The tie-in with US 41/SR 3 would have a shorter weave.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 856,642	\$ 0	\$ 856,642
ALTERNATIVE	\$ 404,206	\$ 91,807	\$ 496,012
SAVINGS (Original minus Alternative)	\$ 452,436	\$ (91,807)	\$ 360,630

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:
 R-2

SHEET NO.: 3 of 7

Pavement Costs - for all Alternates

$$(I-75) (12.5mm \text{ mix}) (135 \frac{\#}{sy} + 165 \frac{\#}{sy}) \times \frac{T}{2000\#} \times \$74.24 = \$11.14 \frac{\$}{sy}$$

$$(19mm \text{ mix}) (220 \frac{\#}{sy}) \times \frac{T}{2000\#} \times \$85 = \$9.35 \frac{\$}{sy}$$

$$(25mm) (440 \frac{\#}{sy}) \times \frac{T}{2000\#} \times \$85 = \$18.70 \frac{\$}{sy}$$

$$GAB_{10"} (.833' \times 95 \frac{sf}{sy}) \times \frac{.075T}{cy} \times \$15.44 = \$8.68 \frac{\$}{sy}$$

$$M.L. I-75: \underline{\$47.87/sy}$$

(I-75 shldr)

$$(19mm \text{ mix}) 220 \frac{\#}{sy} \times \frac{T}{2000\#} \times \$85 = \$9.35 \frac{\$}{sy}$$

$$(25mm \text{ mix}) 440 \frac{\#}{sy} \times \frac{T}{2000\#} \times \$85 = \$18.70 \frac{\$}{sy}$$

$$GAB_{10"} (.833' \times 95 \frac{sf}{sy}) \times \frac{.075}{cf} \times \$15.44 = \$8.65 \frac{\$}{sy}$$

$$\underline{\$36.73/sy}$$

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:

R-2

SHEET NO.:

4 of 7

Ramps Pavement Section:

Concrete Pavement Section

$$\text{PCC } 12'' \text{ thk} : = \$65/\text{sy}$$

$$(19 \text{ mm mix}) \frac{440\#}{\text{sy}} \times \frac{T}{2000\#} \times \$85/T = \$18.70/\text{sy}$$

$$\text{GAB } (1' \times 9 \text{ sf}) \times \frac{.075T}{\text{CF}} \times \frac{\$15.44}{T} = \frac{\$10.42}{\text{sy}}$$

$$\text{Ramp Conc. PCC section} : \quad \underline{\$94.12/\text{sy}}$$

Asphalt Pavement Ramp:

$$1\frac{1}{2}'' (12.5 \text{ mm}) \frac{165\#}{\text{sy}} \times \frac{T}{2000\#} \times \frac{\$74.24}{T} = \$6.13/\text{sy}$$

$$4'' (19 \text{ mm}) \frac{440\#}{\text{sy}} \times \frac{T}{2000\#} \times \frac{\$85}{T} = \$18.70/\text{sy}$$

$$6'' (25 \text{ mm}) \frac{660\#}{\text{sy}} \times \frac{T}{2000\#} \times \frac{\$85}{T} = \$28.05/\text{sy}$$

$$12'' \text{ GAB } (1' \times 9 \text{ sf}) \times \frac{.075T}{\text{CF}} \times \frac{\$15.44}{T} = \frac{\$10.42}{\text{sy}}$$

$$\text{Asph. Ramp} = \underline{\$63.30/\text{sy}}$$

$$\text{Same Pavement Section for US 41/SR 3} = \$63.30/\text{sy}$$

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:

R-2

SHEET NO.: 5 of 7

Original Design:

Ramp "B" Area of Conc. Pavement:

$$\frac{(850 \times \frac{80'}{2}) + (30' \times 1200')}{9 \text{ SF/sy}} = 7,778 \text{ sy}$$

Alternate Design: Asphalt Pavement.

Area of Ramp "B" to be Retained:

$$\frac{790' \times 30'}{9 \text{ SF/sy}} = 2,633 \text{ s.y.}$$

Area of Ramp "B" to be Rebuild under Alternate Design:

$$7,778 \text{ sy} - 2,633 \text{ s.y.} = 5,145 \text{ sy}$$

Overlay for Alternate Design Asphalt Pavement to be used in Life Cycle Cost

$$7,778 \text{ sy} \times \$9.35/\text{sy} = \$72,724$$

↑
for 2" Asphalt overlay/10yrs

LIFE CYCLE COST WORKSHEET



PROJECT:		P.I. No. 0000931, I-75 @ US 41/SR 76/SR 3 (ROCKY FACE) <i>Whitfield County, Georgia, GDOT District 6</i> <i>Design Development Stage</i>				ALTERNATIVE NO.: R-7	
						SHEET NO.: 7 of 7	
LIFE CYCLE PERIOD: <u>30</u> years						ORIGINAL	PROPOSED
INTEREST RATE: <u>3.20%</u>		INFLATION RATE: <u>0.00%</u>					
A. INITIAL COST						856,642	404,205
Useful Life (Years)							
INITIAL COST SAVINGS							452,437
B. RECURRENT COSTS (Annual Expenditures)							
1. Maintenance							
2. Operating							
3.							
4.							
5.							
6.							
Total Annual Costs						-	-
Present Worth Factor						19.1033	19.1033
Present Worth of RECURRENT COSTS						-	-
C. SINGLE EXPENDITURES		Year	Amount	PW factor	Present Worth	Present Worth	
ORIG	PROP	< Put "x" in appropriate box (original design or proposed design)					
	x	1. 2" asphalt overlay	10	72,724	0.7298	-	53,074
	x	2. 2" asphalt overlay	20	72,724	0.5326	-	38,733
		3.			1.0000	-	-
		4.			1.0000	-	-
		5.			1.0000	-	-
		6.			1.0000	-	-
		7.			1.0000	-	-
		8.			1.0000	-	-
D. SALVAGE VALUE		Year	Amount	PW factor	Present Worth	Present Worth	
		1.		(1.0000)	-	-	
		2.		(1.0000)	-	-	
Present Worth of SINGLE EXPENDITURES						-	91,807
E. Total Recurrent Costs & Single Expenditures (B + C + D)						-	91,807
RECURRENT COSTS & SINGLE EXPENDITURES SAVINGS							(91,807)
TOTAL PRESENT WORTH COST (A + E)						856,642	496,012
TOTAL LIFE CYCLE SAVINGS							360,630

VALUE ENGINEERING ALTERNATIVE



PROJECT:	P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction <i>Whitfield County, Georgia Department of Transportation, District 6</i> <i>Design Development Stage</i>	ALTERNATIVE NO.: R-3
DESCRIPTION:	REALIGN RAMP F TO IMPROVE SIGHT AND DRIVER SAFETY	SHEET NO.: 1 of 3

ORIGINAL DESIGN:

The baseline of Ramp F ends 40 feet west of the end of the baseline of Ramp G. Drivers turning right from Ramp F will have to turn their head 100 degrees or more to see if another vehicle is approaching on US 41.

ALTERNATIVE:

Align Ramp F perpendicular (90 degrees) to US 41 to improve sight. Design the median to force right turn only.

ADVANTAGES:

- Improves sight for drivers
- Improves safety
- No impact to construction costs

DISADVANTAGES:

- Additional redesign cost
- Will require traffic from Ramp F to stop before turning right on US 41

DISCUSSION:

Aligning Ramp F perpendicular (90 degrees) to US 41 will improve sight, circulation, and safety for a small redesign cost.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE			DESIGN SUGGESTION
SAVINGS (Original minus Alternative)			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **R-4**

DESCRIPTION: **SHORTEN THE I-75 RAMP B EXIT LENGTH**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The original design includes the proposed exit Ramp B beginning approximately 800 feet +/- before a standard type exit design would typically begin.

ALTERNATIVE: (See attached sketch)

Use a standard design freeway exit (See AASHTO Greenbook pages 82-84) and shorten the original design exit length by approximately 800 feet.

ADVANTAGES:

- Reduces construction cost
- Simpler staging for Ramp A exit

DISADVANTAGES:

- Shorter decision length for travelers heading eastbound or westbound

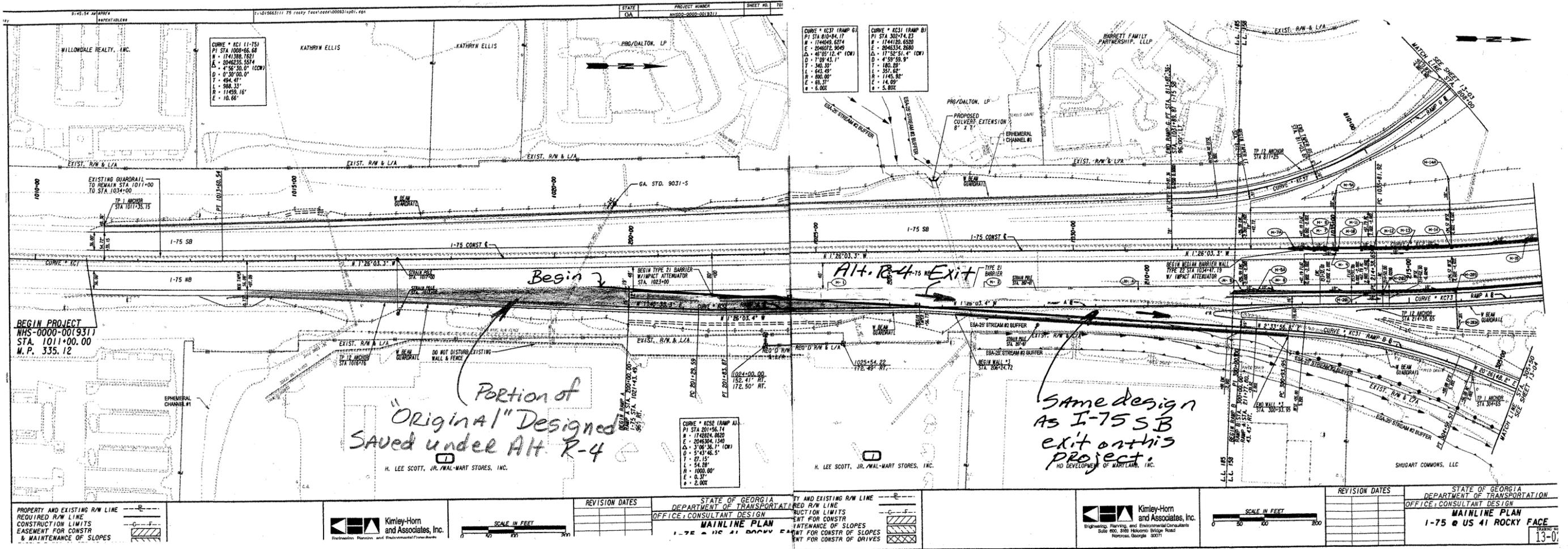
DISCUSSION:

The alternative standard design freeway exit being recommended is currently being used on this project for the I-75 southbound exit Ramp F. This alternative would accomplish the goal of increasing capacity, reducing congestion, and improving circulation and save a substantial amount of asphalt pavement and median barrier.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 259,797	—	\$ 259,797
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 259,797	—	\$ 259,797

Alternate Design

Sketch
 Alt: R-4
 sheet 2 of 4



PROPERTY AND EXISTING R/W LINE
 REQUIRED R/W LINE
 CONSTRUCTION LIMITS
 EASEMENT FOR CONSTR
 & MAINTENANCE OF SLOPES

Kimley-Horn
 and Associates, Inc.



REVISION DATES

STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE: CONSULTANT DESIGN

MAINLINE PLAN
 I-75 @ US 41 ROCKY FACE

EXISTING R/W LINE
 RED R/W LINE
 CONSTRUCTION LIMITS
 EASEMENT FOR CONSTR
 & MAINTENANCE OF SLOPES
 EASEMENT FOR CONSTR OF DRIVES

Kimley-Horn
 and Associates, Inc.
 Engineering, Planning, and Environmental Consultants
 Suite 400, 988 Hickory Bridge Road
 Norcross, Georgia 30071



REVISION DATES

STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE: CONSULTANT DESIGN

MAINLINE PLAN
 I-75 @ US 41 ROCKY FACE

13-0

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:

R-4

SHEET NO.: 3 of 4

Portion of NB I-75 exit Ramp A & B saved under R-4 Alternate design. (see sketch)
Ramp Area Saved: $\left[730' \times \left(\frac{11' + 12' + 16'}{2} \right) \right] + (16' \times 300') + (250' \times \frac{16'}{2}) =$

$$21,035_{sf} = 2,340_{sy}$$

I-75 Shldr Area Saved: $\frac{(12' \times 200')}{9_{sf/sy}} = 270_{sy}$

See R-2 for pavement / sy unit cost calculations.

