



Georgia Department of Transportation
NH-75-1(246)

*INTERCHANGE CONSTRUCTION—
SARDIS CHURCH ROAD AT I-75*

P.I. No. 311910
Bibb County, Georgia

Value Engineering Study Report
Preliminary Design

July 2006

Design Consultant

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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August 3, 2006

Ms. Lisa L. Myers
Design Review Engineer Manager
State of Georgia Department of Transportation, General Office
No. 2 Capitol Square, Room 266
Atlanta, Georgia 30334-1002

re: Project Number NH-75-1(246), P.I. No. 311910, Interchange Construction, Sardis Church
Road at I-75 in Bibb County, Georgia
Value Engineering Study Report

Dear Ms. Myers:

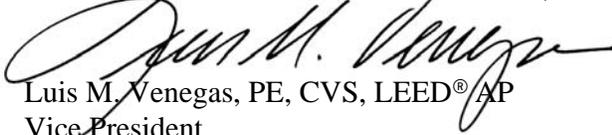
Lewis & Zimmerman Associates, Inc., is pleased to submit four hard copies and one electronic copy of the referenced report.

The VE report documents an alternative solution to the partial cloverleaf configuration proposed in the current design. This solution preserves the known historic farmsteads/homesteads abutting the project limits while saving significant costs. The report also documents additional cost saving opportunities in other aspects of the project.

We thank you and the State of Georgia Department of Transportation for your hospitality and Kimley-Horn and Associates, Inc. for providing the information necessary for the VE team to generate alternative solutions for this project. Please do not hesitate to contact us if you have any questions as you review this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.



Luis M. Venegas, PE, CVS, LEED® AP
Vice President

Attachment

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EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report summarizes the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA), for the State of Georgia Department of Transportation (GDOT) in Atlanta, Georgia. The subject of the study was Project NH-75-1(246), P.I. No. 311910, Interchange Construction, Sardis Church Road at I-75, in Bibb County, Georgia, being designed by Kimley-Horn and Associates, Inc. (KHA). The study was conducted July 19–21, 2006, at GDOT headquarters in Atlanta, Georgia, when the project was at the Preliminary Design Stage.

PROJECT DESCRIPTION

Project NH-75-1(246) will construct a partial cloverleaf interchange at I-75 and Sardis Church Road located on the south side of Sardis Church Road. The existing bridge over I-75 will be replaced to accommodate future widening of I-75 as well as a 16.5-ft. clearance height. In addition, auxiliary lanes will be added to I-75 in both directions from Hartley Bridge Road to Sardis Church Road. Sardis Church Road will be widened to a four-lane roadway: Two lanes in each direction divided by a 20-ft. raised median. The project will include 8-ft. paved shoulders and 4-ft. paved bicycle lanes on both sides of Sardis Church Road. The proposed widening of Sardis Church Road will extend from just east and west of I-75 and connect to a local project that extends in an easterly direction to SR-247/Hawkinsville Road. The project's termini are 1.18 miles south of and 0.45 miles north of Sardis Church Road on I-75. In addition, the project will extend the current Macon ITS (Intelligent Transportation System) from about 500 ft. south of Tobesofkee Creek along I-475 to the beginning of the project limits on I-75.

The current estimated cost of construction is \$30,970,484, and the preliminary right-of-way cost estimate is \$7,836,651. This brings the total project cost to \$38,807,135.

CONCERNS AND OBJECTIVES

The reason for the partial cloverleaf configuration proposed under the current design solution is preservation of known historic farmsteads and homesteads abutting the project limits on the north side of Sardis Church Road and the east and west sides of I-75. It also preserves a smaller homestead on the south side of Sardis Church Road east of I-75. This solution appears to be trying to stay as close as possible to the existing Sardis Church Road alignment while allowing for direct access to a widened I-75 and a widened Sardis Church Road. The VE team has some concerns about this approach and its inherent inefficiencies.

A second concern identified by the VE team is the addition of sidewalks on both sides of Sardis Church Road. While it is understood that sidewalks are being mandated by both Federal and State governments, this is a rural location and the planned sidewalks will not lead anywhere. In addition, there are sidewalks planned under an abutting project that extends and widens Sardis Church Road further east from the

eastern terminus of this project. This, too, seems unwarranted as the area is also quite rural and there are no apparent immediate destinations for pedestrians. To merely “connect the sidewalks” appears to be an unnecessary expense.

The objective of the VE study effort was to address the two concerns noted and to identify opportunities that would improve the value of the project in terms of fulfilling the basic functions while potentially reducing costs. The basic functions of the project are as follows:

- Improving east-west connectivity,
- Providing direct access to I-75 from Sardis Church Road,
- Increasing capacity, and
- Improving the existing infrastructure.

HIGHLIGHTS OF THE STUDY

The most compelling alternative developed by the VE team relocates and reshapes the Sardis Church Road interchange by realigning Sardis Church Road to intersect I-75 about 1,000 ft. further south from the center line of the current partial cloverleaf intersection. This alternative also provides for a full diamond interchange. Not only is this design safer, it also reduces the amount of right-of-way required to provide the interchange. This alternative permits a perpendicular interchange crossing over I-75, thereby eliminating the current design’s skew. This solution is listed as Alternative Number (Alt. No.) 1 and shows initial savings of over \$4,500,000 while fulfilling all the intended requirements. In a related manner, if mechanical stabilized earth abutment walls are used for Alt. No. 1, approximately \$630,000 additional initial savings could be attained as shown on Alt. No. 1A.

In an effort to reduce the section along the north side of Sardis Church Road abutting the historical properties, Alt. No. 30 uses 11-ft. travel lanes on both sides of Sardis Church Road. This permits a section reduction of at least 4 ft. while retaining the bicycle paths. Initial savings are calculated to be about \$275,000. In a similar manner, if a rural shoulder section with bicycle lanes replaces the as-designed urban shoulder with bicycle lanes, initial savings from the reduced section are close to \$395,000 as shown in Alt. No. 14.

Finally, as described in Alt. No. 8, connecting the I-75 northbound off-ramp with the northbound on-ramp via a realigned Nowell Road connector will yield initial savings of close to \$400,000. This alternative not only minimizes the amount of right-of-way takes along the south side of Sardis Church Road, it creates a safer and easier traffic pattern flow to and from the Sardis Church Road/Skipper Road intersection.

The Summary of Potential Cost Savings worksheet follows this narrative and summarizes all of the alternatives and design suggestion 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 all of the ideas considered by the VE team can be found on the Creative Idea Listing worksheets in the Value Analysis and Conclusions section of this report.



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, Bibb County <i>Design Development</i>						
PRESENT WORTH OF COST SAVINGS						
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
1	Relocate Sardis Church Road interchange to the south and use a diamond configuration	\$31,046,752	\$26,493,346	\$4,553,406		\$4,553,406
1A	Relocate Sardis Church Road interchange to the south and use a diamond configuration with MSE wall abutments	\$2,982,771	\$2,354,976	\$627,795		\$627,795
2	Eliminate Sardis Church Road improvements (four lanes) west of I-75	\$286,407	\$0	\$286,407		\$286,407
4	Eliminate ditch on north side of Sardis Church Road	DESIGN SUGGESTION				
5	Reduce the median width of the minimization section to allow 12-ft. lanes	\$28,564	\$0	\$28,564		\$28,564
8	Connect the northbound I-75 off- and on-ramps with a realigned Nowell Road connector	\$1,064,267	\$677,187	\$387,080		\$387,080
14	Replace urban shoulder with bicycle lanes with a rural section with bicycle lanes	\$1,901,931	\$1,506,927	\$395,004		\$395,004
15	Do not include sidewalks in the project	\$181,645	\$0	\$181,645		\$181,645
17	Reevaluate the intersection of Skipper Road, Nowell Road, and Everett Drive	\$49,440	\$17,192	\$32,248		\$32,248
19	Use a cable barrier system in place of the double-sided steel barrier on the I-75 mainline	DESIGN SUGGESTION				
21	Use a "T" intersection at Nowell Road and Nowell Road Connector	\$679,153	\$486,402	\$192,751		\$192,751
30	Use 11-ft. travel lanes along Sardis Church Road	\$275,533	\$0	\$275,533		\$275,533

STUDY RESULTS

INTRODUCTION

The results are the major feature of a VE study since they represent the benefits that can be realized on the project by the owner, users, and designer. The results will directly affect the project design and will require coordination among the designer, the user, and the owner to determine the ultimate acceptance of each alternative.

The creative ideas are organized according to the order in which they were originally generated by the VE team during their creative sessions.

RESULTS OF THE STUDY

The VE team generated 31 ideas for change during the Speculation Phase of the VE Job Plan. The evaluation of these ideas was based on their potential for capital cost savings, probability of acceptance, availability of information to properly develop an idea, compliance with perceived quality, adherence to universally accepted standards and procedures, life cycle cost efficiency, safety, maintainability, constructability, and soundness of the idea.

Of the 31 ideas generated, 11 were sufficiently rated to warrant further investigation. Continued research and development of these ideas yielded 10 alternatives for change with an impact on project costs and 2 design suggestions that will enhance the value of the project in terms of reduced long-term maintenance and improved constructability. All of these alternatives and design suggestions are presented in detail following this narrative.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

Once the aforementioned ideas are developed, it is important to consider each part of an individual alternative on its own merit. There may be a tendency to disregard an alternative because of concern about one portion of it. Separate consideration should be given to each of the areas within an alternative that are acceptable, and those parts should be considered in the final design, even if the entire alternative is not implemented.

Cost is the primary basis of comparison for alternative designs. To ensure that costs are comparable within the alternatives proposed by the VE team, the designer's cost estimates, where possible, were used as the pricing basis. Where appropriate, the impact of energy costs, replacement costs, and effect on operations and maintenance were shown within each alternative.

Some of the alternatives are interrelated, so acceptance of one may preclude the acceptance of another. The reader should evaluate those alternatives carefully to select the ideas with the greatest beneficial impact to the project.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: **1**

DESCRIPTION: **RELOCATE SARDIS CHURCH ROAD INTERCHANGE TO THE SOUTH AND USE A DIAMOND CONFIGURATION**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The proposed interchange is just to the south of the existing Sardis Church Road Bridge over I-75. Due to the historic properties immediately to the north, all ramps are located to the south of the interchange using a trumpeted configuration. The skewed bridge has spans of 71 ft., 123 ft., 139 ft., and 65 ft. The superstructure consists of AASHTO Type II and 72-in. bulb T beams.

ALTERNATIVE: (Sketch attached)

Relocate the interchange approximately 1,000 ft. to the south of the proposed location. The location is dictated by the alignment of the northern ramps to avoid impacting the historic properties. The connector will tie into Sardis Church Road to the east and west with direct flow alignments. Intersections will be provided for cutoff portions of Sardis Church Road, Nowell Road, and Everett Drive. The alternative bridge will be perpendicular to I-75 and have spans of 56 ft., 98.25 ft., 98.25 ft., and 56 ft.

ADVANTAGES:

- Eliminates impact to historic properties
- Reduces structural costs (reduced spans, beam sizes, and substructure)
- Uses a standard diamond interchange
- Easier construction due to less staging of separated alignment

DISADVANTAGES:

- Adds more curves to Sardis Church Road
- Requires redesign

DISCUSSION:

The realignment pulls the construction away from the existing structure and historic properties. This alleviates the majority of constraints on the design and allows for a more conventional configuration. If this is acceptable, additional savings may be achieved by substituting MSE wall abutments for 2:1 end spans (see Alt. No. 1A).