Shorten the median barrier by 1,000 L.F.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **R-5**

DESCRIPTION: **PROVIDE ACCESS TO RAMP G FROM NORTH TIBBS ROAD** SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The original design does not provide direct access to Ramp G from North Tibbs Road.

ALTERNATIVE:

Reduce congestion and improve circulation by providing a one-lane, 14-foot-wide entrance road from North Tibbs Road to Ramp G.

ADVANTAGES:

- Creates a “short-cut” to save local business people commute time

DISADVANTAGES:

- Additional cost (approximately \$10,000)
- Will require traffic from Ramp F to stop before turning right on US 41

DISCUSSION:

Since the proposed connector will be at a higher elevation than the incoming traffic on Ramp G, the line of sight is adequate. As such, safety is not compromised by creating this convenient “short-cut” for local business people.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation,, District 6
Design Development Stage

ALTERNATIVE NO.: **R-6**

DESCRIPTION: **ELIMINATE SIDEWALKS ON US 41 BETWEEN RAMPS G AND F AND NORTH TIBBS ROAD**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (Sketch attached)

The original design includes construction of 5-foot-wide, 4-in-thick concrete sidewalks on US 41 between Ramps G and F and North Tibbs Road.

ALTERNATIVE: (Sketch attached)

Eliminate the sidewalks on both sides of US 41.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- None identified

DISCUSSION:

People are not expected to be walking between the proposed new ramps west of I-75. In an emergency, people can walk on the shoulder.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 24,116	—	\$ 24,116
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 24,116	—	\$ 24,116

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **R-7**

DESCRIPTION: **CONSTRUCT ALL NEW RAMPS USING ASPHALTIC CONCRETE IN LIEU OF PORTLAND CEMENT CONCRETE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The original design includes constructing Ramps B, C, D, G, and F using Portland cement concrete.

ALTERNATIVE: (See attached sketch)

Construct Ramps B, C, D, G, and F using asphaltic concrete.

ADVANTAGES:

- Saves first cost

DISADVANTAGES:

- Requires a two-inch overlay of asphaltic concrete every ten years

DISCUSSION:

A two-inch asphaltic concrete overlay every ten years should be worth the savings in material and labor costs compared to Portland cement concrete.

For calculation of pavement costs, see alternative R-2, sheets 3 - 5.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,449,448	\$ 0	\$ 1,449,448
ALTERNATIVE	\$ 974,820	\$ 162,598	\$ 1,137,418
SAVINGS (Original minus Alternative)	\$ 474,628	\$ (162,598)	\$ 312,030

CALCULATIONS



PROJECT:

P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)

Interchange Reconstruction

Whitfield County, Georgia Department of Transportation, District 6

Design Development Stage

ALTERNATIVE NO.:

R-7

SHEET NO.:

2 of 4

Cost for 2" of overlay:

$$165 \text{ lbs/sy} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$74.24}{T} \times \frac{2}{1.5} = \$9.20/\text{sy}$$

For 14,000 sy, the maintenance cost every 10 years at today's dollars =

$$14,000 \times 9.20 = \$128,800$$

LIFE CYCLE COST WORKSHEET



PROJECT:		P.I. No. 0000931, I-75 @ US 41/SR 76/SR 3 (ROCKY FACE) <i>Whitfield County, Georgia, GDOT District 6</i> <i>Design Development Stage</i>				ALTERNATIVE NO.: R-7		SHEET NO.: 4 of 4		
LIFE CYCLE PERIOD: <u>30</u> years						ORIGINAL		PROPOSED		
INTEREST RATE: <u>3.20%</u>		INFLATION RATE: <u>0.00%</u>								
A. INITIAL COST						1,449,448		974,820		
Useful Life (Years)										
INITIAL COST SAVINGS								474,628		
B. RECURRENT COSTS (Annual Expenditures)										
1. Maintenance										
2. Operating										
3.										
4.										
5.										
6.										
Total Annual Costs						-		-		
Present Worth Factor						19.1033		19.1033		
Present Worth of RECURRENT COSTS						-		-		
C. SINGLE EXPENDITURES										
		Year		Amount		PW factor		Present Worth		
ORIG	PROP	< Put "x" in appropriate box (original design or proposed design)								
	x	1. 2" overlay with asphaltic concrete		10	128,800	0.7298	-	93,998		
	x	2.2" overlay with asphaltic concrete		20	128,800	0.5326	-	68,600		
		3.				1.0000	-	-		
		4.				1.0000	-	-		
		5.				1.0000	-	-		
		6.				1.0000	-	-		
		7.				1.0000	-	-		
		8.				1.0000	-	-		
D. SALVAGE VALUE										
				Year	Amount		PW factor		Present Worth	
		1.				(1.0000)	-	-		
		2.				(1.0000)	-	-		
Present Worth of SINGLE EXPENDITURES						-		162,598		
E. Total Recurrent Costs & Single Expenditures (B + C + D)						-		162,598		
RECURRENT COSTS & SINGLE EXPENDITURES SAVINGS								(162,598)		
TOTAL PRESENT WORTH COST (A + E)						1,449,448		1,137,418		
TOTAL LIFE CYCLE SAVINGS								312,030		

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **R-9**

DESCRIPTION: **ELIMINATE LOOP RAMP A BY WIDENING RAMP B TO TWO LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The original design includes a new loop Ramp A for I-75 northbound traffic exiting onto US 41/SR 3 westbound.

ALTERNATIVE: (See attached sketch)

Eliminate Ramp A by widening Ramp B and adding a left-turn lane crossing onto US 41/SR 3 westbound. This would make Ramp B two lanes at the intersection with US 41/SR 3.

ADVANTAGES:

- Reduces construction cost
- Reduces construction time
- Eliminates the need to reconstruct Ramps C and D
- Narrows I-75 Bridge

DISADVANTAGES:

- Would add an additional phase to the traffic signal at the northbound ramp "B/C" intersection with US 41/SR 3
- May increase intersection delays

DISCUSSION:

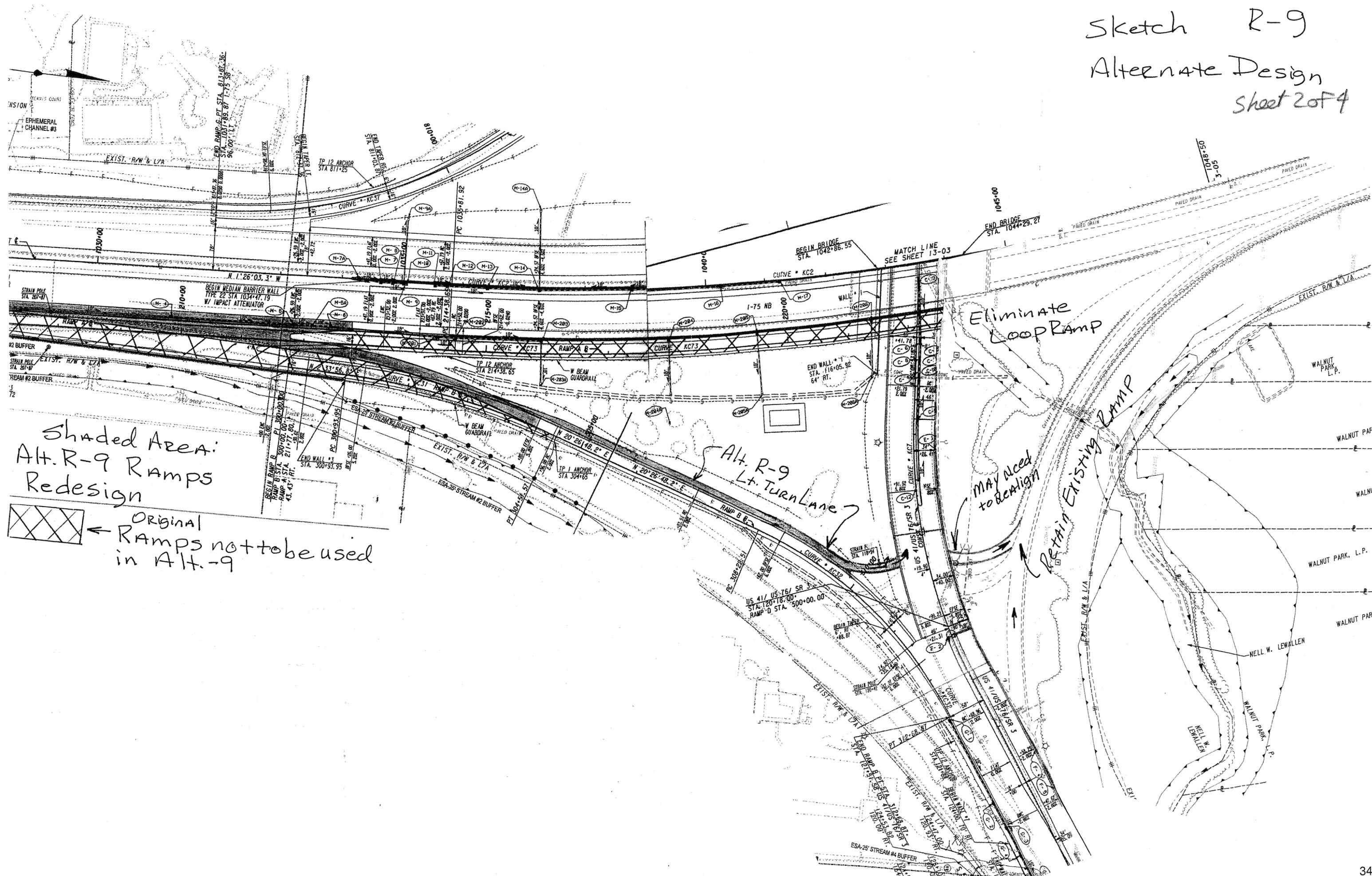
Since the design hourly volume (DHV) for the current left turning movement is 218 vehicles per hour (VPH) in the AM and 397 VPH in the PM for design year 2032, providing two left-turns onto US 41/SR 3 westbound should easily accommodate this demand and deliver the required increase in volume, reduction in congestion, and improvement in safety.

It is important to point out that the heaviest turning movement from Ramp B is the right turns; therefore, if the left turn storage length is adequate, this intersection should operate with acceptable LOS.

Loop Ramp A could always be reconsidered and added in the future, if necessary.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,619,827	-	\$ 1,619,827
ALTERNATIVE	\$ 177,143	-	\$ 177,143
SAVINGS (Original minus Alternative)	\$ 1,442,684	-	\$ 1,442,684

Sketch R-9
 Alternate Design
 Sheet 2 of 4



Shaded Area:
 Alt. R-9 Ramps
 Redesign

 ORIGINAL Ramps not to be used in Alt.-9

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:

R-9

SHEET NO.:

3 of 4

Original Ramps "A" & "B"

Pavement AREA Costs under Original but eliminated under Alt.

$$\text{Ramp "A": } \frac{(860' \times \frac{52'}{2}) + (120' \times 52') + (400' \times \frac{20'}{2}) + (1800' \times 26')}{9 \text{ SF/SY}} =$$

$$\text{Ramp "A" saved: } \frac{79,400 \text{ SF}}{9 \text{ SF/SY}} = 8,222 \text{ s.y.}$$

$$\text{Ramp "B" saved: } \frac{(420' \times \frac{35'}{2}) + (200' \times 35')}{9 \text{ SF/SY}} = 1,594 \text{ s.y.}$$

(I-75 Bridge) width saved: 26'

$$\text{Area} = 26' \times 126' = 3,276 \text{ SF}$$

from Alt. S-3 use: \$127.55/SF for Bridge Unit Cost.

The Alt. Ramp "B" Decel Lane (exit) to Sta. 304+20 is common to both Original & Alt. Designs therefore is not included in these computations.

Alt. Design Additional Ramps Pavement Area.

$$\text{Ramp "B" Lt. Turn Lane } \frac{(700' \times 22')}{9} = 1,711 \text{ sy}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction <i>Whitfield County, Georgia Department of Transportation, District 6</i> <i>Design Development Stage</i>	ALTERNATIVE NO.: R-10
DESCRIPTION:	ELIMINATE LOOP RAMP A BY WIDENING RAMP B FOR DOUBLE LEFT TURNS	SHEET NO.: 1 of 4

ORIGINAL DESIGN: (See attached sketch)

The original design includes a new loop Ramp A for I-75 northbound traffic exiting onto US 41/SR 3 westbound.

ALTERNATIVE: (See attached sketch)

Eliminate Ramp A by widening Ramp B and adding double left-turn lanes for future capacity. This would make Ramp B three lanes at the intersection with US 41/SR 3 (includes two left turn lanes and one right turn lane).