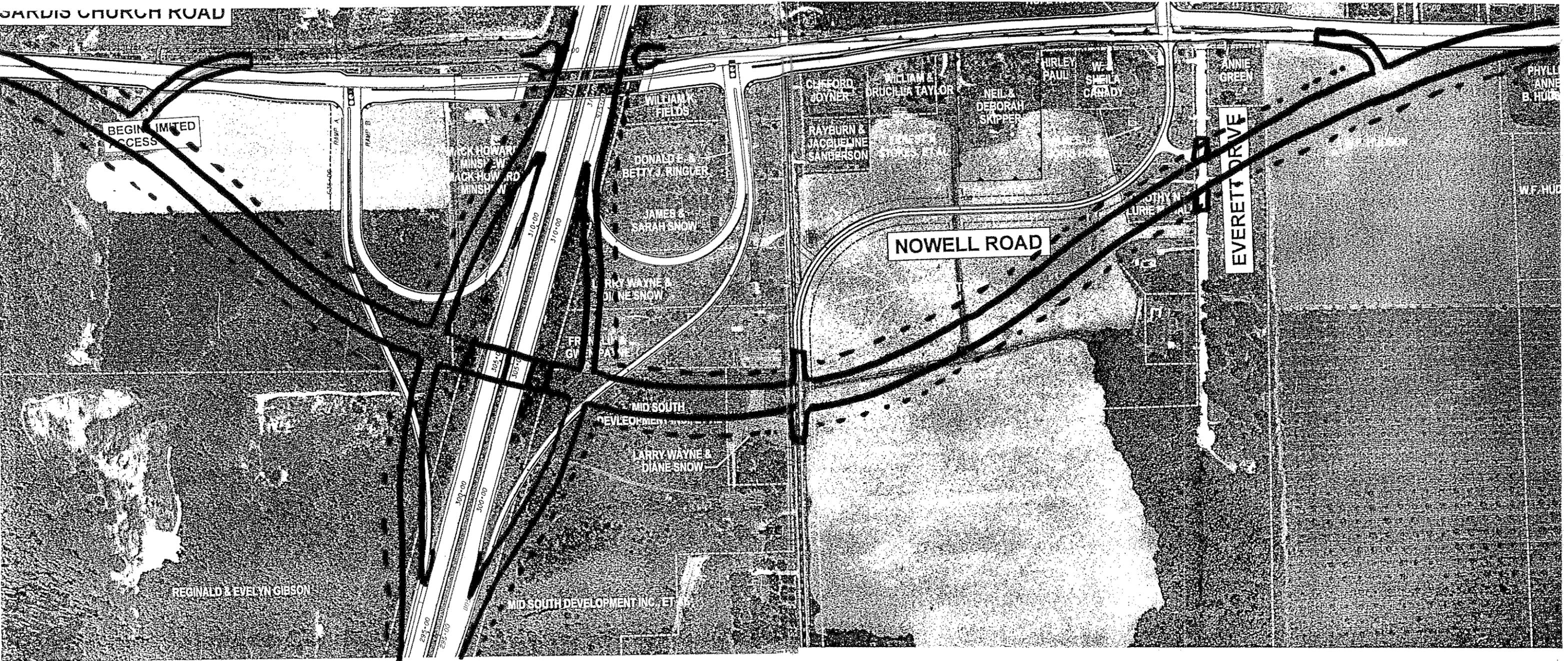
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 31,046,752	—	\$ 31,046,752
ALTERNATIVE	\$ 26,493,346	—	\$ 26,493,346
SAVINGS (Original minus Alternative)	\$ 4,553,406	—	\$ 4,553,406

NH-75-1(246) (P.I. No. 3/19/10), INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
SCALE: 1"=300'

ALTERNATIVE No. 1

1

SHEET No. 2 of 6



I-75

CALCULATIONS



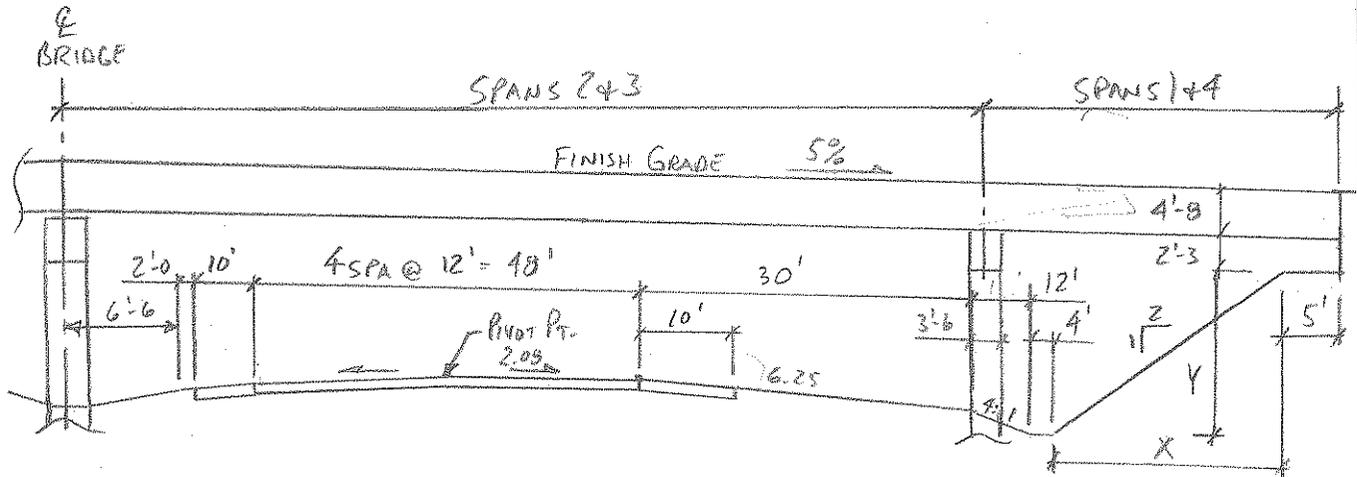
PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

1

DESCRIPTION: RELOCATE SARDIS CHURCH INTERCHANGE TO THE SOUTH AND
 USE A DIAMOND CONFIGURATION

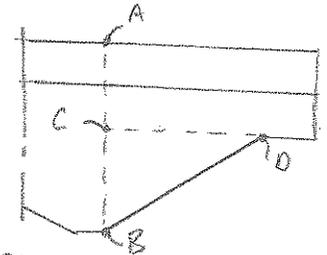
SHEET NO.: 3 of 6



FIND SPAN LENGTHS:

$$\text{SPANS 2+3} \Rightarrow 6.5' + 2' + 10' + 48' + 30' + 3.5' \frac{1}{2} = \boxed{98'-3''}$$

SPANS 1+4 \Rightarrow ASSUME 5% BRIDGE SLOPE
 FINISH GRADE @ PIVOT = 100



$$\therefore A = 100 - (24' + 30' + 12' + 4') \cdot 0.05 = 76.5$$

$$B = 100 - 4.67 - 17 - (24 \times 0.0209) - (30 \times 0.0625) - (12 \times \frac{1}{4}) = 72.96$$

$$C = 76.5 - 4.67 - 2.25 = 69.58$$

$$D = 69.58 - (X \times 0.05) = 72.96 + (X \times 0.5)$$

$$\text{SOLVE FOR X} \Rightarrow X = \frac{69.58 - 72.96}{0.5 - 0.05} = 36.93'$$

$$\therefore \text{SPANS 1+4} = 36.93' + 12' - 1.75' + 4' + 5' = \boxed{56'-2''}$$

$$\text{BRIDGE AREA} = \frac{308.26'}{2} \times 106.42' = \underline{32,868.93 \text{ SF}}$$

$$\text{ORIG.} = 398' \times 106.42' = 42,355.16 \text{ SF} \quad \text{DIFF} = \boxed{< 9,486.28 \text{ SF} >}$$

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

1

DESCRIPTION: RELOCATE SARDIS CHURCH INTER. TO THE SOUTH w/ A DIAMOND CONFIG.

SHEET NO.: 4 of 6

ALT. R.O.W.:

LAND: TYP. SARDIS CHURCH CONN => WIDTH = $(25' + 12' + 4' + 24' + 10') \times 2 = 150'$

- WEST END TO WEST RAMP INTER. = 2,500 LF

- EAST RAMP INTER. TO EAST END = 4,000 LF

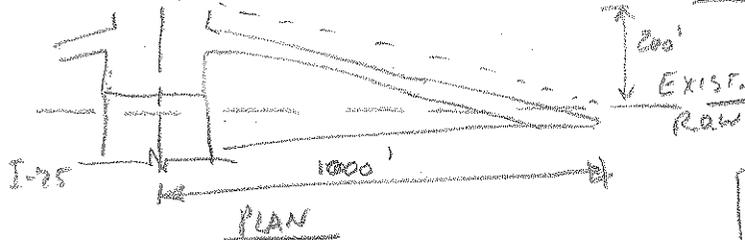
150' x
(2500 + 4000)
SARDIS SUBTOTAL = 975,000 SF

TYP. OLD SARDIS CHURCH DRIVE CONN => WIDTH = $(25' + 10' + 12') \times 2 = 94 \text{ SAY } 100'$

- WEST CONN = 500'
- EAST CONN = 400'
- NOWELL CONN = 200'
- EVERETT CONN = 100'

SUBTOTAL = $100(500 + 400 + 200 + 100) = \underline{120,000 SF}$

INTERCHANGE => $(200' \times 1000') \times \frac{1}{2} \times 4 = \underline{400,000 SF}$



RESIDENTIAL TOTAL = 1,495,000 SF
 @ 0.483\$/SF
 \$ 717,600

IMPROVEMENTS = 8 HOUSES (SAME AS ORIGINAL) = \$1,020,000

RELOCATION = 4 RES @ 20,000 \$/PARC. = \$80,000

DAMAGES = PROX. = 6 PARCELS (SAME AS ORIG.) = \$90,000

SUM =>	NET COST	SCHED COST 55%	ADMIN/CURT 60%	INFL. 40%	TOTAL COST
	\$ 1,897,600	+ 1,043,080	1,764,768	1,892,419	=> \$ 6,588,467.2

COST WORKSHEET



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONST. **ALTERNATIVE NO:**
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development 1
DESCRIPTION: Relocate SARDIS CHURCH INTER. TO THE SOUTH w/ A DIAMOND CONFIGURATION SHEET NO. 6 of 6

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL (\$)
ORIGINAL BRIDGE	SF	42,855	82.5	3,489,000			
ALT. REALIGNED BRIDGE					32,868	82.5	2,711,610
ORIGINAL R.O.W.				7,836,651			
ALT. R.O.W (APPROX).							6,588,467
ADD'L SIGNAL @ NOWELL/ SARDIS CHURCH RA							89,833
ADD'L ALT. ROADWAY							487,820
Row Sum				7,836,651			6,588,467
MARK-UP				247.2%			247.2%
				19,372,201			16,286,690
Roadway Sum				3,489,000			3,289,263
MARK-UP				10%			10%
				348,900			328,926
Sub-total				11,325,651			9,877,730
Mark-up at				19,721,101			16,615,616
TOTAL				31,046,752			26,493,346

VALUE ENGINEERING ALTERNATIVE



PROJECT:	INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY <i>Design Development</i>	ALTERNATIVE NO.:	1A
DESCRIPTION:	RELOCATE SARDIS CHURCH ROAD INTERCHANGE TO THE SOUTH AND USE A DIAMOND CONFIGURATION WITH MSE WALL ABUTMENTS	SHEET NO.:	1 of 5

ORIGINAL DESIGN: (Sketch attached)

Alternate 1 is a direct comparison to the original four-span bridge layout.

ALTERNATIVE: (Sketch attached)

Use a two-span AASHTO beam bridge with MSE walls at the abutments in lieu of the 2:1 paved end slopes with the associated end spans and concrete intermediate bents.

ADVANTAGES:

- Saves initial costs
- Expedites construction
- Enhances bridge aesthetics

DISADVANTAGES:

- Requires some redesign
- Eliminates future build-out capacity

DISCUSSION:

The MSE wall has the noted advantages and achieves the required functions at a reduced cost.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,982,771	—	\$ 2,982,771
ALTERNATIVE	\$ 2,354,976	—	\$ 2,354,976
SAVINGS (Original minus Alternative)	\$ 627,795	—	\$ 627,795



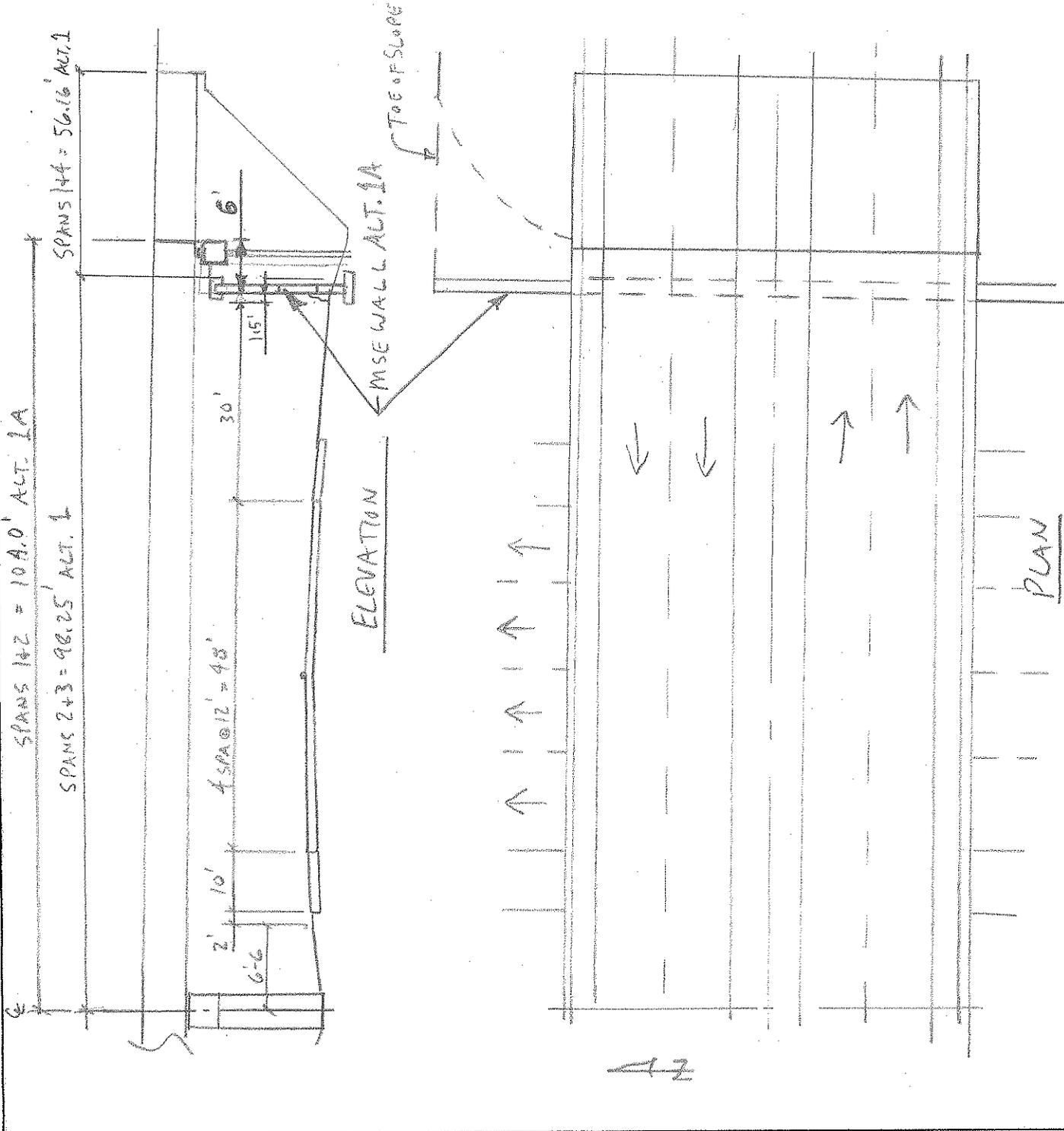
PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.:

1A

AS DESIGNED ALTERNATIVE

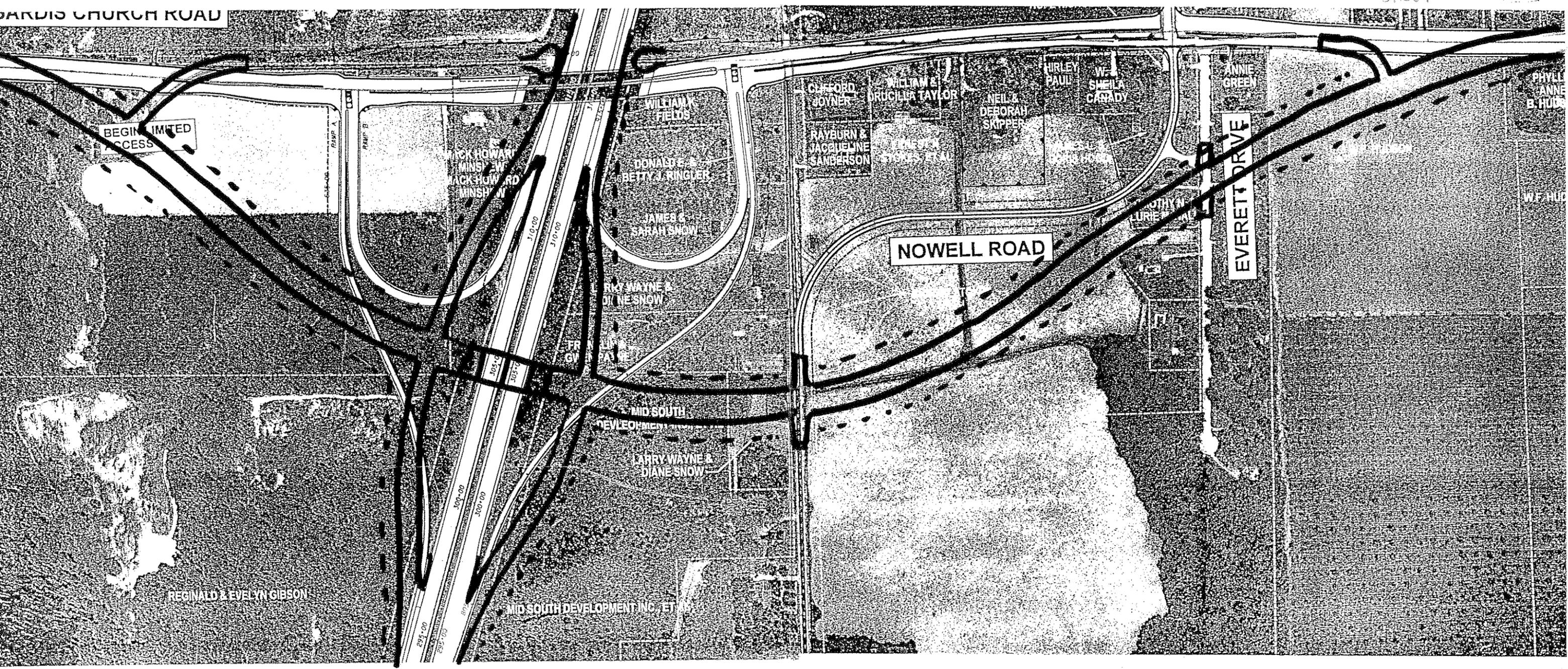
SHEET NO.: 2 of 5



NH-75-1(246) (I. No. 3/19 10, INTERCHANGE CONSTRUCTION)
SARDIS CHURCH ROAD AT I-75
SCALE: 1"=300'

ALTERNATE No. 1A

SHEET No. 3 of 5



7A

I-75

CALCULATIONS



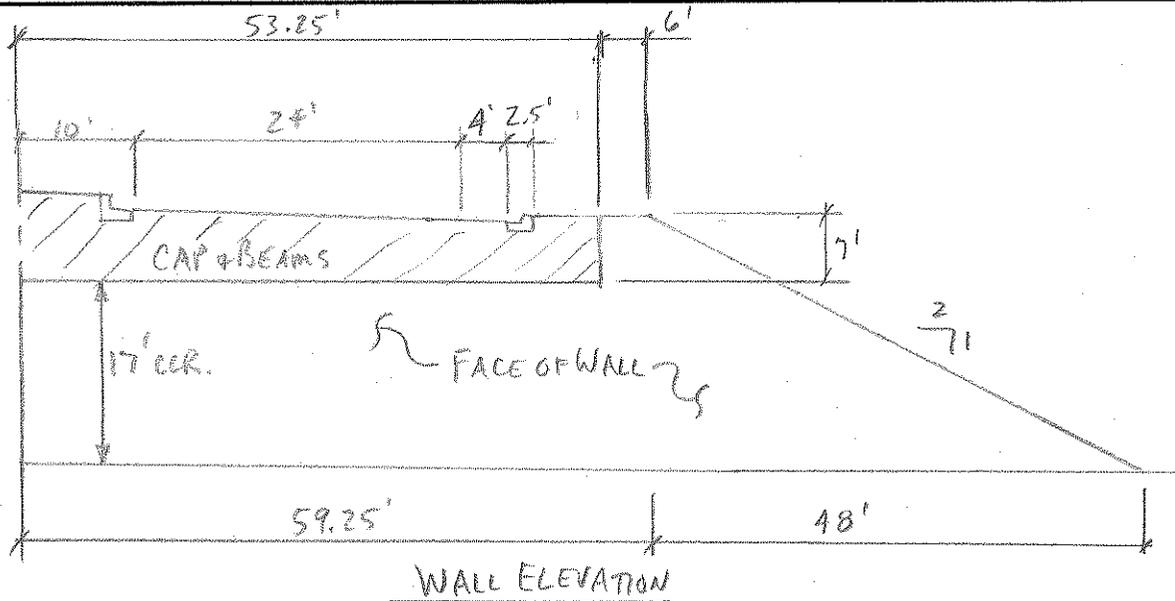
PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

1A

DESCRIPTION: RELOCATE SARDIS CHURCH INTERCHANGE TO THE SOUTH AND
 USE A DIAMOND CONFIGURATION W/ MSE WALL ABUTMENTS

SHEET NO.: 4 of 5



$$\text{AREA OF WALL} = 2(59.25 \times 17') + 2(6' \times 7') + (24' \times 48') = 3,250.5 \text{ SF}$$

x 2 WALLS
6,501 SF

$$\text{WALL COST} \Rightarrow 48.2 \text{ \$/SF (MSE WALL)} \times 6501 = \underline{\underline{\$ 313,348}}$$

$$\text{REVISED BRIDGE AREA} \Rightarrow (104.0 \times 2) \times 106.5 = \underline{\underline{22,152.0 \text{ SF}}}$$

$$\text{REVISED BRIDGE COST} \Rightarrow 82.5 \text{ \$/SF (ALT 2 BRIDGE)} \times 22,152 = \underline{\underline{\$ 1,827,540}}$$

$$\text{TOTAL COST} = \$2,140,888$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: **2**

DESCRIPTION: **ELIMINATE SARDIS CHURCH ROAD IMPROVEMENTS (FOUR LANES) WEST OF I-75**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design continues the construction of a four-lane section of Sardis Church Road west of the most current historic boundary, west of I-75, all the way to the western end of the property.

ALTERNATIVE: (Sketch attached)

End the construction of the four-lane section of Sardis Church Road at the point where the 660-ft. minimum distance from the Interstate on-ramp has been met.

ADVANTAGES:

- Decreases costs
- Decreases construction time
- Maintains historic boundary

DISADVANTAGES:

- None apparent

DISCUSSION:

The original design apparently was completed before the decision was made to decrease the historic boundary.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 286,407	—	\$ 286,407
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 286,407	—	\$ 286,407

**LIMIT OF CONSTRUCTION
STA. 100+00.00
SARDIS CHURCH ROAD**

SARDIS CHURCH ROAD

I-75

**BEGIN LIMITED
ACCESS**

← 540' →
Taper To
Exist. 2-Lane

660'
Min Dist. To
Entry From
Ramp

← End New Construction

Sketch 2-1
20 Scale
Sheet 2 of 4

CARLE
RUCKETT

GERTRUDE HUNT HUDSON

GERTRUDE HUNT HUDSON

WILLIAM HUDSON

JAMEL GIBSON

WILLIAM K.
FIELDS

DONALD E.
BETTY J. RINGLER

JAMES &
SARAH SNOW

LARRY WAYNE &
DIANE SNOW

FRANK
GWEN

WACK HOWARD
MINSHEW
WACK HOWARD
MINSHEW

325+00

325+00

325+00

320+00

320+00

320+00

315+00

315+00

315+00

310+00

310+00

310+00

305+00

305+00

305+00

305+00

310+00

310+00

305+00

305+00

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

2

DESCRIPTION: Eliminate Sardis Church Road Improvements
 (4 Lanes) West of I-75 (Sta 100+00 To 102+20) SHEET NO.: 4 of 4

Calculate Cost of Eliminated Road Construction:

Approx. 220 ft (± Sta 100+00 to 102+20)

Items:		Unit
Rec AC	12.5 (165lb/sy)	TN
Rec AC	19mm (220/sy)	TN
Rec AC	25mm (440lb/sy)	TN
GAB	12" (110lb/cf)	TN
Curb & Gutter		LF
Sidewalk		SY
ROW		Acres

Quantities:

Rec. AC 12.5mm (TN)

$$Q = 620 \text{ ft} \cdot 76 \text{ ft} \cdot \frac{1 \text{ SY}}{9 \text{ ft}^2} \cdot 165 \text{ lb/sy} \cdot \frac{1 \text{ TN}}{2000 \text{ lb}} = \underline{432 \text{ TN}}$$

Rec. AC 19mm (TN)

$$Q = 620 \cdot 76 \cdot \frac{1}{9} \cdot 220 \cdot \frac{1}{2000} = \underline{576 \text{ TN}}$$

Rec. AC 25mm (TN)

$$Q = 620 \cdot 76 \cdot \frac{1}{9} \cdot 440 \cdot \frac{1}{2000} = \underline{1152 \text{ TN}}$$

GAB 12" (TN)

$$Q = 620 \text{ ft} \cdot 82 \text{ ft} \cdot 1 \text{ ft} \cdot 110 \text{ lb/cf} \cdot \frac{1 \text{ TN}}{2000 \text{ lb}} = \underline{2796 \text{ TN}}$$

Curb & Gutter (LF)

$$Q = 620 \text{ ft} \cdot 2 = \underline{1240 \text{ LF}}$$

Sidewalk (SY)

$$Q = 5 \text{ ft} \cdot 620 \text{ ft} \cdot 2 \cdot \frac{1 \text{ SY}}{9 \text{ ft}^2} = \underline{689 \text{ SY}}$$

ROW (Acres)

$$Q = \frac{1}{2} \cdot 620 \text{ ft} \cdot 30 \text{ ft} = 9300 \text{ ft}^2$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY <i>Design Development</i>	ALTERNATIVE NO.:	4
DESCRIPTION:	ELIMINATE DITCH ON NORTH SIDE OF SARDIS CHURCH ROAD	SHEET NO.:	1 of 1

ORIGINAL DESIGN:

A 4-ft. flat bottom ditch is located behind the sidewalk on the north side of Sardis Church Road from Sta. 128+00 to Sta. 146+00, which impacts the historic property.

ALTERNATIVE:

Reduce the size of the ditch to what is needed to convey stormwater and remove ditch where possible to allow stormwater to flow over the sidewalk into the curb and gutter.

ADVANTAGES:

- Reduces impacts to historic property

DISADVANTAGES:

- Increases number of inlets and pipe sizes along curb and gutter

DISCUSSION:

This alternative would reduce the right-of-way impacts to the historical area and still provide conveyance of stormwater. A cost comparison could not be done since the number of additional inlets and increased pipe size could not be determined. Also, the required size of or need for a ditch could not be calculated without additional coverage.

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: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH
ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: 5

DESCRIPTION: **REDUCE MEDIAN WIDTH OF MINIMIZATION SECTION
TO ALLOW 12-FT. LANES**

SHEET NO.: 1 of 3

ORIGINAL DESIGN:

Twelve-ft. lanes with 4-ft. bike lanes are provided, but these are reduced to one 11-ft. lane and one 14-ft. shared lane in the area where the historical boundary is impacted.

ALTERNATIVE:

Reduce the median width in the area where the historical boundary is impacted to maintain 12-ft. lanes with 4-ft. bike lanes throughout the project.

ADVANTAGES:

- Maintains driver expectations

DISADVANTAGES:

- Reduces median width to 14 ft.