ADVANTAGES:

- Reduces construction cost
- Reduces construction time
- Eliminates the need to reconstruct Ramps C and D
- Narrows I-75 Bridge

DISADVANTAGES:

- Would add an additional phase to the traffic signal at the northbound ramp “B/C” intersection with US 41/SR 3
- May increase intersection delays

DISCUSSION:

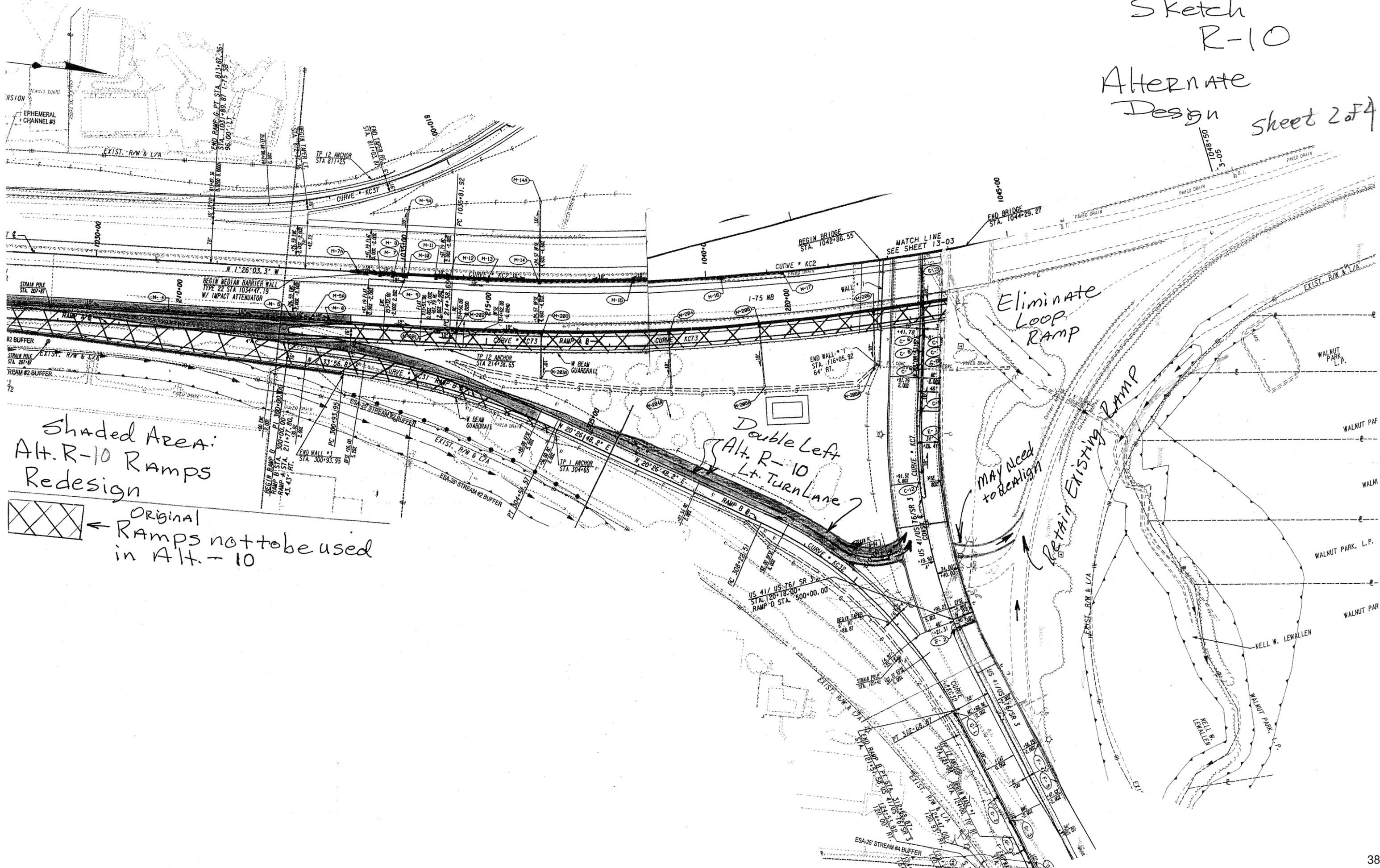
Since the design hourly volume (DHV) for the current left turning movement is 218 vehicles per hour (VPH) in the AM and 397 VPH in the PM for design year 2032, providing two left-turns onto US 41/SR 3 westbound should easily accommodate this demand and deliver the required increase in volume, reduced congestion, and improved safety.

It is important to point out that the heaviest turning movement from Ramp B is the right turns; therefore, if the left turn storage length is adequate, this intersection should operate with acceptable level of service.

Loop Ramp A could always be reconsidered and added in the future, if necessary.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,619,827	-	\$ 1,619,827
ALTERNATIVE	\$ 303,659	-	\$ 303,659
SAVINGS (Original minus Alternative)	\$ 1,316,168	-	\$ 1,316,168

Sketch
R-10
Alternate
Design sheet 2 of 4



Shaded Area:
Alt. R-10 Ramps
Redesign

Original
Ramps not to be used
in Alt. - 10

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.:

R-10

SHEET NO.:

3 of 4

See Alt. R-9 calculations for exact same Ramp Pavement Areas. & Bridge Widening Area for "Original" Design.

Alt. Design for Double Left turn Lanes on Ramp "B":

$$\text{Area } \frac{(700' \times 22') + (500' \times 22')}{9 \text{ sf/sy}} = 29,333 \text{ sy}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **R-15**

DESCRIPTION: **ELIMINATE GUARD RAIL WHERE POSSIBLE**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The original design includes guard rail wherever it is believed necessary.

ALTERNATIVE:

Eliminate guard rail in areas where 2:1 slope has less than 5 feet of fall and also in areas where changing 2:1 slope to 4:1 slope will reducing the fall to less than 5 feet.

ADVANTAGES:

- Reduces construction cost
- Reduces construction time
- Provide areas to bury additional waste rather than hauling away
- More aesthetically appealing

DISADVANTAGES:

- None identified

DISCUSSION:

Approximately 1,700 linear feet have been identified where guard rail can be eliminated or where the slope can be changed from 2:1 to 4:1 and provide the necessary safety requirements.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 26,722	-	\$ 26,722
ALTERNATIVE	\$ 0	-	\$ 0
SAVINGS (Original minus Alternative)	\$ 26,722	-	\$ 26,722

VALUE ENGINEERING ALTERNATIVE



PROJECT: P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.: R-18

DESCRIPTION: ADD A LEFT TURN LANE TO RAMP E AND ELIMINATE RAMP F

SHEET NO.: 1 of 4

ORIGINAL DESIGN:

The original design proposes to add Ramp F to the I-75 at US 41/SR 3 Interchange.

ALTERNATIVE: (See attached sketch)

Add a left-turn lane to Ramp E and eliminate Ramp F.

ADVANTAGES:

- Reduces construction cost
- Reduces construction time
- Less construction staging required
- Less Right-of-Way cost

DISADVANTAGES:

- Increases delay time by adding a left-turn phase to the signal at the southbound ramps and US 41/SR 3

DISCUSSION:

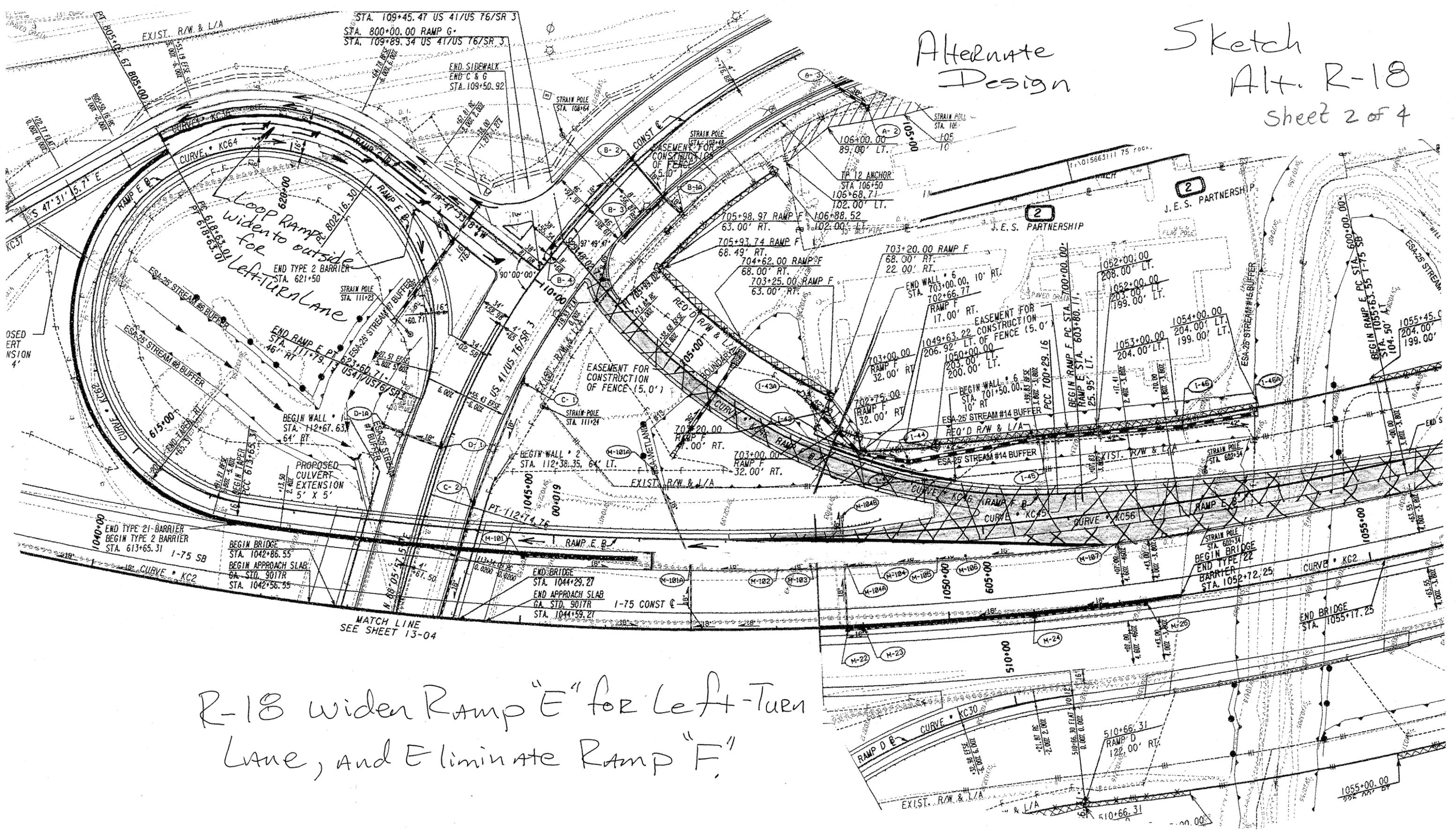
US 41/SR 3 westbound is projected to see 110 vehicles per hour (VPH) in the AM and 238 VPH in the PM for design year 2032. This volume of traffic could be accommodated with an acceptable level of service by widening the new alignment for Ramp E. Eliminating Ramp F would provide a substantial cost savings and would justify redesign of Ramp E.

Traffic currently backs up on I-75 exiting to US 41/SR 3 eastbound (900 VPH). The free-flow right from the proposed loop Ramp E and the third lane on US 41/SR 3 should eliminate the back-up on I-75. The traffic volume on proposed Ramp F is only projected to be 238 VPH (PM) in design year 2032 and is therefore not needed.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,657,305	-	\$ 2,657,305
ALTERNATIVE	\$ 54,311	-	\$ 54,311
SAVINGS (Original minus Alternative)	\$ 2,602,994	-	\$ 2,602,994

Alternate Design

Sketch
Alt. R-18
Sheet 2 of 4



R-18 widen Ramp "E" for Left-Turn Lane, and Eliminate Ramp "F"

CALCULATIONS



PROJECT: P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)
 Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.:

R-18

SHEET NO.: 3 of 4

Original Design eliminated or saved under Alt. R-18 Design
 Ramp "F" Area = $\left(\frac{550' \times 26'}{9 \text{ SF}_{5y}}\right) + \left(\frac{550' \times 40'}{9 \text{ SF}_{5y}}\right) = 2,811 \text{ sy}$
 Ramp Proper Decel Lane

I-75 widening saved:

$$\left[\left(300 \times \frac{36'}{2}\right) + (36' \times 350') + \left(700' \times \frac{40'}{2}\right) \right] / 9 \text{ SF}_{5y} = 3,555 \text{ sy}$$

portion of C-DRd eliminated.

I-75 decel lane

median BARRIER saved (C-DRoad): 900 L.F.