DISCUSSION:

Maintain 12-ft. lane widths and 4-ft. bike lanes throughout the project and reduce the median width to accommodate a reduction in right-of-way impacts to the historic property.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 28,564	—	\$ 28,564
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 28,564	—	\$ 28,564

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.: 5

DESCRIPTION:

*Reduce Median Width of Minimization Section
to Allow 12' Lanes*

SHEET NO. 2 of 3

Concrete Median - 1420 LF x 6 FT ÷ 9 SF/SY = 947 SY

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: **8**

DESCRIPTION: **CONNECT NB OFF-RAMP WITH NB ON-RAMP TO NOWELL ROAD**

SHEET NO.: **1 of 9**

ORIGINAL DESIGN: (Sketch attached)

The northbound off-ramp and northbound on-ramp currently connect into Sardis Church Road. This configuration requires a wide, 20-ft. median on Sardis Church Road to accommodate the left-turn movements.

ALTERNATIVE: (Sketch attached)

Connect the ramps at Nowell Road.

ADVANTAGES:

- No need for left-turn storage for these movements on Sardis Church Road
- Reduces number of displacements
- Reduces number of signals in the corridor

DISADVANTAGES:

- Narrower median does not allow room for landscaping
- Driver expectations may not be met because the entrance to I-75 is located far from the interchange

DISCUSSION:

This alternative allows Sardis Church Road to have a narrower median, thus reducing the impacts to the historic property. This configuration also allows the traffic leaving the freeway to directly access Skipper Road without zigzagging along Sardis Church Road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,064,267	—	\$ 1,064,267
ALTERNATIVE	\$ 677,187	—	\$ 677,187
SAVINGS (Original minus Alternative)	\$ 387,080	—	\$ 387,080



WILLIAM K. FIELDS

DONALD E. & BETTY J. RINGLER

JAMES & SARAH SNOW

LARRY WAYNE & DIANE SNOW

FRANKLIN & GWEN PAYNE

MID SOUTH DEVELOPMENT INC., ET AL

LARRY WAYNE & DIANE SNOW

OSWALD & GYNER

WILLIAM & DRUCILLA TAYLOR

RAYBURN & JACQUELINE SANDERSON

NEIL & DEBORAH SKIPPER

HIRLEY PAUL

W. J. SHELL & CANADY

ANNIE GREEN

TIMOTHY N. & LURIE M. HALL

NOWELL ROAD

EVERETT DRIVE

Alt. No. 8
Sheet 2 of 9

Alternative No:

8

Sheet 3 of 9



Begin Reduced Median STA 12210

End Reduced Median STA 14030

NOWELL ROAD

EVERETT DRIVE

Alt. No. 8
Sheet 3 of 9

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

8

DESCRIPTION:

SHEET NO.: 4 of 9

Calculations measuring only area within the median of Sardis Church Rd, and from Sta 909+00 on Ramp D and Sta 817+00 on Ramp C

Ramp D is $90100 - 90000 - 350 = 550$ ft longer in Original
 Original Design Ramp C is $82760 - 81700 - 490 = 610$ ft longer

Length of 20' median to be Replaced 1800'

Top 7 curb + gutter $2 \times 1800' = 3600'$

12.5mm Sardis Rd - 550' - Approx length of Left turn Lane + median, bench

$$550 \cdot 12 = 6600 \text{ sf}$$

Nowell rd	- From Alt 21 Estimate	70004 ft ²	
Ramp D	$(4+6.5) \cdot 550$	= 5775 ft ²	
Ramp C	$(4+6.5) \cdot 610$	= 6405 ft ²	
19mm Sardis Rd	= 6600 sf		
Nowell Rd	70004 sf		

Ramp D	- $(220 \frac{1}{2} \frac{1}{2} \text{ ft}^2)$	5775	
Ramp C	- $(220 \frac{1}{2} \frac{1}{2} \text{ ft}^2)$	6405	
		<u>88784</u>	

$88784 \cdot \frac{1 \frac{1}{2} \frac{1}{2}}{100} + 220 \frac{1}{2} \frac{1}{2} \cdot \frac{170}{1000} = 108571$

Ramp D	- $(370 \frac{1}{2} \frac{1}{2} \text{ ft}^2)$	29,550	= 15950
Ramp C	- $(370 \frac{1}{2} \frac{1}{2} \text{ ft}^2)$	16,610	9760
		<u>25710</u>	

$25710 \cdot \frac{1 \frac{1}{2} \frac{1}{2}}{100} + 370 \frac{1}{2} \frac{1}{2} \cdot \frac{170}{1000} = 47120$

1556



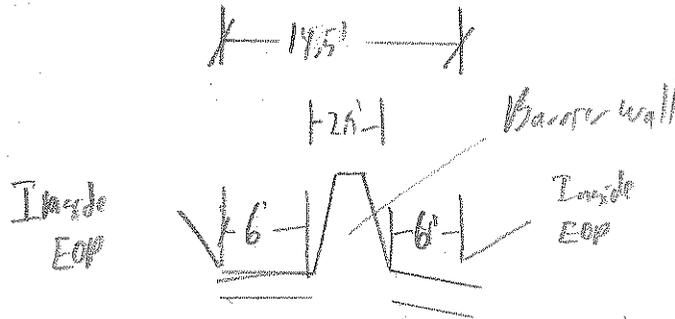
PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.:

AS DESIGNED

ALTERNATIVE

SHEET NO.: 6 of 9



Reduced median saves 3.5' total width of the cross section

Nowell Rd Section - Same as sardis church 5 lane section.

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:
 8

DESCRIPTION: CONNECT NB OFF-RAMP AND ON-RAMP TO Nowell Rd.

SHEET NO.: 7 of 9

ADD'L BARRIER COST: ALONG SARDIS CHURCH RD.

$$1800' \times 128 \text{ \$/LF (STANDARD MEDIUM BARRIER)} = \underline{\underline{\$ 230,400}}$$

ADD'L PAVEMENT COST: 6' EITHER SIDE OF BARRIER

402 - ASPHALT \Rightarrow (A) $1800'(6) \left(\frac{165 \#}{54} \right) / 9 = 2000 = 99.0 \text{ T} \times 80 \text{ \$/T} = \$ 7,920$

(J) $1800'(6) \left(\frac{220}{9} \right) = 2000 = 132 \text{ T} \times \text{' } = \$ 10,560$

(K) $1800'(6) \left(\frac{440}{9} \right) = 2000 = 264 \text{ OT} \times \text{' } = \$ 21,120$

310 - GAB $\Rightarrow 1800' \times 6' \times \left(\frac{110 \#}{9} \right) = 2000 = 594 \text{ T} \times 15.31 \text{ \$/T} = \underline{\underline{\$ 9,094}}$

\\$ 48,694

TOTAL ADDITION = \$279,094

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

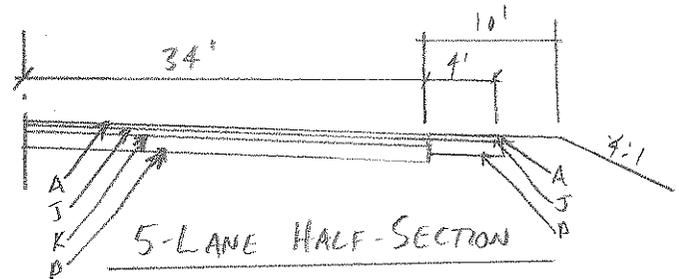
8

DESCRIPTION: CONNECT NB OFF-RAMP AND ON-RAMP TO NOWELL RD.

SHEET NO.: 8 of 9

ADD'L NOWELL ROADWAY COSTS =>

1,750 LF FROM RAMP INTERSECTION OF NOWELL RD TO SARDIS CHURCH RD.



$$310 - \text{GAB} \Rightarrow (38' \times 1' \times 1') \ 110 \#/\text{CF} \div 2000 = 2.09 \text{ T/LF} \times 15.31 \text{ \$/CY} = 32.0$$

$$402 - \text{ASPHACT} \Rightarrow \textcircled{A} \ 38' \ (165 \#/\text{sq yd}) \div 2000 = 3.14 \times 80 \text{ \$/T} = 250.8$$

$$\textcircled{J} \ 38' \ (220/\text{y}) \div 2000 = 0.46 \times \text{"} = 37.2$$

$$\textcircled{K} \ 34' \ (440/\text{y}) \div 2000 = 0.83 \times \text{"} = 66.5$$

386.4 \\$/LF

$$\text{ADD'L COST} = 1750 (386.4) =$$

=\$676,274

COST WORKSHEET



PROJECT: **NH-75-1(246), PI No. 311910, INTERCHANGE CONST.**
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO:

8

SHEET NO.: 9 of 9

DESCRIPTION

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
125mm	TN	815.1	80	65208	102.1	80	8168
19mm	TN	1556	80	124480	132.5	80	10600
25mm	TN	1444	80	115520	264.8	80	21184
GAB	TN	6297	15.91	96407	546.1	15.31	9125
PC Concrete	SF	2856	43.98	125607			
TP 7 curb + gutter	LF	3600	11.23	40428			
Barrier wall (TYPE 20)					1800LF	128	230,400
Subtotal				567481			279,477
Markup @ 1.10				56748			27,948
Subtotal				624229			307,424
Easement							
	SF	65628	0.48	31501	185946	0.48	89254
	SF	171096	0.24	41063	65628	0.24	15751
	Ea	5	20,000	100,000	2	20,000	40,000
Subtotal				172564			145005
Markup @ 155%				267974			224758
Subtotal				440538			369763
Sub-total							
Mark-up at							
TOTAL				1064267			677,187

VALUE ENGINEERING ALTERNATIVE



PROJECT: INTERCHANGE CONSTRUCTION—SARDIS CHURCH
 ROAD AT I-75, BIBB COUNTY
Design Development

ALTERNATIVE NO.: 14

DESCRIPTION: REPLACE URBAN SHOULDER WITH BIKE LANES WITH
 RURAL SECTION WITH BIKE LANES

SHEET NO.: 1 of 5

ORIGINAL DESIGN: (Sketch attached)

The original design shows a 4-ft. bike lane with a 12-ft. urban shoulder.

ALTERNATIVE: (Sketch attached)

Provide a 10-ft. rural shoulder with 4-ft. bike lane.

ADVANTAGES:

- Pulls in limits by 6 ft.
- Reduces impacts to surrounding property

DISADVANTAGES:

- Increases difficulty to add a sidewalk in the future, if it is needed

DISCUSSION:

Use of a rural shoulder will reduce the overall typical section width by 12 ft., thus reducing the impacts on the surrounding historic properties and reducing the costs of constructing the sidewalk and curb and gutter. The rural shoulder will allow room for a bike lane but does not allow room for a sidewalk.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,901,931	—	\$ 1,901,931
ALTERNATIVE	\$ 1,506,927	—	\$ 1,506,927
SAVINGS (Original minus Alternative)	\$ 395,004	—	\$ 395,004



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

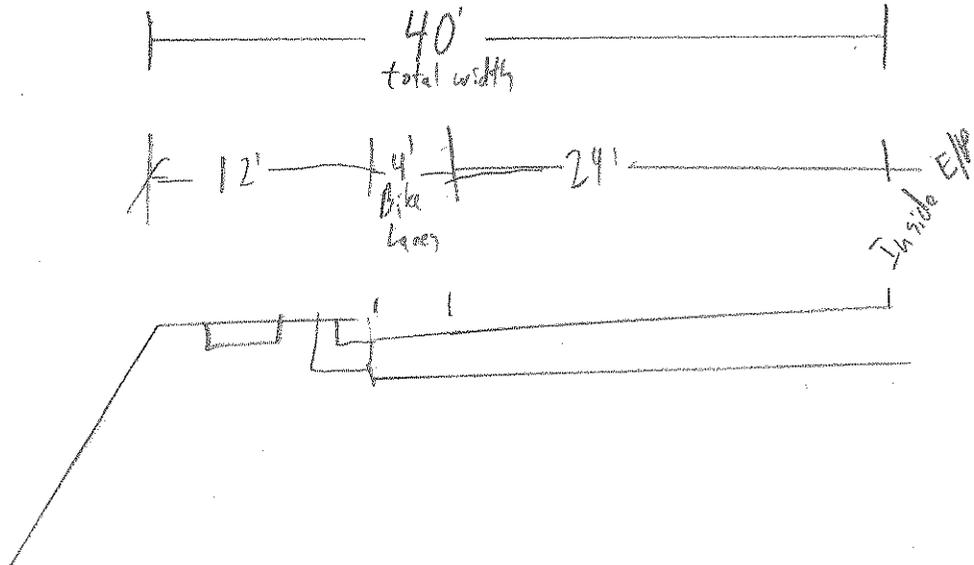
ALTERNATIVE NO.:

14

AS DESIGNED

ALTERNATIVE

SHEET NO.: 2 of 9

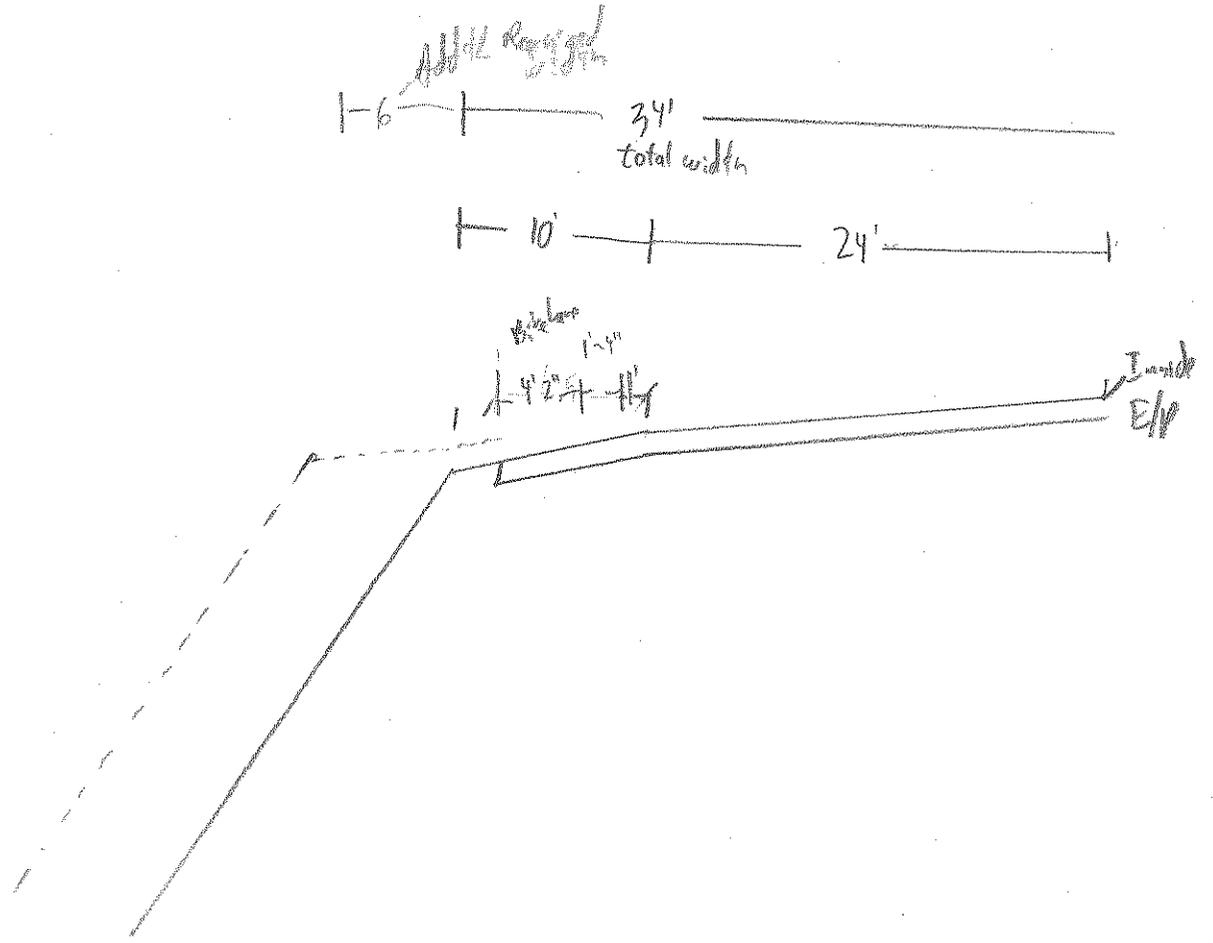


PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.:
14

AS DESIGNED ALTERNATIVE

SHEET NO.: 3 of 5



CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

14

DESCRIPTION:

SHEET NO.: 4 of 9

Original
 12.5 mm 24 + 4 = 28'
 19 mm = 28'
 25 mm = 28'
 GAB (24 + 4 + 3) · 1.1 · 110 ^{lb}/_{ft} = 3910
 Curb & Gutter 1 x 55 45.57
 Sidewalk 5' · 55 45.57

total
 $155 275.96 \text{ ft}^2 = 17253 \text{ yd}^2 / 165 = 104 578$
 $= 17253 \cdot 1.20 / 100 = 18984$
 $= 17253 \cdot 1.40 / 100 = 24154$
 18910394 = 99556
 5546 ft =
 $2 7728 \text{ ft}^2 = 3080 \text{ yd}^2$

Alternate
 12.5 mm 24 + 1 + 4 + 4' 2" = 30'
 19 mm 30'
 25 mm 24
 GAB (30) · 1.1 · 110 ^{lb}/_{ft} = 3700 ^{lb}/_{ft}
 Asphalt Curb 55 45

$166367 = 18485 \cdot 165 / 100 = 15257$
 $166367 = 18485 \cdot 170 / 100 = 15633$
 $133093 = 14788 \cdot 140 / 100 = 20703$
 $1830071 = 9150 \text{ TN}$
 5545 LF

Quantities as measured from the inside EOP to shoulder break point

Note additional shoulder reqd. for placement of guardrail is not shown because the additional costs would be the same for entire section

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH
ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: **15**

DESCRIPTION: **DO NOT INCLUDE SIDEWALK IN PROJECT**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The project includes a 5-ft. sidewalk on both sides of Sardis Church Road.

ALTERNATIVE:

Do not include sidewalk in project but maintain section for placement at a later date.

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- None apparent

DISCUSSION:

There is no pedestrian movement noted in the area. Also, there are currently no sidewalks on either side of Sardis Church Road. Room will be provided to add a sidewalk at a later date.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 181,645	—	\$ 181,645
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 181,645	—	\$ 181,645

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.: 15

DESCRIPTION: *Do Not Include Sidewalk in Project*

SHEET NO.: 2 of 3

Sidewalk - 11,150 LF \times 5' \div 95 SF/SY = 6,194 SY

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH
ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: 17

DESCRIPTION: **REEVALUATE INTERSECTION OF SKIPPER, NOWELL,
AND EVERETT**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

See attached sketch.

ALTERNATIVE: (Sketch attached)

Intersect Nowell Road and Everett Drive with a "T" intersection. Pave Everett Drive and relocate to intersect Skipper Road.

ADVANTAGES:

- Reduces right-of-way impacts

DISADVANTAGES:

- Adds pavement costs

DISCUSSION:

Realign Nowell Road and Everett Drive, as shown on the attached sketch, to reduce right-of-way impacts.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 49,440	—	\$ 49,440
ALTERNATIVE	\$ 17,192	—	\$ 17,192
SAVINGS (Original minus Alternative)	\$ 32,248	—	\$ 32,248

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.: 17

DESCRIPTION: Reevaluate Intersection of Skipper, Howell + Everett Drives

SHEET NO.: 2 of 4

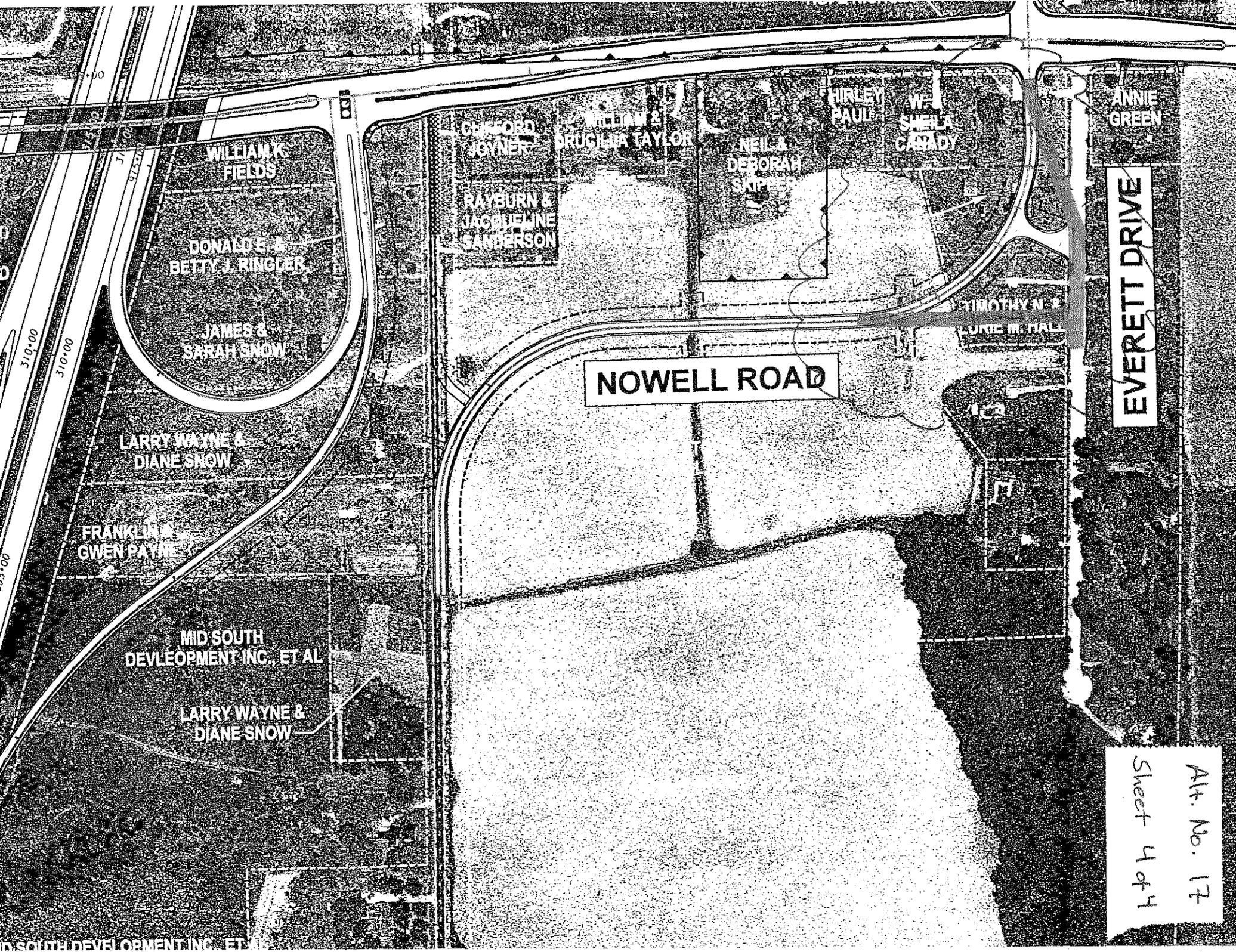
Add'l Pavement: New Alignment - 1100 LF
 Old " - 925 LF
 175 LF Add'l Pavement

12.5 mm Superpave - $175 \text{ LF} \times 24 \text{ ft} \div 9 \text{ ft}^2/\text{sq} \times 165 \text{ #}/\text{sq} \div 2000 \text{ #}/\text{ton} = 39 \text{ Tons}$
 19 mm " - $175 \times 24 \div 9 \times 220 \div 2000 = 51 \text{ Tons}$
 25 mm " - $175 \times 24 \div 9 \times 440 \div 2000 = 103 \text{ Tons}$

Traffic Strip - Solid - 700 LF

R/W - New Alignment - $600 \text{ LF} \times 100' = 60,000 \text{ SF}$
 Old Alignment - $600 \text{ LF} \times 100' = 60,000 \text{ SF}$ } Same

1 Less Relocation



WILLIAM K
FIELDS

DONALD E &
BETTY J RINGLER

JAMES &
SARAH SNOW

LARRY WAYNE &
DIANE SNOW

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LARRY WAYNE &
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CHESTER
JOYNER

WILLIAM &
ARUELLA TAYLOR

RAYBURN &
JACQUELINE
SANBERSON

NEIL &
DEBORAH
SKIPP

HURLEY
PAUL

W
SHEILA
CADDY

ANNIE
GREEN

NOWELL ROAD

EVERETT DRIVE

TIMOTHY N
LURIE III TALL

Alt. No. 17
Sheet 4 of 4

VALUE ENGINEERING ALTERNATIVE



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: 19

DESCRIPTION: **USE CABLE BARRIER IN PLACE OF DOUBLE-SIDED STEEL BARRIER**

SHEET NO.: 1 of 1

ORIGINAL DESIGN:

The proposed design uses the standard GDOT corrugated steel barrier on both sides of steel posts.

ALTERNATIVE:

Replace the steel barrier with the standard steel cable barrier.

ADVANTAGES:

- Safer, more efficient system

DISADVANTAGES:

- None apparent

DISCUSSION:

This alternative will need to be investigated further to determine whether it is feasible to use the cable barrier for the required project length.

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: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY**
Design Development

ALTERNATIVE NO.: 21

DESCRIPTION: **USE A "T" INTERSECTION AT NOWELL ROAD AND NOWELL ROAD CONNECTOR**

SHEET NO.: 1 of 5

ORIGINAL DESIGN: (Sketch attached)

The original design shows Nowell road curving into Everett Drive intersection.

ALTERNATIVE: (Sketch attached)

Provide a connector between Nowell Road and Everett Drive. This connector ties in at "T" intersection. Everett ties into Sardis Church Road at a skew.

ADVANTAGES:

- Requires more agricultural right-of-way and less residential right-of-way
- Saves displacement

DISADVANTAGES:

- Traffic counts may require Nowell Road to have continuous through movements

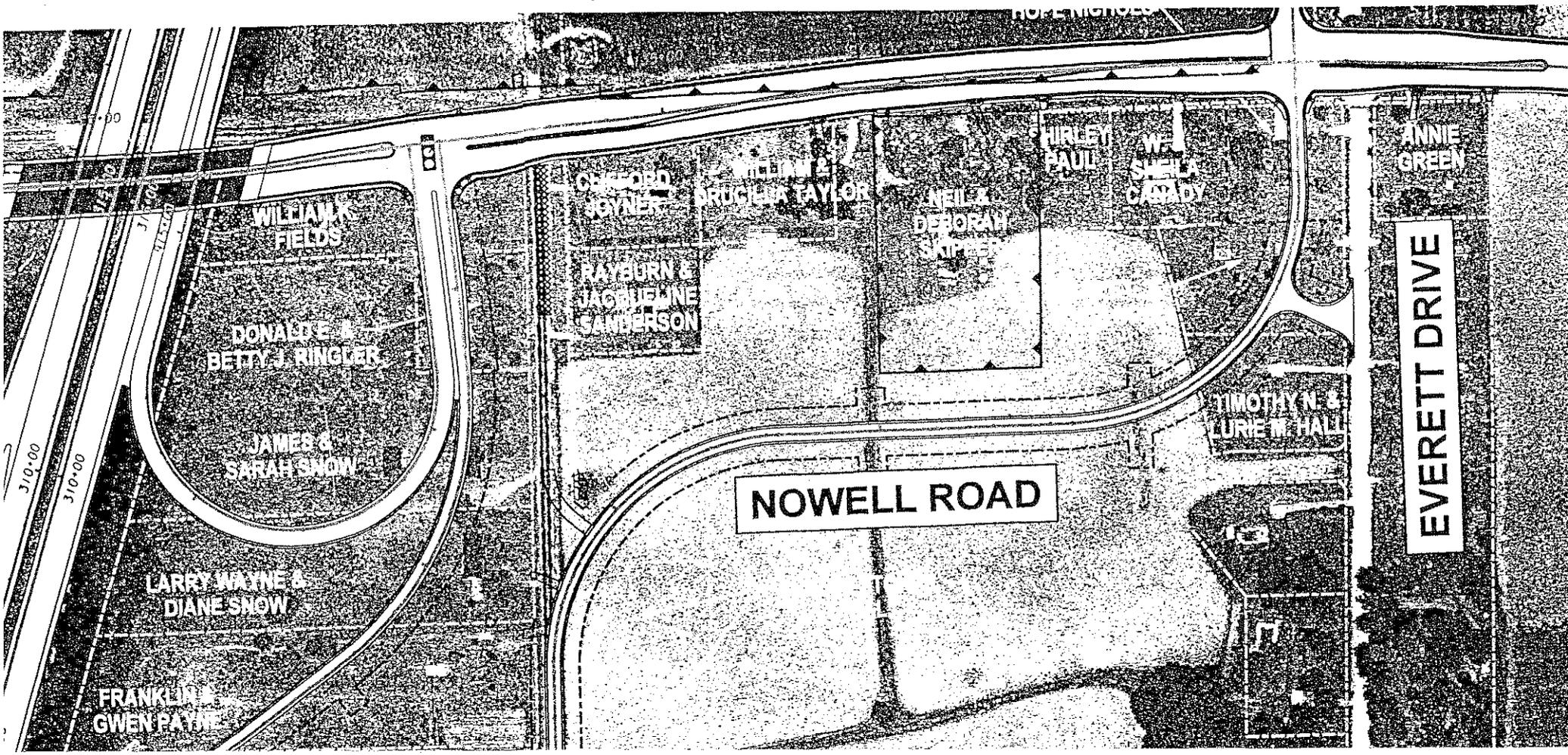
DISCUSSION:

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 679,153	—	\$ 679,153
ALTERNATIVE	\$ 486,402	—	\$ 486,402
SAVINGS (Original minus Alternative)	\$ 192,751	—	\$ 192,751

Alternative
21

Sheet 2 of 5

Original design

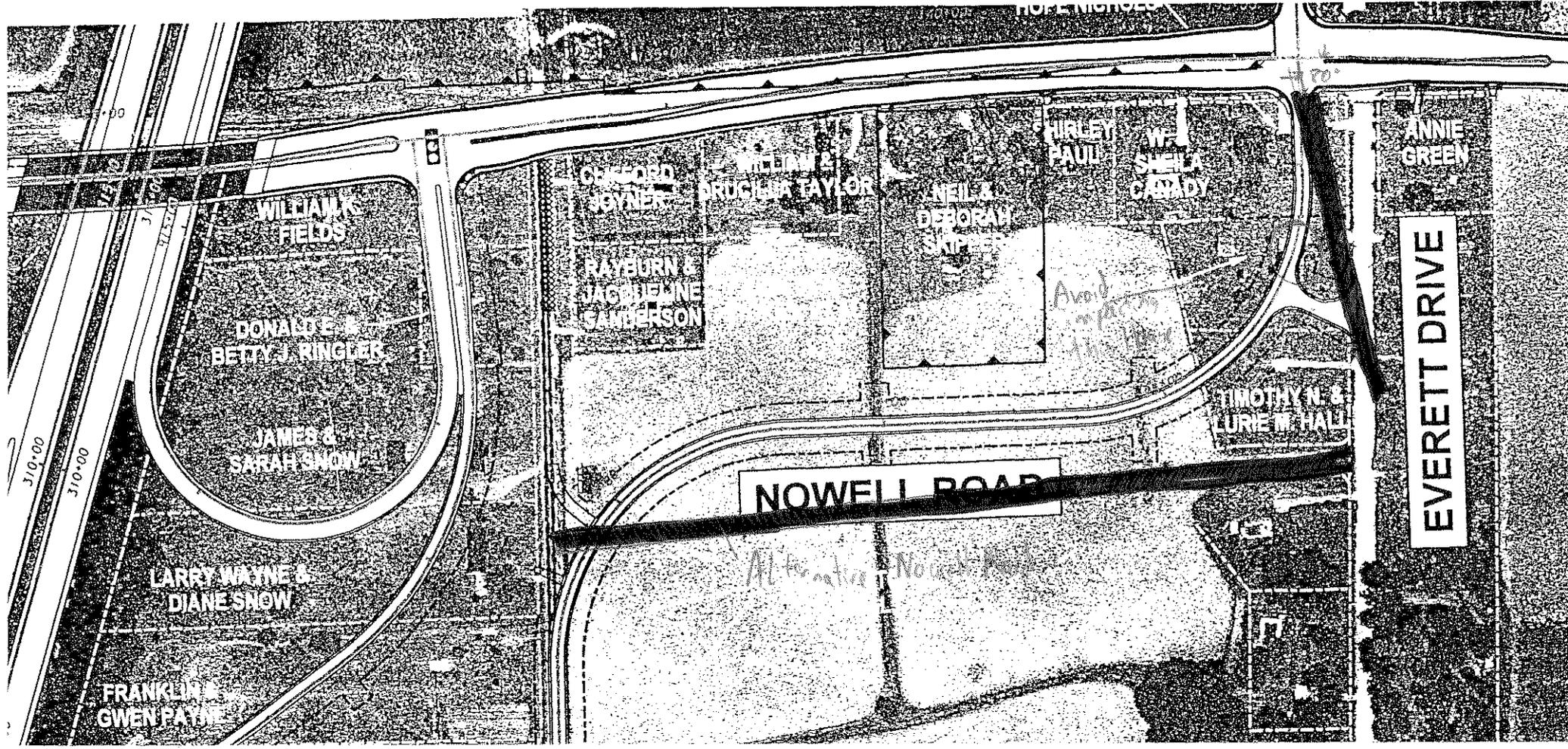


Alternative No.:

21

Sheet 3 of 5

Alternate Design



CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
 SARDIS CHURCH ROAD AT I-75
 Bibb County, Georgia Department of Transportation, District 3
 Design Development

ALTERNATIVE NO.:

12

DESCRIPTION:

SHEET NO.: 4 of 5

2187.6 LF Nowell Rd

12.5 mm (4 + 12 + 12 + 4) · 2187.6 = 70004 ft²

$\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 165 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 641 \text{ TN}$

19 mm (4 + 12 + 12 + 4) · 2187.6 = 70004 ft²

$\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 220 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 855 \text{ TN}$

25 mm (12 + 12) · 2187.6 = 52502 ft²

" $\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 440 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 1283 \text{ TN}$

GAB (4 + 12 + 12 + 4) · 2187.6 = 70004 ft²

" $\frac{110 \text{ lb}}{\text{ft}^2} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 385 \text{ TN}$

R/w 85 ft wide · 2187.6 = 185946 ft²

approx 15 ft/side · 2 sides · 2187.6 = 65628 ft²

displacements 2

1100 LF Nowell Rd

550 LF Event drive

12.5 mm (4 + 12 + 12 + 4) 1650 = 52800 ft²

$\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 165 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 481 \text{ TN}$

19 mm (4 + 12 + 12 + 4) 1650 = 52800

$\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 220 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 645 \text{ TN}$

25 mm (12 + 12) 1650 = 39600

" $\frac{1 \text{ in}^2}{4 \text{ ft}^2} \cdot 440 \frac{\text{in}}{\text{side}} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 968 \text{ TN}$

GAB (4 + 12 + 12 + 4) 1650 = 52800 ft²

" $\frac{110 \text{ lb}}{\text{ft}^2} \cdot \frac{1 \text{ in}}{1000 \text{ lb}} = 2904 \text{ TN}$

R/w 85 ft wide · 1650 = 140250

15 ft/side · 2 sides · 1650 = 49500

displacements 1

COST WORKSHEET



PROJECT: **NH-75-1(246), PI No. 311910, INTERCHANGE CONST.**
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO:

21

SHEET NO.: 5 of 5

DESCRIPTION

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
12.5 mm	TN	641	80	51,280	484	80	38,720
19 mm	TN	855	80	68,400	645	80	51,600
25 mm	TN	1253	80	102,640	968	80	77,440
GAB	TN	3850	15.31	58,944	2904	15.31	44,460
Subtotal				281,264			212,220
Markup @10%				30,930			23,542
R/w Costs							
R/w	SF	185,946	0.48	89,254	140,250	0.48	67,320
Embedment	SF	65,628	0.24	15,751	49,500	0.24	11,880
Displacement	Each	2	20,000	40,000	1	20,000	20,000
Subtotal				145,005			99,200
Markup @15%				22,475			15,376
Subtotal				369,763			25,296
Sub-total							
Mark-up at							
TOTAL				679,153			486,402

VALUE ENGINEERING ALTERNATIVE



PROJECT:	INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, BIBB COUNTY <i>Design Development</i>	ALTERNATIVE NO.:	30
DESCRIPTION:	USE 11-FT. TRAVEL LANES ALONG SARDIS CHURCH ROAD	SHEET NO.:	1 of 3

ORIGINAL DESIGN: (Sketch attached)

The original design shows 12-ft. travel lanes with 4-ft bike lanes and curb and gutter.

ALTERNATIVE: (Sketch attached)

Use 11-ft. travel lanes with 4-ft bike lanes and curb and gutter.

ADVANTAGES:

- Reduces right-of-way impacts to historic property

DISADVANTAGES:

- None apparent

DISCUSSION:

Reduction in the width of travel lanes will have no effect on traffic and will reduce impacts to historic properties.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 275,533	—	\$ 275,533
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 275,533	—	\$ 275,533

CALCULATIONS



PROJECT: NH-75-1(246), PI No. 311910, INTERCHANGE CONSTRUCTION
SARDIS CHURCH ROAD AT I-75
Bibb County, Georgia Department of Transportation, District 3
Design Development

ALTERNATIVE NO.: 30

DESCRIPTION: Use 11' Travel Lanes Along Sardis Church Rd

SHEET NO.: 2 of 3

$$6144 \text{ LF} - 398 \text{ LF (Bridge)} = 5746 \text{ LF} \times 4 \text{ ft} \div 9 \text{ ft/5y} = 25545 \text{ yd}$$

$25545 \text{ yd} \times 165 \text{ \#/yd} \div 2000 \text{ \#/ton} =$	211 Tons	12.5 mm Superpave
220	281 Tons	19 mm Superpave
440	562 Tons	25 mm Superpave

$$25545 \text{ yd} \times 9 \text{ ft/5y} = 22,986 \text{ SF}$$

$$\text{Bridge} = 398 \text{ LF} \times 4 \text{ ft} = 1592 \text{ SF}$$

PROJECT DESCRIPTION

BACKGROUND

The Macon Area Transportation Study (MATS) first identified the need for the proposed interchange and a multi-lane arterial to provide improved access between U. S. Interstate Highway 75 (I-75) and U.S. Route 129 (US 129)/State Route 247 (SR 247) in the 2015 MATS Long Range Transportation Plan, completed in 1994. The need is again cited in the 2030 MATS Long Range Plan. The combination of improvements would provide direct interstate access to the Middle Georgia Regional Airport (Lewis B. Wilson Airport) and Industrial Park in Bibb County and Warner Robins Air Force Base in Houston County. Currently, east-west movements from the interstate are hampered by the lack of a grid surface street continuity between I-75 and US 129/SR 247. I-75/SR 401 is a six-lane facility functionally classified as an urban interstate connecting Atlanta with Macon, Warner Robins Air Force Base, and Valdosta. County Road 717 (CR 717)/Sardis Church Road is a major collector from Hartley Bridge Road to SR 111.

COMMUNITIES SERVED

The proposed interchange is located approximately halfway between Macon and Warner Robins Urbanized Areas and would serve a triangle of three counties: Bibb, Houston, and Peach. In 1990, Bibb County, which includes the Macon Urbanized Area, had a population of about 150,000; Houston County, which includes the Warner Robins Urbanized Area and the City of Perry, had a population of about 111,000; and Peach County, with the Cities of Fort Valley and Byron, had a population of close to 25,000. While the population of Bibb County has remained stable over the past 20 years, Peach County has experienced strong growth and Houston County has experienced very aggressive growth and is considered one of the fastest growing counties in Georgia.