Will not need to Build Wall # 6: 11,200 SF (MSE)

SAVE 1,200 L.F. of Guardrail Approaching Wall # 6.
 SAVE I-75 Bridge widening (over Mill Creek)
 $(240' \times 50') = 12,000 \text{ S.F.}$

unit Bridge cost: use \$ 70.00/SF based on Cost Estimate

SAVE R/W: $(420' \times 25') + (700' \times 35') + (130' \times 200') + (160' \times 160') + (160' \times 25') = 90,600 \text{ SF (R/W)}$

Alternate Design cost to widen Ramps "E" for Left-Turn Lane →
 $(14' \times 450') / 9 \text{ SF}_{5y} = 700 \text{ sy}$ EXTRA Pavement for Ramp "G" $(12' \times 60') / 9 = 80 \text{ sy}$

COST WORKSHEET



PROJECT:	P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (ROCKY FACE) <i>Whitfield County, Georgia, GDOT District 6</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-18
		SHEET NO.:	4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original Design Saved:							
Ramp F Items:							
Portland Concrete Pavement	SY	2,811	90.12	253,327			
I-75 Items:							
Asphalt Pavement	SY	3,555	63.30	225,032			
Median Barrier	LF	900	59.46	53,514			
Guard Rail	LF	1,200	14.29	17,148			
MSE Wall #6	SF	11,520	54.42	626,918			
Bridge Widening	SF	12,000	70.00	840,000			
Grading	CY	10,000	9.34	93,400			
R/W Savings	SF	90,600	1.50	135,900			
R/W Markup (148%)	LS	1	1.48	201,132			
Extra Widneing for Ramp E Left Turn Lane							
Asphalt Pavement	SY				700	63.30	44,310
Ramp G extra length of Pavement	SY				80	63.30	5,064
Subtotal				2,109,339			49,374
Markup (%) at 10%				210,934			4,937
TOTAL				2,657,305			54,311

VALUE ENGINEERING ALTERNATIVE



PROJECT:	P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction <i>Whitfield County, Georgia Department of Transportation, District 6</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	S-2
DESCRIPTION:	REVISE THE ENVELOPE ON MECHANICALLY STABILIZED EARTH WALL NUMBER 6	SHEET NO.:	1 of 4

ORIGINAL DESIGN: (See attached sketch)

The original design includes construction of the bottom of the mechanically stabilized earth (MSE) Wall Number 6 wall ends on the existing grade and covering with the wrap-around 2:1 finished grade slope at the front face of the wall.

ALTERNATIVE: (See attached sketch)

Step up the bottom of the wall section to match the 2:1 slope in front of the wall to save material and associated cost.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- Requires consolidating the backfill before building the wall on top

DISCUSSION:

Instead of building the wall from the existing grade at the two ends of MSE Wall Number 6, backfill just below the proposed stepped leveling pad, thus saving on the cost of extra panels and special backfill.

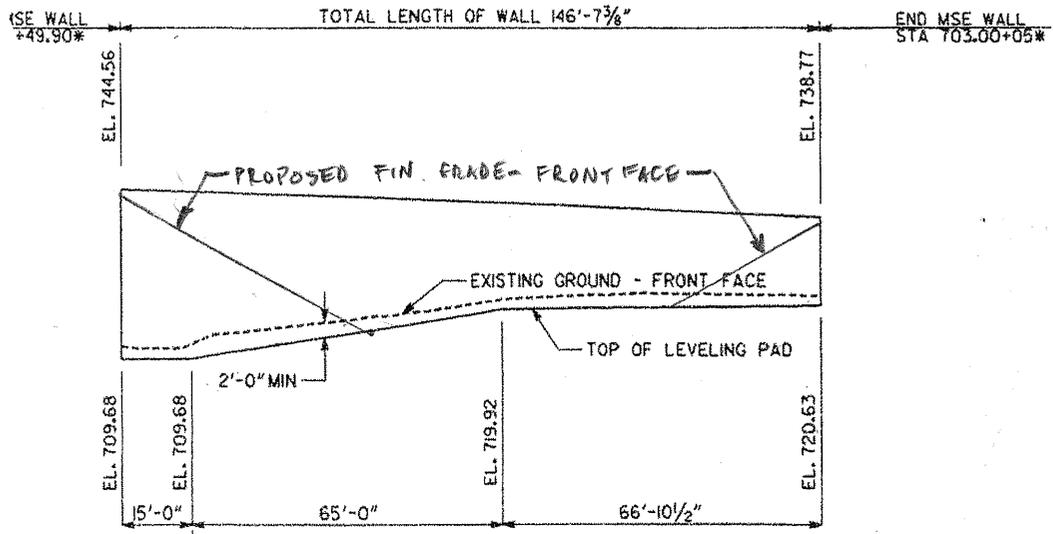
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 689,610	—	\$ 689,610
ALTERNATIVE	\$ 632,741	—	\$ 632,741
SAVINGS (Original minus Alternative)	\$ 56,869	—	\$ 56,869

PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

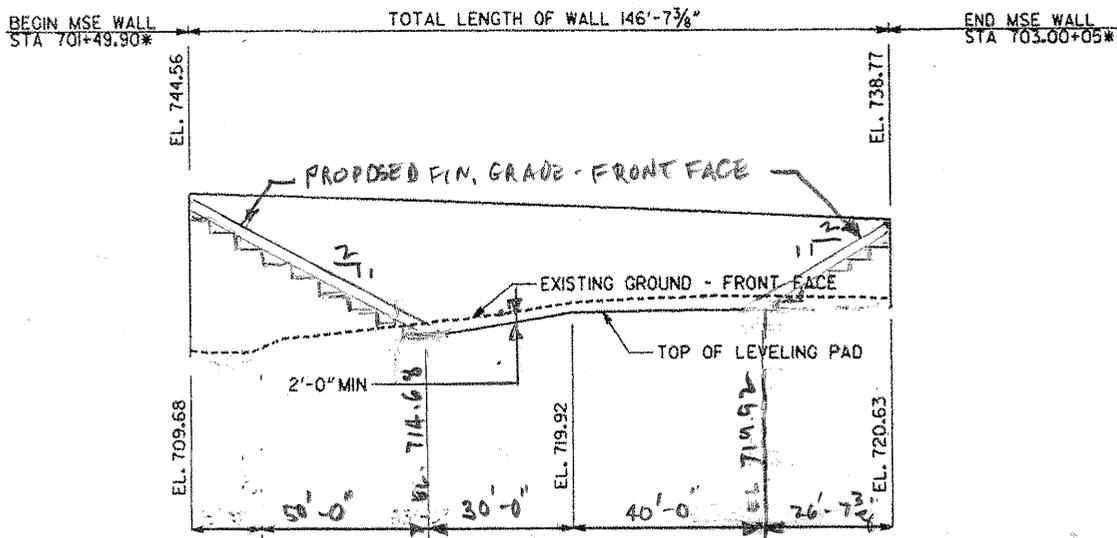
ALTERNATIVE NO.: S-2

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 4



ORIGINAL DESIGN
ELEVATION



ALTERNATIVE DESIGN
ELEVATION

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: S-2

SHEET NO.: 3 of 4

WALL AREA

ORIGINAL DESIGN = 11,520 SF

ALTERNATIVE DESIGN = $11,520 \text{ SF} - 0.5(50') 30' - 0.5(26.61')(15')$
= 10,570 SF.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **S-3**

DESCRIPTION: **BUILD THE I-75 BRIDGES TO ACCOMMODATE THE
 INSIDE SHOULDER ONLY RETAINING A 12-FOOT GAP**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The original design includes widening I-75 northbound and southbound and closing the gap (median) between the two bridges over US 41/US 76/SR 3.

ALTERNATIVE: (See attached sketch)

Design the bridges to accommodate only 12-foot-wide inside shoulders leaving a gap of 12'-10" between the bridges.

ADVANTAGES:

- Saves one row of beams and 12.75 feet of bridge slab and corresponding substructure

DISADVANTAGES:

- None identified

DISCUSSION:

Reducing the proposed bridge at the inside section will not affect the staging of traffic, since all the shifting of traffic is on the outside sections of the new bridges.

The future fourth lane is also located on the outside of the existing three lanes for each bridge, making construction easier in the future.

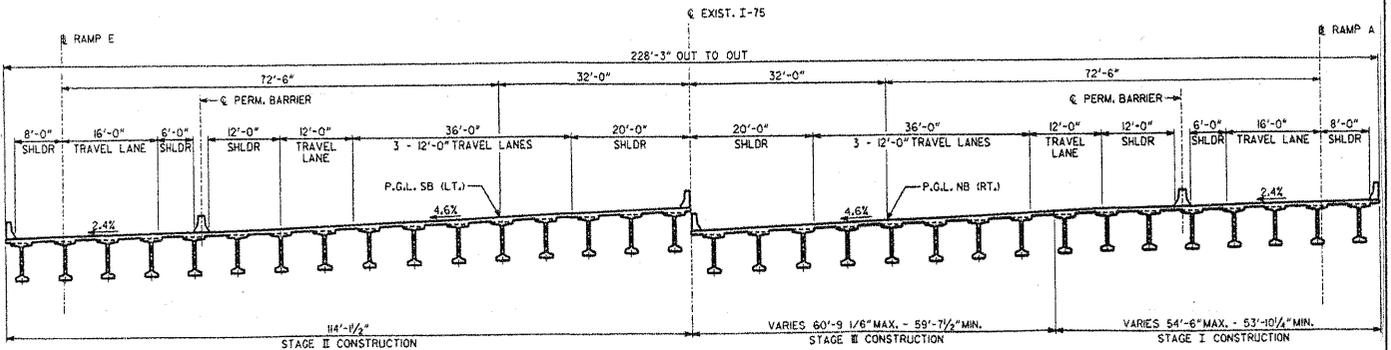
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,570,576	—	\$ 4,570,576
ALTERNATIVE	\$ 4,275,234	—	\$ 4,275,234
SAVINGS (Original minus Alternative)	\$ 295,342	—	\$ 295,342

PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **5-3**

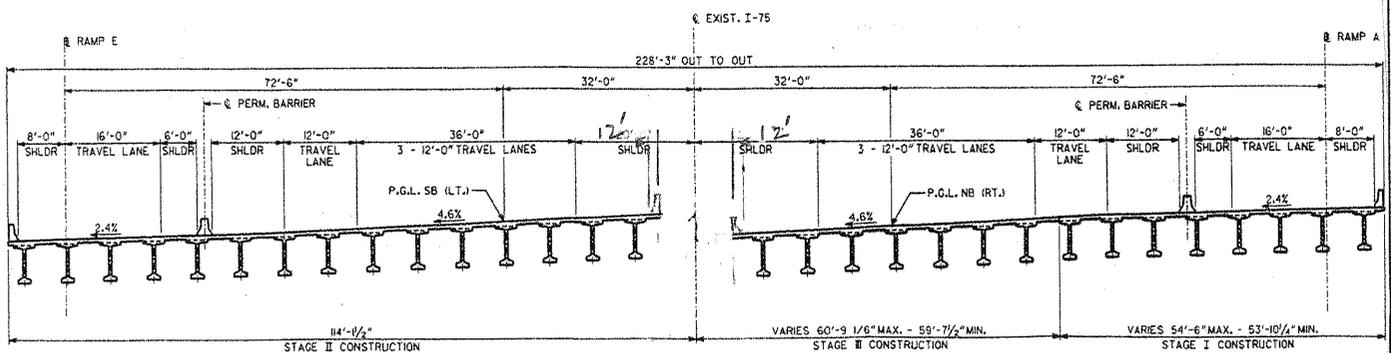
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 4**



TYPICAL SECTION - STAGE III

ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **S-3**

SHEET NO.: **3 of 4**

BRIDGE AREA:

$$\text{ORIGINAL DESIGN} = 228.25' \times 142.72' = 32,575.84 \text{ SF}$$

$$\text{ALTERNATIVE DESIGN} = 32,575.84 - 142.72' \times 14.75' = 30,471 \text{ SF}$$

UNIT PRICE COSTING:

$$\text{UNIT COST} = 4,155,000 / 32,575.84 = \$ 127.55 / \text{SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **S-4**

DESCRIPTION: **MAKE THE TYPICAL SECTION OF US 41 NARROWER**
UNDER THE I-75 BRIDGE ONLY

SHEET NO.: **1 of 5**

ORIGINAL DESIGN:

The original design shows the typical section of US 41 to be 128 feet from the face of Wall Number 1 to the face of Wall Number 2.

ALTERNATIVE:

Design the typical section of US 41 under the bridge only as follows and achieve a substantial reduction in bridge length:

- Provide 12-foot-wide outside shoulders with a barrier at the face of the wall
- Provide a 12-foot-wide outside lane,
- Provide two 11-foot-wide inside lanes,
- Provide a 16-foot-wide median

ADVANTAGES:

- Significant reduction in bridge length and construction cost

DISADVANTAGES:

- Some geometric adjustments must be made on US 41 and related alignments

DISCUSSION:

A 12% reduction in bridge cost can be achieved by changing the typical section of US 41 under the bridge.

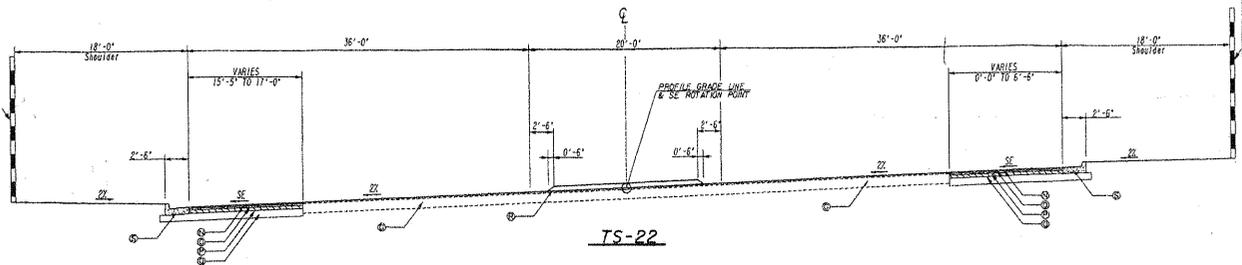
COST SUMMARY	INITIAL COST	PRESENT RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,115,986	—	\$ 5,115,986
ALTERNATIVE	\$ 4,021,001	—	\$ 4,021,001
SAVINGS (Original minus Alternative)	\$ 1,094,985	—	\$ 1,094,985

PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
 Whitfield County, Georgia Department of Transportation, District 6
 Design Development Stage

ALTERNATIVE NO.: **5-4**

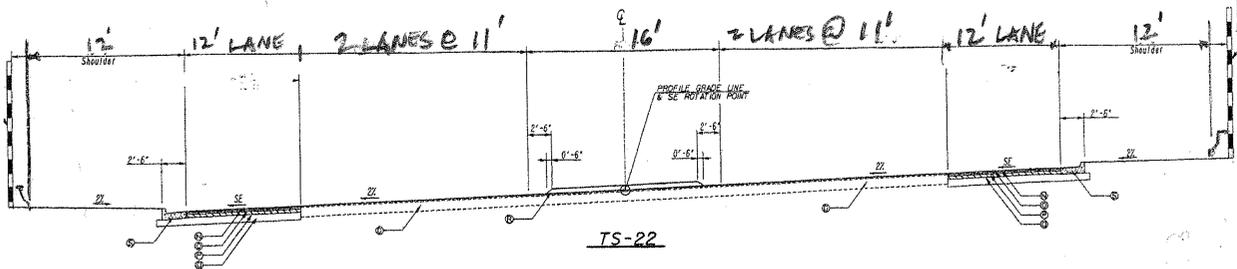
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 5**



TS-22
 US 41 / SR 3
 TANGENT SECTION
 N. T. S.
 STA. 112+00 +/- TO STA. 116+50 +/-

ORIGINAL DESIGN



TS-22
 US 41 / SR 3
 TANGENT SECTION
 N. T. S.
 STA. 112+00 +/- TO STA. 116+50 +/-

ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: S-4

SHEET NO.: 3 of 5

TOTAL WIDTH OF SECTION:

ORIGINAL DESIGN

$$\text{WALL-TO-WALL DISTANCE} = 2(18' + 36' + 10') = 128'$$

ALTERNATIVE DESIGN:

$$\text{WALL-TO-WALL DISTANCE} = 2(1.42' + 12' + 12' + 2 \times 11' + 8') = 110.84'$$

UNIT PRICE COSTING OF BRIDGE

$$\text{UNIT COST} = 4,155,000 / (228.25' \times 142.72') = \$127.55/\text{SF}$$

TOTAL AREA OF BRIDGE

ORIGINAL DESIGN

$$\text{AREA} = 228.25' \times 142.72' = 32,576 \text{ SF}$$

ALTERNATIVE DESIGN

$$\text{AREA} = 32,576 - (128' - 110.84')(228.25') = 29,659 \text{ SF}$$

CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.:

SHEET NO.: 4 of 5

$$\text{SPAN LENGTH, BRG. TO BRG.} = 111' + 2(6' - 1.5') = 120'$$

FOR THIS SPAN LENGTH, EVEN BULB-TEE 54" BEAMS WILL WORK.

$$\text{CHANGE IN DEPTH} = \text{BT 74} - \text{BT 54} = 20''$$

$$\text{TOTAL BEAM LENGTHS} = 2 \times 16 \times 123' = 3936'$$

USE COST DIFFERENCE BETWEEN BT 74 + BT 54 TO CALCULATE SAVINGS

$$\text{UNIT COST} = \$242.05 - \$167.13 = \$74.92$$

$$\text{WALL NO. 1 LENGTH} = 338.33'$$

$$\text{WALL NO. 2 LENGTH} = 332.33'$$

REDUCTION IN WALL AREA:

$$\text{WALL NO. 1} = 20''/12 \times 338.33' = 564 \text{ SF}$$

$$\text{WALL NO. 2} = 20''/12 \times 332.33' = 554 \text{ SF}$$

ESTIMATED SAVINGS IN EMBANKMENT \approx 15,000 CY (CONSERVATIVELY)

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **S-5**

DESCRIPTION: **ELIMINATE PROVISIONS FOR A FOURTH LANE ON THE I-75 BRIDGE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The proposed typical section for the I-75 bridge over US 41/SR 3 (Structure ID 313-0043-0) designates a future 12-foot lane for each of the southbound and northbound sides.

ALTERNATIVE: (See attached sketch)

Drop the future lanes and reconstruct the bridges narrower.

ADVANTAGES:

- Reduces construction cost
- Reduces construction time

DISADVANTAGES:

- Higher cost to add a fourth lane later

DISCUSSION:

I-75 is currently operating at level of service "C." Improving the ramps will solve the problem and eliminate the need to widen I-75 to four lanes per side.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,570,576	—	\$ 4,570,576
ALTERNATIVE	\$ 4,089,891	—	\$ 4,089,891
SAVINGS (Original minus Alternative)	\$ 480,685	—	\$ 480,685

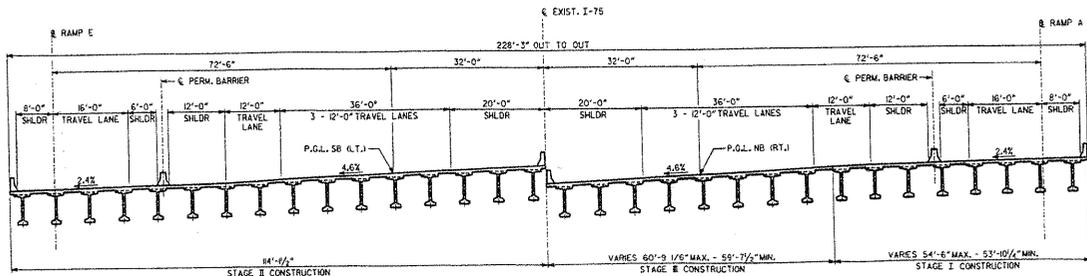


PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

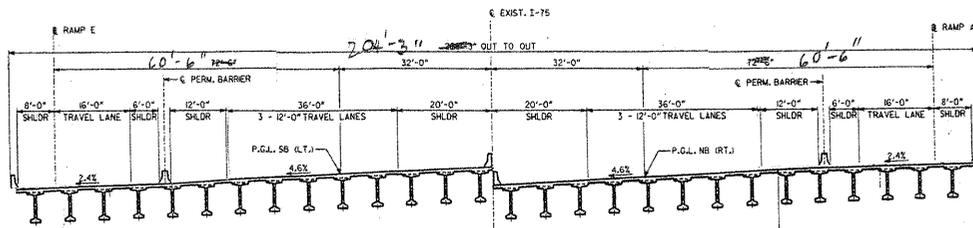
ALTERNATIVE NO.: 5-5

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 4



TYPICAL SECTION



CALCULATIONS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: 3-5

SHEET NO.: 3 of 4

AREA OF BRIDGE NO. 1

$$\text{LENGTH} = 142.72' \quad \text{WIDTH} = 228.25' \quad (\text{TOTAL WIDTH})$$

$$\text{AREA} = 142.72' \times 228.25' = 32575.84 \text{ SF}$$

$$\text{UNIT COST} = \$4,155,000 / 32575.84 = \$127.55 / \text{SF}$$

AREA OF PROPOSED ALTERNATE :

$$32575.84 - 2(12')(142.72') = 29150.16 \text{ SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

ALTERNATIVE NO.: **M-1**

DESCRIPTION: **DURING CONSTRUCTION, MODIFY THE SIGNAL AT RAMP F AND SR 3 BEFORE SHIFTING ALL SOUTHBOUND EXIT TRAFFIC TO RAMP F**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The original design Construction Phasing Plan Stage 3 Notes on drawing number 19-59 call for all southbound exit traffic to be shifted to Ramp F (Step 3) before modifying the signal at Ramp F and SR 3 (Step 4).

ALTERNATIVE:

Modify the signal at Ramp F and SR 3 before shifting all southbound exit traffic to Ramp F.

ADVANTAGES:

- Improves safety
- Improves maintenance of traffic (MOT)

DISADVANTAGES:

- None apparent

DISCUSSION:

Improve MOT during construction phasing stage 3 by modifying the signal at Ramp F and SR 3 before shifting all southbound exit traffic to Ramp F.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

PROJECT DESCRIPTION

NEED AND PURPOSE

The purpose of the I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction Project P. I. No. 0000931 is to reduce congestion and improve automobile and truck access to the industrial area of north Dalton, as well as improve safety on this heavily traveled interchange. Improvements to the interchange are needed due to continuing traffic growth, heavy truck usage, and turning volumes that result in traffic backups on the interchange ramps. The truck percentage has been estimated at 16.3% for SR 3/US 41. US 41/SR 3 currently carries approximately 40,000 VPD just east of I-75. This number is expected to increase to approximately 52,000 VPD by 2032. Although all traffic signals currently operate at level of service (LOS) "D" or better, these intersections are all expected to have failing levels of service by 2032 without the proposed improvements.

The three-year accident data for this segment (Ref. page 9 of the Interchange Modification Report, prepared by Kimley-Horn and Associates, Inc., dated January 2007) indicates 225 total accidents with 74 total injuries and 2 fatalities. Additionally, in 2003 and 2004, the accident rate on this segment was computed to be approximately 1.2 and 1.3 times the statewide average rate for comparable roads. In 2004 the fatality rate was 9.7 times the statewide average rate for comparable roads. Further analysis reveals that a majority of these accidents were rear end collisions resulting from congestion at ramp diverge sections (i.e., type 3 ramp sections) during the peak hours. Improving the ramp diverge sections with single-exit ramp design uses a collector-distributor and thus removes the weaving maneuvers of exiting traffic from the mainline to a slower speed facility. This provides exiting traffic a safer opportunity to diverge from the interstate.

With the proposed improvements, these intersections are all expected to operate at LOS "D" or better with improved safety in 2032.

PROJECT LOCATION

This project is located in central Whitfield County at the interchange of I-75 and US 41/SR 3. The I-75 section of the project begins at the Rocky Face northbound exit ramp just northwest of the city of Dalton and extends north for approximately 0.727 miles. The US 41/SR 3 portion of the project begins at Tibbs Road west of I-75 and extends to Old SR 3 east of I-75 for approximately 0.721 miles.

APPROVED CONCEPT

The approved concept provides for widening of I-75 and US 41/SR 3. The widening of I-75 will consist of an auxiliary lane northbound and accommodations for a future fourth lane in each direction. US 41/SR 3 will be widened to three 12-foot lanes in each direction with a raised median and partial curb and gutter, as well as two 12-foot left turn lanes onto both the I-75 northbound and southbound exit ramp traffic. Collector-distributor (CD) ramps will be added parallel to I-75 to separate I-75 traffic from both the proposed northbound exit ramp traffic and the proposed

southbound exit ramp traffic. The CD lanes will be separated from the I-75 mainline by a concrete barrier wall. The existing southbound exit loop ramp will be reconstructed and modified to accommodate only an easterly movement onto US 41/SR 3. The existing southbound entrance ramp will be realigned perpendicular to US 41/SR 3 to align with the proposed southbound exit ramp. A loop ramp in the northeast quadrant of the interchange will be added to accommodate the I-75 northbound exit movement onto US 41/SR 3 westbound. The existing northbound entrance ramp from US 41/SR 3 eastbound to I-75 northbound will be relocated to make room for the new loop ramp. The existing I-75 northbound exit ramp will be retained and modified to align with the proposed I-75 northbound exit ramp accommodating the easterly movement onto US 41/SR 3.