U.S. Census Year	Bibb County	Houston County	Peach County
1960	141,249	39,145	13,846
1970	143,366	62,924	15,990
1980	150,256	77,605	19,151
1990	149,967	89,208	21,189
2000	153,877	110,765	24,655
1960 - 2000 Growth	8.94%	182.96%	78.07%

Population Growth for Bibb, Houston and Peach Counties Over 40 Years

Although Bibb County has experienced only moderate growth, the county has experienced fairly rapid residential development. The area adjacent to the proposed interchange and east of I-75 along Sardis Church and Walden Roads is rapidly changing from agricultural and rural residential to suburban medium-density residential. The relatively vibrant economies of these middle Georgia counties are strongly dependent on Warner Robins Air Force Base and various support industries.

INTERCHANGE SPACING

The proposed Sardis Church Road interchange is located about 2 miles (3.20 kilometers) south of the Hartley Bridge Road interchange and slightly more than 4 miles north of the SR 49 interchange.

Interchange	Distance in Miles (mi)	Distance in Kilometers (km)
SR 247C / SR 49	3.30	5.31
SR 40 to Sardis Church Road	4.18	6.73
Sardis Church Road to Hartley Bridge Road	2.04	3.28
Hartley Bridge Road to I-475	1.10	1.77
I-475 to US 41 / SR 247	3.16	5.08
AVERAGE SPACING	2.76	4.44

Center-to-Center Spacing for Existing Interchanges and Propose Interchange

Interchange spacing regulations specify a minimum of 2 miles between rural interchanges and 1 mile between urban interchanges, and the proposed Sardis Church Road interchange meets the interchange spacing requirements.

EXISTING, DESIGN YEAR, AND FUTURE TRAFFIC

Level of Service (LOS) is defined as a quantitative measure describing operational conditions within a traffic stream. There are six identified LOSs with letters “A” through “F,” LOS “A” represents the best operating conditions, and LOS “F” represents the worst. LOS “C” is considered acceptable and marks the beginning range of traffic flow in which level of driving comfort declines noticeably on the roadway, LOS “E” represents at or near capacity for traffic flow, and LOS “F” represents heavily congested flow with traffic demands exceeding capacity.

The 2005 Average Annual Daily Traffic (AADT) on I-75 is 74,000 vehicles per day measured between the Crawford County line and Hartley Bridge Road, providing a “C” LOS. The no-build design traffic volumes in the year 2030 on I-75 for said interchange shows 135,000 AADT, an “E” LOS. During 2004, Sardis Church Road carried an AADT of about 2,200 vehicles per day.

NEEDS AND PURPOSE

Currently, east-west movements from I-75 are hampered by poor surface street continuity between I-75 and US 129/SR 247 and two at-grade railroad crossings. In addition, the common section of US 41/US 129/SR 247, a divided six-lane facility, is congested and constrained by the numerous bridge crossings

over the Tobesofkee Creek and Rocky Creek floodplains. Nearly every adopted Macon transportation plan has identified this section of US 41/US 129/SR 247 as constricting to travel. The combination of the proposed interchange and multi-lane arterial (P.I. No. 0000566 scheduled for construction in 2009) would provide direct access to the Middle Georgia Region Airport and Industrial Park in Bibb County and Warner Robins Air Force Base in Houston County. The proposed facilities would also provide an alternate route for traffic using a common section of US 41/US 129/SR 247, improving connectivity and travel time for residents of southern Bibb County. Another benefit of the proposed improvements is accommodating the existing and future traffic demands on I-75 through the associated widening.

PROJECT LOCATION

The proposed project is located in the southern part of Bibb County, south of the I-475/I-75 interchange and the Hartley Bridge Road interchange. The project begins about 1.18 miles (1.89 km) south of Sardis Church Road and ends about 0.45 miles (0.72 km) north of Sardis Church Road along I-75. The project also extends Sardis Church Road from 1.89 miles (3.04 km) west of I-75 to 3.05 miles (4.91 km) east of I-75. The project lengths are 1.16 miles (1.87 km) on Sardis Church Road and 1.63 miles (2.62 km) on I-75.

DESCRIPTION OF APPROVED CONCEPT

The proposed concept will construct a partial cloverleaf AB interchange at I-75 and Sardis Church Road located on the south side of Sardis Church Road. The existing bridge over I-75 will be replaced to accommodate future widening of I-75 as well as a 16.5-ft. (5.03 meters) clearance height. To maintain an acceptable LOS along I-75 for the design year, auxiliary lanes will be added in both directions from Hartley Bridge Road to Sardis Church Road. Sardis Church Road will be widened to a four-lane roadway: Two lanes in each direction divided by a 20-ft. (6.1 m) raised median. The project will include 8-ft. (2.4 m) paved shoulders and 4-ft. (1.2 m) paved bicycle lanes on both sides of Sardis Church Road within the project limits. The proposed widening will extend from just east and west of I-75 and connect the proposed local project, STP-0000-00(566), that extends in an easterly direction to SR 247/Hawkinsville Road.

The project termini on I-75 were extended to include the widening on I-75 that was originally included in the Hartley Bridge Road project since the Hartley Bridge Road project let date is currently a year ahead of this project's let date. It is, thus, more economical to add the widening on I-75 near Sardis Church Road to this project. The project limits extend the project terminus to 1.18 miles (1.99 km) south of and 0.45 miles (0.72 km) north of Sardis Church Road on I-75.

In addition, the proposed project will extend the current Macon ITS (Intelligent Transportation System) from about 500 ft. south of Tobesofkee Creek along I-475 to the beginning of the project limits on I-75.

PROJECT COSTS

The current estimated cost of construction is \$30,970,484 and is based on the Kimley-Horn and Associates, Inc., document entitled *Estimate Report for file "311910,"* dated June 13, 2006. This figure includes an Engineering and Construction (E&C) Rate of 10.00% (\$2,815,499) and no escalation. The

Preliminary Right-of-Way Cost Estimate, prepared by GDOT, is \$7,836,651 and includes a Scheduling Contingency of 55.00% (\$1,241,405), an Administration/Court Cost of 60.00% (\$2,099,103), and an Inflation Factor of 40.00% (\$2,239,043). Thus, the total project cost is \$38,807,135.

VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis procedure used during the VE study. It is followed by separate narratives and conclusions concerning:

- Value Engineering Workshop Participants
- Economic Data
- Cost Estimate Summary and Cost Histogram
- Function Analysis
- Creative Idea Listing and Judgment 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

Preparation for the VE workshop 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

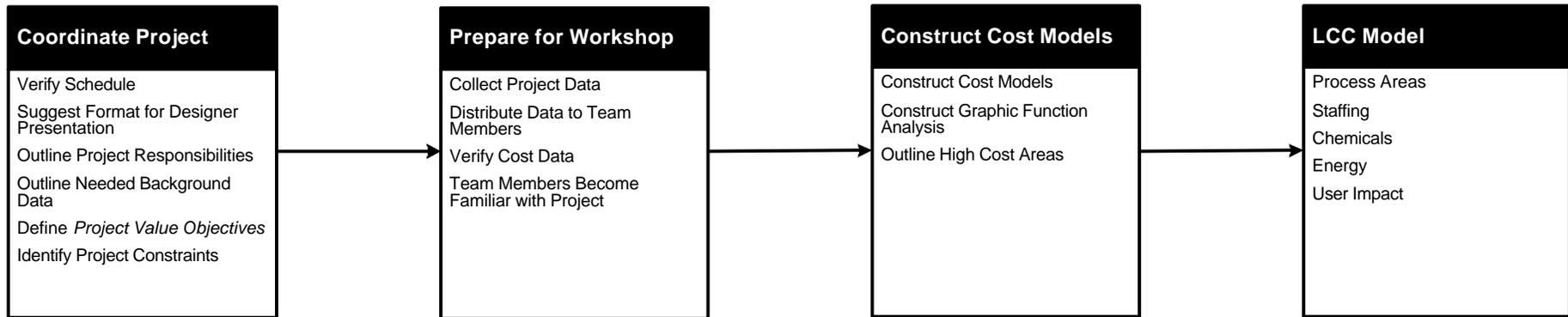
The VE workshop was a three-day effort (see attached agenda). During the workshop, the VE Job Plan was followed. The job plan guided the search for high-cost areas in the project and included procedures for developing alternative solutions for consideration. For this study, the following five phases of the Job Plan were conducted:

- Information Phase
- Function Identification and Analysis Phase
- Speculation Phase
- Evaluation Phase
- Development Phase

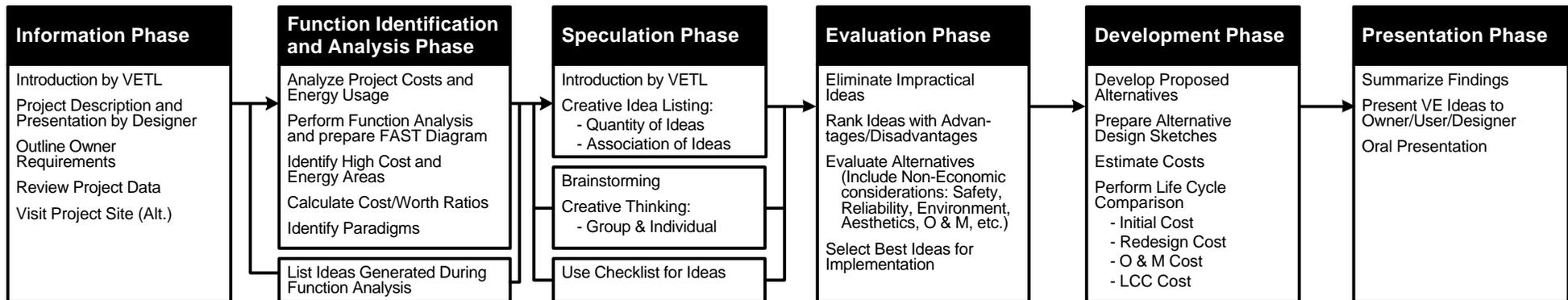


Value Engineering Study Task Flow Diagram

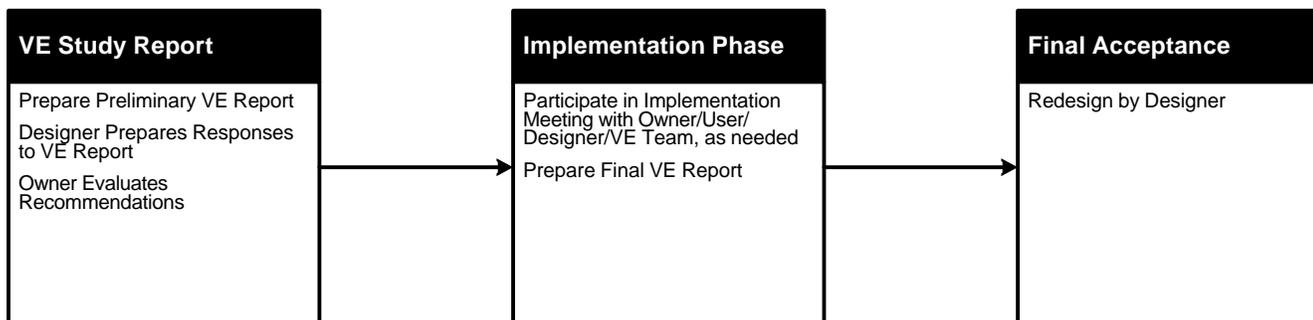
Preparation Effort



Workshop Effort



Post-Workshop Effort



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 development manager presented information about the project to the VE team on the first day of the session. Following the presentation, the VE team discussed the project using the following documents:

- **Revised Project Concept Report**, prepared by the Department of Transportation, State of Georgia, Office of Preconstruction, for the I-75 New Interchange at Sardis Church Road, Project Number NH-75-1(246) Bibb County, P.I. No. 311910, dated May 30, 2006
- **Detailed Estimate Report for file "311910,"** prepared by Kimley-Horn and Associates, Inc., dated June 13, 2006
- **Preliminary Right-of-Way Cost Estimate**, prepared by the Department of Transportation, State of Georgia, Office of Right-of-Way, dated November 18, 2005
- **Half Size Copy of Original Plan and Profile** of Interchange Construction, Sardis Church Road at I-75, prepared by Kimley-Horn and Associates, Inc., dated April 3, 2006
- **General Highway Map**, Bibb County, prepared by the Department of Transportation, Division of Planning and Programming, Planning Data Services in cooperation with the U.S. Department of Transportation, Federal Highway Administration, dated 1986
- **Aerial** of the NH-75-1(246) project indicating the proposed new Sardis Church Road and I-75 Interchange and Sardis Church Road Typical Section, prepared by Kimley-Horn and Associates, Inc., dated June 28, 2006
- **Sardis Church Road Minimization Section**, prepared by Kimley-Horn and Associates, Inc., undated

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 to 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 using random function generation techniques, resulting in the attached Random Function Analysis worksheet and Function Analysis Systems Technique (F.A.S.T.) diagram.

Speculation 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 KHA representatives 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 Speculation 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.