The January 14, 2000 concept report indicated the following laneage per intersection:

N. Tibbs Road @ US 41/SR 3

- Add an eastbound left-turn lane along N. Tibbs Road.
- Convert yield controlled eastbound right-turn lane along N. Tibbs Road to a free-flow right-turn lane.

I-75 SB Off-Ramps @ US 41/SR 3

- Add a southbound off-ramp for the westbound US 41/SR 3 direction.
- Realign the southbound off-ramp loop for the eastbound US 41/SR 3 direction.
- Construct a CD lane parallel to I-75 for southbound exit ramp traffic.

I-75 SB On-Ramp @ US 41/SR 3

- Add a receiving lane for the dual westbound left-turn departure lanes.
- Provide protected phasing for the westbound dual left-turn lanes.
- Add an eastbound right-turn lane and yield control onto the I-75 southbound ramp.

I-75 NB Off-Ramps

- Construct a northbound off-ramp loop for the westbound US 41/SR 3 direction.
- Realign the northbound off-ramp for the eastbound US 41/SR 3 direction.
- Convert right-turn yield control to a right-turn free-flow control for the eastbound US 41/SR 3 direction.
- Construct a CD lane parallel to I-75 for northbound exit ramp traffic.

I-75 NB On-Ramps @ US 41/SR 3

- Add a receiving lane for the dual eastbound left-turn departure lanes.
- Provide protected phasing for the dual eastbound left-turn lanes.
- Add an exclusive separate right-turn lane for the westbound approach.

Shugart Road @ US 41/SR 3

- Add a right-turn, free-flow control lane for the eastbound approach.
- Relocate Tampico Drive further south of the intersection.

Old SR 3 @ US 41/SR 3

- Move project end point prior to intersection.
- Tie third eastbound through lane into existing right-turn deceleration lane.

Interstate 75

- Provide accommodations for a future fourth lane in each direction.
- Provide barrier separated (concrete wall) collector-distributor ramps parallel to I-75.
- Provide tapered merge for I-75 northbound and southbound entrance ramps.

A design exception is required for substandard shoulders and horizontal clearance under the I-75 overpass. A slight profile grade change along US 41/SR 3 will be required to maintain minimum vertical clearance under the I-75 overpass bridge. Additional right-of-way is required to implement this project. Traffic will be maintained during construction.

CONSTRUCTION COSTS

The estimated total cost of construction is \$18,925,434. The estimated right-of-way cost is \$1,128,000.00 and the estimated reimbursable utilities cost is \$1,915,510 bringing the total estimated project cost to \$21,968,944. The cost estimates include the following markups:

Construction:

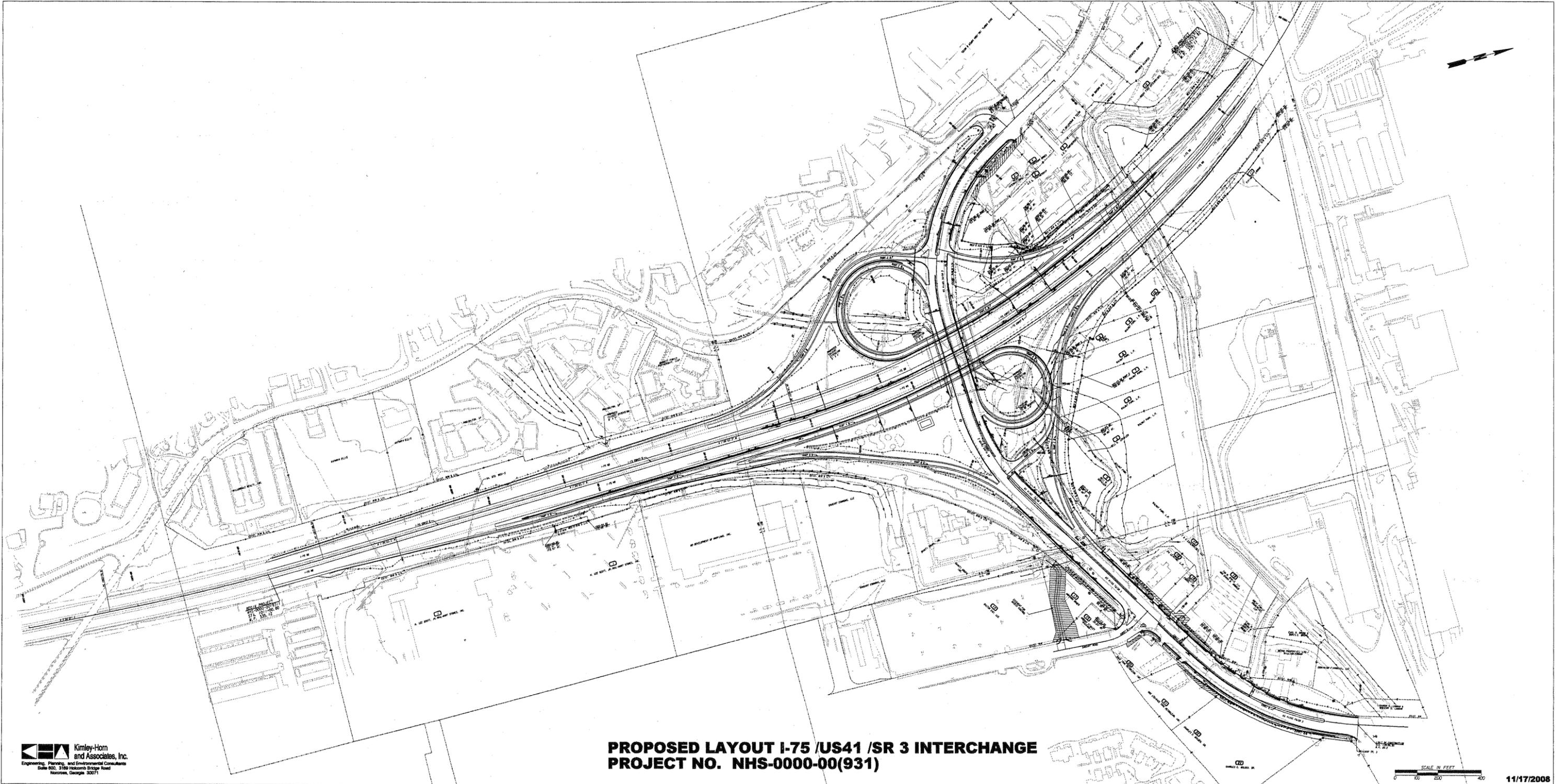
- Engineering and Construction - 10.00%
- Zero Inflation (per GDOT)

Right-of-Way:

- Scheduling Contingency - 55.00%
- Administration/Court Costs - 60.00%
- Zero Inflation (per GDOT)

Drawing:

A proposed layout of the project follows.



**PROPOSED LAYOUT I-75 /US41 /SR 3 INTERCHANGE
PROJECT NO. NHS-0000-00(931)**


**Kimley-Horn
and Associates, Inc.**
 Engineering, Planning, and Environmental Consultants
 Suite 600, 5180 Holcomb Bridge Road
 Norcross, Georgia 30071

SCALE IN FEET
0 60 120 180 240 300 360 420

11/17/2008

VALUE ANALYSIS AND CONCLUSIONS

INTRODUCTION

This section describes the procedures used during the VE study. It is followed by separate narratives and conclusions including:

- Value Engineering Study Agenda
- Value Engineering Workshop Participants
- Economic Data
- Cost Estimate Summary and Cost Model
- Function Analysis
- Creative Idea Listing and Evaluation of Ideas

A systematic approach was used in the VE study and the key procedures involved were organized into three distinct parts: 1) preparation; 2) VE workshop; and 3) post-study. A Task Flow Diagram that outlines each of the procedures included in the VE study is attached for reference.

PREPARATION EFFORT

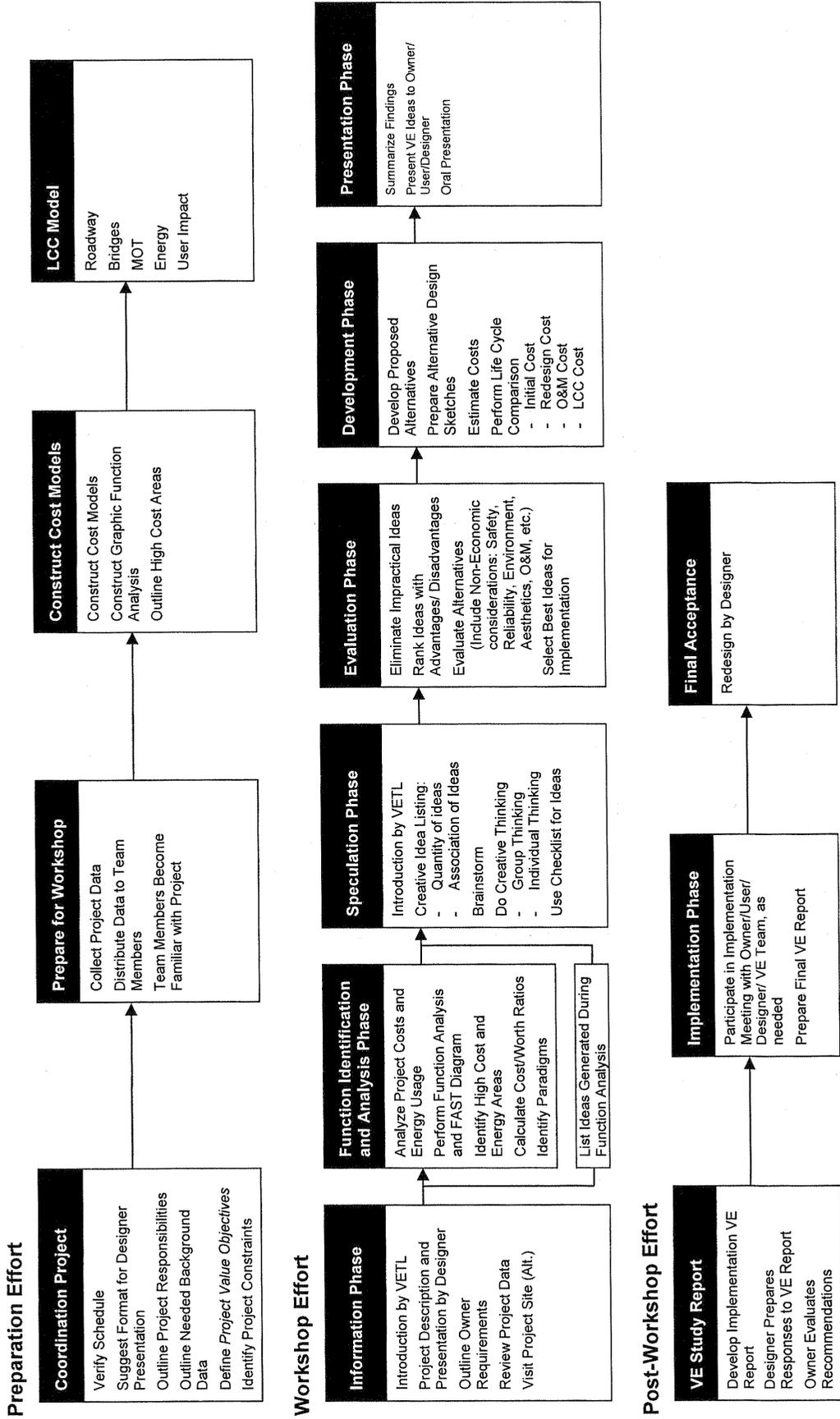
Pre-study preparation for the VE effort consisted of scheduling study participants and tasks, gathering necessary background information on the facility, and compiling project data into a cost model and graphic cost histogram. Information relating to the design, construction, and operation of the facility is important as it forms the basis of comparison for the study effort. Information relating to funding, project planning operating needs, systems evaluations, basis of cost, soil conditions, and construction of the facility was also a part of the analysis.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three and a half-day effort (see attached agenda). During the workshop, the VE job plan was followed. The job plan guides the search for high cost areas in the project and includes procedures for developing alternative solutions for consideration. It has six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

Value Engineering Study Task Flow Diagram



Information Phase

At the beginning of the study, the conditions and decisions that have influenced the development of the project must be reviewed and understood. For this reason, the design team presented information about the project to the VE team on first day of the session. Following the presentation, the VE team discussed the project using the following documents:

- Half Size Construction Plans entitled Plan and Profile of Proposed Interchange Reconstruction I-75 @ US 41/US 76/SR 3 (Rocky Face); Spalding County, Project Number NH-0000-00(931), P. I. No. 0000931, prepared by Kimley-Horn and Associates, Inc. for the State of Georgia Department of Transportation.
- Project Concept Report, Department of Transportation, State of Georgia, Office of Preconstruction for NH-0000-00(931), Whitfield County, P. I. No. 0000931; dated January 14, 2000;
- Estimate Report for file “000931 NHS-0000-00(931)”, prepared by District 6, State of Georgia Department of Transportation; not dated;
- Interchange Modification Report, I-75 @ US/41/SR 3 (Rocky Face) IMR, Whitfield County, NHS-0000-00(931), P.I. 0000931, prepared for Georgia Department of Transportation & Federal Highway Administration, prepared by Kimley-Horn and Associates, Inc., dated January 2007.
- Bridge Foundation Investigation, Project Number: NHS00-0000-00(931), P.I. 0000931, Bridge No. 1: I-75 Bridge over US 41/SR 3, Rocky Face, Whitfield County, Georgia, prepared for State of Georgia Department of Transportation, Geotechnical Engineering Bureau, Prepared by Professional Service Industries, Inc., dated August 4, 2008, revised September 25, 2008.
- Bridge Condition Survey for Structure ID 313-0043-0, I-75 over US 41/SR 3 and Structure ID 3313 0045-0 I-75 over Mill Creek, Project Number: NHS00-0000-00(931), P.I. 0000931, I-75 Over US 41/SR 3 Rocky Face, Georgia, Whitfield County, Georgia, Prepared by GDOT State Bridge Maintenance Engineering, dated January 9, 2007.
- Categorical Exclusion for NHS-0000-00(931), Whitfield County – Reconstruction of I-75 Interchange at US 41/SR 3 (Rocky Face), approved on October 2, 2008, dated October 9, 2008.
- Soil Survey Summary, Project Number: NHS00-0000-00(931), P.I. 0000931, I-75 Over US 41/SR 3 Rocky Face, Georgia, Whitfield County, Georgia, prepared for State of Georgia Department of Transportation, Geotechnical Engineering Bureau, Prepared by Professional Service Industries, Inc., dated October 17, 2007, revised February 17, 2008.
- Retaining Wall Foundation Investigation, Project Number: NHS00-0000-00(931), P.I. 0000931, I-75 Over US 41/SR 3 Rocky Face, Georgia, Whitfield County, Georgia, prepared for State of Georgia Department of Transportation, Geotechnical Engineering Bureau, Prepared by Professional Service Industries, Inc., dated October 17, 2007, revised February 17, 2008.
- Final Acceptance of Soil Survey Summary – I-75 @ SR 3/US 41/US 76 Rocky Face Exit – Phase 2 Interchange, dated October 17, 2007 and revised February 7, 2008.
- Bridge and Structures Design Policy Manual, prepared by the Georgia Department of Transportation, Office of Bridge and Structural Design, dated October 2005, revised April 2007;
- Item Mean Summary for 07/2007 to 06/2008 compiled by the State of Georgia Department of Transportation; dated June 26, 2008;
- Standards and Construction Details Binder; prepared by the Department of Transportation, State of Georgia; undated;
- Standard Specifications Construction of Transportation Systems; prepared by the Department of Transportation, State of Georgia; 2001 Edition;
- Design Policy Manual; A Georgia Department of Transportation Publication; Version 2.0; revised June 1, 2007; and

- A Policy on Geometric Design of Highway and Streets; prepared by the American Association of State Highway and Transportation Officials; dated 2004.

Function Identification and Analysis Phase

Based on historical and background data, a cost model and graphic function analysis were developed for this project by major construction elements. They were used to distribute costs by project element, serve as a basis for alternative functional categorization, and assign worth to the categories, where worth is the least cost to provide the required function, as determined by the VE team. The VE team identified the functions of the various project elements and subsystems by using random function generation techniques resulting in the attached Random Function Analysis worksheet.

Creative Phase

This VE study phase involved the creation and listing of ideas. Creative idea worksheets were organized by project element. During this phase, the VE team developed as many ideas as possible to provide the necessary functions within the project at a lower cost to the owner, or to improve the quality of the project. Judgment of the ideas was restricted at this point. The VE team was looking for a large quantity of ideas and association of ideas.

GDOT and the design team may wish to review the creative list since it may contain ideas that can be further evaluated for potential use in the design.

Evaluation Phase

During this phase of the workshop, the VE team judged the ideas generated during the creative phase. Advantages and disadvantages of each idea were discussed to find the best ideas for development. Ideas found to be irrelevant or not worthy of additional study were discarded. Those that represented the greatest potential for cost savings or improvement to the project were then developed further.

Each idea was compared with the present schematic design concepts, in terms of how well it met the design intent. Advantages and disadvantages were discussed, and each team member rated the ideas on a scale of zero to five, with the best ideas rated 4 or 5. Only those ideas rated 4 or 5 were developed into alternatives. In cases where there was little cost impact but an improvement to the project was anticipated, the designation DS, for design suggestion, was used. The design team should review this listing for possible incorporation of ideas into the project.

The creative listing was re-evaluated frequently during the process of developing alternatives. As the relationship between creative ideas became more clearly defined, their importance and ratings may have changed, or they may have been combined into a single alternative. For these reasons, some of the originally high-rated items may not have been developed into alternatives.

Development Phase

During the development phase, each highly rated idea was expanded into a workable solution. The development consisted of a description of the alternative, life cycle cost comparisons, where applicable, and a descriptive evaluation of the advantages and disadvantages of the proposed alternatives. Each alternative was written with a brief narrative to compare the original design to the proposed change.

Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in the Study Results section.

Presentation Phase

The last phase of the VE study was the presentation of the findings. The VE alternatives were screened by the VE team before draft copies of the Summary of Potential Cost Savings worksheets were provided to GDOT and design team representatives during an informal presentation on the last day of the workshop. The VE alternatives were arranged in the same order as the idea listing sheets to facilitate cross-referencing.

POST-WORKSHOP EFFORT

The post-study portion of the VE study includes the preparation of this report. It is recommended that personnel from GDOT and the design team analyze each alternative and prepare a short response, recommending either incorporating the alternative into the project, offering modifications before implementation, or presenting reasons for rejection.



VALUE ENGINEERING WORKSHOP AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will conduct a 4-day Value Engineering (VE) workshop on Project PI No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction. The project is located 100% in Whitfield County, Georgia. The workshop will be held November 17-20, 2008 at the following location:

Georgia Department of Transportation
One Georgia Center (OGC)
5th Floor, Room 5CR1L2
600 West Peachtree Street
Atlanta, Georgia 30308

The point of contact is Ms. Lisa L. Myers, Design Review Engineer Manager, and Value Engineering Coordinator, who can be reached at 404-631-1770.

The design consultants from Kimley-Horn and Associates, Inc. will provide an overview of the project at the beginning of the workshop and be available to answer questions during the VE study effort.

AGENDA

Monday, November 17, 2008

8:30 am - 9:00 am **VE Team Gathers for Introductions**

9:00 am - 9:15 am **Introduction to the Workshop**

- Welcome and opening remarks by GDOT and District 6
- Team member introductions and VE Team Leader comments
- VE process, workshop organization and agenda
- Objectives of the workshop

9:15 am - 11:00 am **Designer's Overview**

Representatives from the design team of Kimley-Horn and Associates, Inc. will provide an overview of the project. After the overview, the design team will answer VE team questions.

11:00 am - 12:00 pm **Function Analysis Phase**

The VE team will perform function analysis by defining the function of each project element or system in the cost model, selecting the primary or basic functions, and determining the worth, or least cost, to provide the function. The goal is to identify those functions or project elements which offer the greatest opportunity for cost reduction or value improvement.

12:00 pm - 1:00 pm **Lunch**



1:00 pm - 2:00 pm **Conclude Function Analysis Phase**

2:00 pm – 5:00 pm **Creative Phase**

The team will conduct a brainstorming session and list as many ideas as possible for consideration. The aim is to obtain a large quantity of ideas through free association, by eliminating roadblocks to creativity and deferring judgment. The VE Team Leader will be responsible for developing an idea listing for the team.

Tuesday, November 18, 2008

8:00 am – 10:00 am **Conclude Creative Phase**

10:00 am - 11:00 am **Evaluation Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas based on project criteria obtained during the design overview and a discussion of the ideas advantages and disadvantages. This will be accomplished by assigning each idea a *Gut Feel Index* rating between 1 and 5, with 5 being the best, based on the team's consensus of how well the idea meets the noted criteria.

The team selects the highly rated ideas for research and development.

11:00 am - 12:00 pm **Development Phase**

The VE team will develop creative ideas into alternate designs. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives will be developed and supported with sketches, calculations and substantiation for change. Suppliers of materials and equipment will be contacted and specialists consulted.

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 5:00 pm **Continue Development Phase**

Wednesday, November 19, 2008

8:00 am - 8:30 am **Review Status and Progress of the Team**

The VE team will assess its status and plan for completion of the alternatives development.

8:30 am - 12:00 noon **Continue Development Phase**

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 3:00 pm **Continue Development Phase**



3:00 pm - 5:00 pm

Completion of Development Phase

The VE team will wrap up and complete the development effort. The VE Team Leader will be responsible for reviewing each developed idea for completion and preparing a summary of the VE alternatives in preparation for the out-briefing presentation.

Thursday, November 20, 2008

8:00 am - 9:00 am

Preparation for Presentation Phase

The VE team will finalize a summary of the VE alternatives with descriptions and initial and life cycle costs for a verbal presentation to interested parties. Summary of Potential Cost Saving worksheets will be copied for distribution to VE presentation attendees.

9:00 am – 10:15 am

Presentation Phase

The VE team will present its alternatives to GDOT, District 6, and Kimley-Horn and Associates and is available to clarify any points. The process for accepting/rejecting VE alternatives is described and a target schedule for meeting to finalize implementation decisions is established.

10:15 am – 10:30 am

Workshop “Post Mortem” and Closing Remarks

10:30 am

Adjourn

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise on the unique project elements involved. Team members consisted of a multidisciplinary group with professional design experience and a working knowledge of VE procedures. The VE team included the following professionals:

Joseph A. Leoni, PE	Roadway QA/QC Manager	ARCADIS U.S., Inc.
Alex Pascual, PE	Structural Engineer	HNTB
Paresh Parikh, PE	Construction/Civil Engineer	Delon Hampton & Associates
Stephen Havens, PE, PMP, CVS	VE Team Leader	Lewis & Zimmerman Associates

OWNER/DESIGNER PRESENTATION

Representatives from GDOT and Kimley-Horn and Associates, Inc. presented an overview of the project on Monday, November 17, 2008. The purpose of this meeting, in addition to being an integral part of the Information Gathering Phase of the VE study, was to bring the VE team “up-to-speed” regarding the overall project. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail, those areas of the project requiring additional or special attention.

VALUE ENGINEERING TEAM PRESENTATION

The VE team conducted an informal presentation on Thursday, November 20, 2008 to GDOT and Kimley-Horn and Associates, Inc. Copies of the draft Summary of Value Engineering Alternative worksheets were provided for interim use.

A copy of the meeting participants is attached for reference.

WORKSHOP PARTICIPANTS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction**
Whitfield County, Georgia Department of Transportation, District 6 Design Development Stage

DATE: **NOVEMBER 17-20, 2008**

NAME & E-MAIL (please print)	ORGANIZATION/TITLE	PHONE/FAX
Lisa L. Myers em lmyers@dot.ga.gov	Georgia Department of Transportation (GDOT) Engineering Services	ph 404-631-1770 mob fx
Amber Phillips em aphillips@dot.ga.gov	GDOT Office of Environment and Labor	ph 404-699-4408 mob fx
Ken Werho em kwerho@dot.ga.gov	GDOT Traffic Operations Design Review	ph 404-635-8144 mob fx
Kimberly Nesbitt em knesbitt@dot.ga.gov	GDOT Consultant Design	ph 404-631-1575 mob fx
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Jerry Milligan em jmilligan@dot.ga.gov	GDOT Right of Way	ph 404-347-0170 mob fx
Kenny Beckworth em kbeckworth@dot.ga.gov	GDOT District 6	ph 770-387-3609 mob fx
Chester Thomas em chthomas@dot.ga.gov	GDOT Urban Design	ph 770-883-6273 mob fx
Carolyn Penry em Carolyn.penry@fhwa.dot.gov	FHWA	ph 404-562-3617 mob fx
Christy Poon-Atkins em	FHWA	ph 404-562-3638 mob fx

WORKSHOP PARTICIPANTS



PROJECT: P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction <i>Whitfield County, Georgia Department of Transportation, District 6 Design Development Stage</i>		DATE: NOVEMBER 17-20, 2008
NAME & E-MAIL (please print)	ORGANIZATION/TITLE	PHONE/FAX
Gary Newton, P.E. em gary.newton@kimley-horn.com	Kimley-Horn and Associates, Inc. Project Manager	ph 770-825-0744 mob 678-533-3902 fx 770-825-0074
Peter Coakley, P.E. (MT) em peter.coakley@kimley-horn.com	Kimley-Horn and Associates, Inc. Design Lead	ph 770-825-0744 mob 678-533-3906 fx 770-825-0074
Paresh Parikh, P.E. em pparikh@delonhampton.com	Delon Hampton & Associates, Chartered Construction/Civil Engineer (VE Team)	ph 404-524-8030 mob fx 404-524-2575
Larry Prescott, P.E. em lprescott@hntb.com	HNTB Structural Engineer (VE Team 1 st day)	ph 404-946-5743 mob fx 404-524-2575
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em		ph mob fx
em		ph mob fx
em		ph mob fx

ECONOMIC DATA

The VE team developed economic criteria used for evaluation with information gathered from the State of Georgia Department of Transportation, Kimley-Horn and Associates, Inc., and District 6 (D6). To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for planning project period interest rates are based on the following parameters:

Year of Analysis:	2008
Construction Start-Up:	Long Range
Construction Duration:	±36 Months (Kimley-Horn and Associates, Inc.)
Economic Planning Life:	30 years for Pavement
Economic Planning Life:	50 years for Bridges
Discount Rate/Interest:	3.20% (Per GDOT)
Inflation/Escalation Rate:	0.00% (Per GDOT)
Cost	Operation and Maintenance Costs (<i>Industry Norms</i>):
	Equipment - With Many Moving Parts 5.00%-5.50%+ of Capital Cost
	Equipment - With Minimal Moving Parts 3.50%-4.00% of Capital Cost
	Equipment - Electronic 3.00% of Capital Cost
	Structural 1.00%-2.00% (or less) of Capital Cost
Composite Construction Mark-Up	10.0% (1.10)
(Composed of: Engineering and Construction at 10.00%)	

COST ESTIMATE SUMMARY AND COST MODEL

The VE team prepared the attached cost model for the project prior to the workshop. The cost model is arranged in the Pareto Charting/Cost Histogram format to aid in identifying high cost areas. As can be expected, judgments at this stage of the study are based on experience and intuition rather than facts, which are not uncovered until well along in the analysis of function. As a result of these qualified hypotheses, there appears to be a potential for initial savings in the following areas:

- Ramp modifications
 - Alignments
 - materials of construction
 - utilization of portions of existing ramps
- Bridge modifications
 - Narrower typical sections at bridge crossings
 - Salvage existing bridge
- Roadway
 - Asphalt vs. Concrete Pavement
- Right-of-Way Reductions

In order to facilitate the cost developments of the selected ideas, the VE team generated numerous “unit” prices for specific roadway costs that are noted below:

NH-0000- 00(931)	Asphalt Overlay (2") Per Square Yard	Asphalt Full Depth Per Square Yard	Concrete Section Full Depth Per Square Yard	Bridge Area Per Square Foot
P.I. No. 0000931	\$9.35*	\$63.30*	\$94.12*	\$127.55**

*Reference Value Engineering Alternative R-2 for Roadway unit pricing calculations.

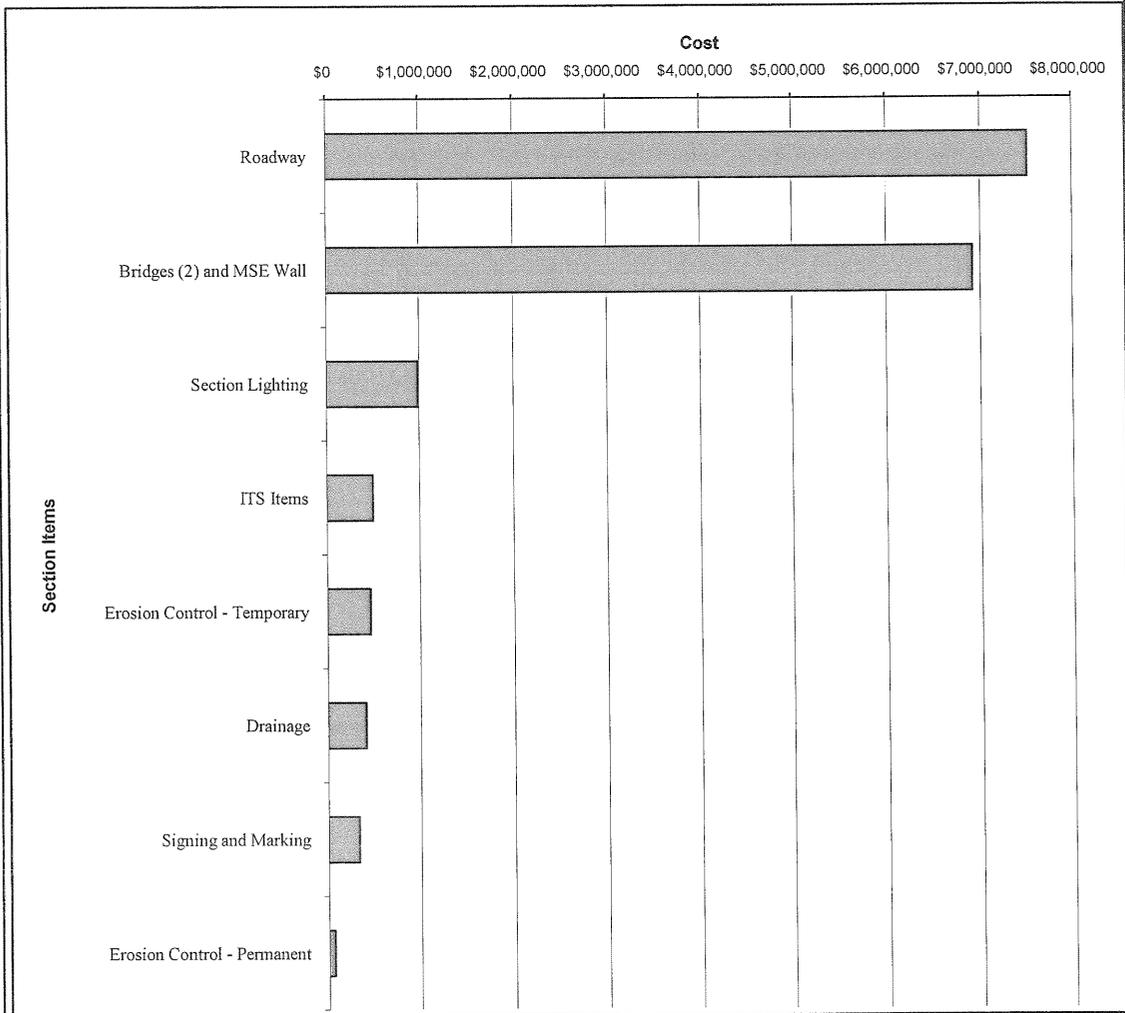
**Reference Value Engineering Alternative S-3 for Bridge Area unit pricing calculations.

COST HISTOGRAM



Project: I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

P. I. No. 0000931	COST	PERCENT	CUM. PERCENT
Roadway	7,518,987	43.70%	43.70%
Bridges (2) and MSE Wall	6,919,442	40.22%	83.92%
Section Lighting	988,725	5.75%	89.67%
ITS Items	500,000	2.91%	92.57%
Erosion Control - Temporary	468,706	2.72%	95.30%
Drainage	411,852	2.39%	97.69%
Signing and Marking	334,271	1.94%	99.63%
Erosion Control - Permanent	62,959	0.37%	100.00%
Construction Subtotal	\$ 17,204,940	100.00%	
Engineering and Construction at 10.00%	\$ 1,720,494		
Inflation Based on 0.00% per annum for 0.00 Years (54) at 0.00%	\$ -		
Construction Total	\$ 18,925,434	Construction	Mark-Up: 10.00%
Right-of-Way Costs	\$ 454,839		
Right-of-Way Subtotal	\$ 454,839		
Scheduling Contingency 55.00%	\$ 250,161		
Administration / Court Costs 60.00%	\$ 423,000		
Inflation Factor 0.00%	\$ -		
Right-of-Way Total	\$ 1,128,000	ROW	Mark-Up: 148.00%
Reimbursable Utilities Costs	\$ 1,915,510		
Reimbursable Utilities Subtotal	\$ 1,915,510		
GRAND TOTAL	\$ 21,968,944		



Costs in graph are not marked-up.

FUNCTION ANALYSIS

A random function analysis was performed to (1) understand the project purpose and need, (2) define the requirements for each project element, (3) ensure a complete and thorough understanding by the VE team of the basic functions needed to attain the given project purpose and need, (4) identify other goals, and (5) identify secondary functions that should be addressed by the VE team. The Random Function Analysis worksheet completed by the team for the project in its entirety and the various elements follow.

The key opportunity areas for potential cost reduction established during the function analysis session (including input from the design team during the design overview) includes the following:

- Roadway
 - Ramps
 - Turning Radius
 - Collector-Distributor
 - Turning Lanes
 - Single
 - Double
 - Sidewalks
- Structures
 - MSE Walls
 - Bridge Span
- Maintenance of Traffic
 - Reduce Congestion

RANDOM FUNCTION ANALYSIS



PROJECT: **P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face)**
Interchange Reconstruction
Whitfield County, Georgia Department of Transportation, District 6
Design Development Stage

SHEET NO.: 1 of 3

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
PROJECT	Reduce	Congestion	B
	Improve	Circulation	B
	Improve	Safety	B
	Increase	Volume	B
	Increase	Capacity	B
	Improve	Convenience	G
	Facilitate	Turning Movements	RS
	Improve	Structural Integrity	RS
	Accommodate	Pedestrians	S
	Prevent	Flooding	RS
	Minimize	Environmental Impact	B
	Meet	Code Requirements	RS
	Improve	LOS	HO
	Stimulate	Local Economy	G
	Manage	Stormwater	RS
	Control	Erosion	RS
	Evacuate	Stranded Motorist	RS
ROADWAY (R)	Improve	Circulation	B
	Add	Ramps	RS
	Optimize	Geometry	RS
	Add	Lanes	RS

Function defined as: Action Verb
 Measurable Noun

Kind: B = Basic
 S = Secondary
 RS = Required Secondary

HO = Higher Order
 LO = Lower Order

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creativity Phase, numerous ideas were generated using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped according to the following categories and numbered in the order in which they were conceived. The following letter prefixes were used to identify the categories.

PROJECT ELEMENT	PREFIX
Roadway	R
Structures	S
Maintenance of Traffic	M

Creative Idea Evaluation

After discussing each idea, the team evaluated the ideas by consensus. This effort produced 12 ideas rated 4 or 5 to research and develop into formal VE alternatives and 3 ideas to develop as design suggestions to be included in the Study Results section of the report. Ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The project team is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: P.I. No. 0000931, I-75 @ US 41/US 76/SR 3 (Rocky Face) Interchange Reconstruction <i>Whitfield County, Georgia Department of Transportation, District 6</i> <i>Design Development Stage</i>	SHEET NO.: 1 of 2
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NO.	IDEA DESCRIPTION	RATING
	ROADWAY (R)	
R-1	Eliminate provisions for a future fourth lane on I-75.	3
R-2	Maximize the use of the existing Ramp B.	4
R-3	Realign Ramp F to improve sight.	DS
R-4	Shorten the proposed Ramp B.	4
R-5	Provide access to Ramp G from North Tibbs Road.	DS
R-6	Eliminate sidewalks on both sides of US 41 east of Tibbs Road.	5
R-7	Construct all new ramps using asphalt pavement in lieu of concrete.	5
R-8	Redesign Ramps A & B (Collector-Distributor) to reduce cost.	3
R-9	Eliminate Ramp A by making Ramp B two lanes.	4
R-10	Eliminate Ramp A by making ramp B three lanes including two left turn lanes.	4
R-11	Begin the Flare-out of Ramp E after the Mills Creek Bridge and make Ramp F two lanes in lieu of a single lane.	2
R-12	Use a parallel deceleration lane southbound on I-75 in lieu of a deflection deceleration lane.	2
R-13	Retain the existing median on I-75 including temporary pavement of portions only during construction in lieu of permanently paving the median as part of the new typical section.	3
R-14	Add an additional exclusive right turn lane from US 41 eastbound onto Shugart Road	2
R-15	Reduce guard railing where possible.	4
R-16	Review slopes to minimize right-of-way requirements.	3
R-17	Provide a free right turn onto westbound SR 41 to improve circulation.	2
R-18	Add a left turn lane to Ramp E and eliminate Ramp F.	4
	STRUCTURES (S)	
S-1	Provide additional right-of-way in lieu of building MSE Wall #5.	2
S-2	Revise the envelope on MSE Wall #6.	5
S-3	Build the I-75 bridges to accommodate the inside shoulder only.	4
S-4	Make the typical section of US 41 narrower under the I-75 bridge only.	4

Rating: 1→2 = Not to be developed 3→4 = Varying degrees of development potential 5 = Most likely to be developed
 DS = Design suggestion ABD = Already being done