The VE team would like to develop all ideas, but time constraints usually limit the number that can be developed. Therefore, each idea was compared with the present design concept 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 1 to 5, with the best ideas rated 5. Scores were summed for each idea and only highly rated ideas 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 highly 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 of this report.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study includes the preparation of this Value Engineering Study Report. Personnel from GDOT and the KHA design team will 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. LZA is available at your convenience as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

VALUE ENGINEERING STUDY AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will conduct a 24-hour Value Engineering (VE) study on the **NH-75-1(246), P. I. No. 311910, Interchange Construction, Sardis Church Road at I-75** project located in Bibb County, Georgia. It is expected the owner, the Georgia Department of Transportation (GDOT) and the design team headed by Kimberly-Horn and Associates, Inc. (KHA) will be available to make a formal presentation concerning the project at the beginning of the workshop and be available to answer questions during the VE study effort.

VE Study Agenda

The VE study will follow the outline described below and be conducted July 19 – 21, 2006. The study will be conducted in Room 274, Personnel Conference Room in GDOT's General Office located at No. 2 Capitol Square Street, Atlanta, Georgia 30334. The point-of-contact is Ms. Lisa L. Myers, Design Review Engineer Manager, who can be reached at 404-651-7468.

Wednesday, July 19th

9:00 am – 9:15 am **General Introduction of all Parties and review of the VE Process**

9:15 am - 11:15 am **Owner's / Designer's Presentation**

GDOT and KHA are to present information concerning the project including, but not necessarily limited to: rationale for design; criteria for specific areas of study; project constraints and the reasons for design decisions.

11:15 am - 12:00 noon **Commence Function Analysis Phase**

The VE team will continue their familiarization with the cost models and project data for each area of study. The cost model(s) will be refined, as necessary; define the function of each project element or system in the cost model, select the primary or basic functions, and determine the worth, or least cost, to provide the function. Cost / worth or value index ratios will be calculated, and high cost / low worth areas for study identified. In addition, the VE team will continue defining the function of each element / system to gain a thorough understanding of the project's needs and requirements.

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

1:00 pm - 5:00 pm **Conclude the Function Analysis Phase and Commence the Creative Phase**

The VE 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.

Thursday, July 20th

8:30 am - 10:00 am **Conclude Creative Phase and Complete Evaluation / Analytical Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas for further development.

10:00 am - 12:00 noon **Development Phase**

VE team will develop creative ideas into alternate design solutions. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives for change will be developed and supported with sketches, calculations and written substantiation.

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

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

Friday, July 21st

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

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

1:00 pm - 4:00 pm **Conclude Development Phase and Commence Summary Worksheets**

Upon completion of the Development Phase, the VE facilitator will commence preparation of the summary worksheets based on the alternatives developed by the VE team. The summary work sheets form the basis of the informal oral presentation.

4:00 – 5:00 pm **Finalize Summary Worksheets**

The VE team will provide draft copies of the *Summary of Potential Cost Savings* worksheets to GDOT representatives and be available to clarify any points.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

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

Name	Specialization	Affiliation
Bradley R. Ehrman, PE	Civil Engineer	GDOT, Office of Road and Airport Design
Dominic F. Saulino	Transportation Engineer	HNTB
Lawrence D. Prescott, PE	Structural/Bridge Engineer	HNTB
Jeffery G. Dingle, PE	Construction/Specialist/Transportation Engineer	Delon Hampton and Associates
Luis M. Venegas, PE, CVS, LEED® AP	Value Engineering Facilitator	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

The KHA design team presented an overview of the project on Wednesday, July 19. The purpose of this meeting, in addition to being an integral part of the Information 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. A list of the meeting participants is attached for reference.

VALUE ENGINEERING TEAM'S FINAL PRESENTATION

The VE team did not conduct a final presentation to GDOT and KHA. However, copies of the Summary of Potential Cost Savings worksheets were provided for interim use by GDOT personnel.

VALUE ENGINEERING ATTENDEES

MEETING PARTICIPANTS



PROJECT: INTERCHANGE CONSTRUCTION— SARDIS CHURCH ROAD AT I-75, Bibb County <i>Design Development</i>		Date: July 19 – 21, 2006
NAME & E-MAIL (PLEASE PRINT)	ORGANIZATION/TITLE	PHONE/FAX
Steve Carter em: steve.carter@dot.state.ga.us	GDOT Engineering Services Design Review Engineering Manager	ph: 404-651-7469 cell: fx: 404-463-6131
Bradley (Brad) R. Ehrman, PE em: brad.ehrman@dot.state.ga.us	GDOT, Office of Road and Airport Design Assistant Design Group Manager	ph: 404-656-5409 cell: fx: 404-657-0653
Sharon Evans em: sharon.evans@dot.state.ga.us	GDOT, Office of Traffic and Safety Design Traffic Safety Design Engineer II	Ph: 404-635-8155 cell: fx: 404-635-8116
Daniel Gethi em: daniel.gethi@dot.state.ga.us	GDOT, Bridge Design Transportation Engineer Associate	Ph: cell: fx:
John Hancock, PE em: john.hancock@dot.state.ga.us	GDOT, Engineering Services Design Review Engineer	ph: 404-651-7463 cell: fx: 404-463-6131
Theresa R. Holder, PE em: theresa.holder@dot.state.ga.us	GDOT, Office of Urban Design Design Group Manager	ph: 404-656-5444 cell: fx: 404-657-2791
Joe King, EIT em: joe.king@dot.state.ga.us	GDOT, Office of Bridge Design Bridge Engineer III	ph: 404-656-5195 cell: fx: 404-651-7076
Richard Marshall em: richard.marshall@dot.state.ga.us	GDOT, General Office – Construction Liaison Engineer	ph: 404-656-5306 cell: fx: 404-657-0783
Jennifer Mathis em: jennifer.mathis@dot.state.ga.us	GDOT, Office of Environmental/Location Supervisor Appraisal Estimator	ph: 404-699-4408 cell: fx: 404-699-4440
Gerald A. Milligan em: jerry.milligan@dot.state.ga.us	GDOT, Office of Right-Of-Way Supervisor Appraisal Estimator	ph: 770-986-1541 cell: fx: 770-986-1558
Lisa L. Myers em: lisa.myers@dot.state.ga.us	GDOT, Engineering Services Design Review Engineer Manager/VE Coordinator	ph: 404-651-7468 cell: fx: 404-463-6131

VALUE ENGINEERING ATTENDEES

MEETING PARTICIPANTS



PROJECT: INTERCHANGE CONSTRUCTION— SARDIS CHURCH ROAD AT I-75, Bibb County Design Development		Date: July 19 – 21, 2006
NAME & E-MAIL (PLEASE PRINT)	ORGANIZATION/TITLE	PHONE/FAX
Lamar M. Pruitt, Jr. em: lamar.pruitt@dot.state.ga.us	GDOT, District 3 – Construction Assistant District Engineer/District Construction Engineer	ph: 706-646-6569 cell: fx: 706-646-6584
William B. Pate, PE em: bill.pate@kimely-horn.com	Kimley-Horn and Associates, Inc. Director of Structures	ph: 678-533-3904 cell: 678-596-4584 fx: 770-825-0074
Jeffery G. Dingle, PE em: jdingle@delonhampton.com	Delon Hampton & Associates, Chartered Vice President, Southern Regional Office, Construction Specialist and Transportation Engineer	ph: 404-524-8030 cell: 404-427-0155 fx: 404-524-2575
Lawrence (Larry) Prescott, Jr., PE em: lprescott@hntb.com	HNTB Corporation Director of Structural Engineering	ph: 404-946-5743 cell: 77-231-8579 fx: 404-841-2820
Dominic (Dom) F. Saulino em: dsaulino@hntb.com	HNTB Corporation Director of Transportation	ph: 404-946-5743 cell: 706-313-1762 fx: 404-841-2820
Luis M. Venegas, PE, CVS, LEED® AP em: lvenegas@lza.com	Lewis & Zimmerman Associates, Inc. VE Facilitator	ph: 770-992-3032 cell: 678-488-4287 fx: 770-435-2666
em:		ph: cell: fx:

ECONOMIC DATA

The VE team developed economic criteria used for evaluation with information gathered from GDOT and the KHA design team. 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:	2006
Construction Startup:	2007
Construction Duration:	±24 Months (2009)
Economic Planning Life:	35 years for Pavement
Economic Planning Life:	50 years for Bridges
Discount Rate/Interest:	2.65% (Latest United States Office of Management and Budget Circular A-94)
Inflation/Escalation Rate:	5.00% (Per GDOT)
Uniform Present Worth (UPW) Factor:	22.6284 for 35 years 27.5310 for 50 years
Composite Markup (Construction): <i>(Composed of Engineering and Construction at 10.00% and 0.00% Inflation)</i>	10.00% (1.1000)
Composite Markup (Right-of-Way): <i>(Composed of Scheduling Contingency at 55.00%, Administration/Court Costs at 60.00%, and Inflation Factor at 40.00 %)</i>	247.20% (2.4720)

COST HISTOGRAM

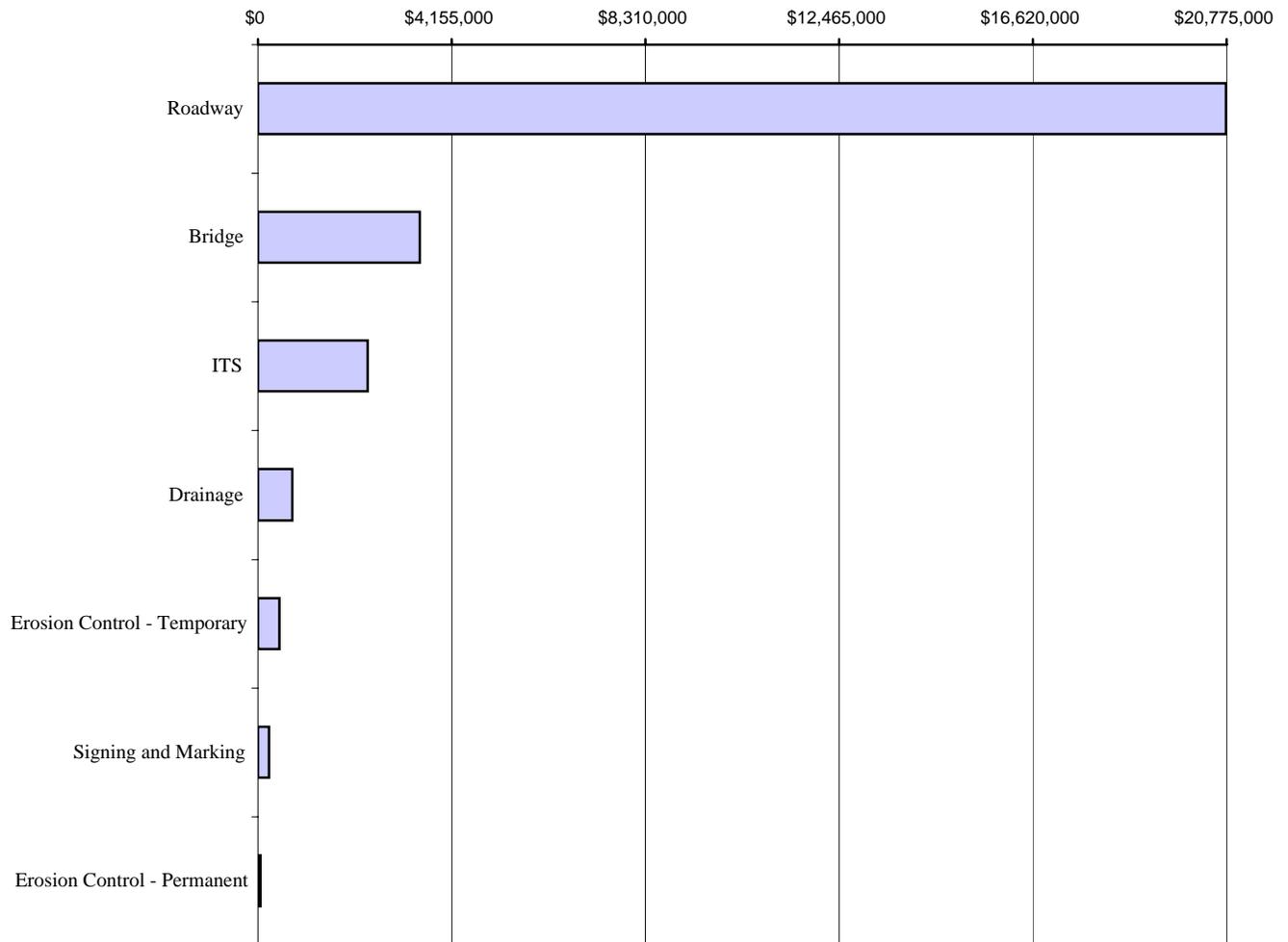
The VE Team Leader prepared a cost model for the project that is included following this page. The cost model is arranged in the Pareto Charting/Cost Histogram format to aid in identifying high-cost areas and is based on the KHA cost estimate, dated June 13, 2006. Based on this model, there appears to be a potential for initial savings in the following areas:

- Roadway
 - Portland Cement Concrete Pavement
 - In Place Embankment
 - Recycled Asphalt Concrete
 - Aggregate Base Course
 - Clearing and Grubbing
- Bridge
- IT System
- Drainage
 - Storm Drain Pipe
 - Class A Concrete
 - Catch Basins
- Temporary Erosion Control
 - Silt Fencing
 - Grassing
 - Water Quality Inspections
- Signing and Marking
 - Steel Strain Pole
 - Traffic Signal Installation
 - Traffic Striping
- Permanent Erosion Control
 - Grassing
 - Soil Reinforcing Mat
 - Fertilizer Mixed Grade

COST HISTOGRAM



Project: INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, Bibb County			
<i>Design Development Stage</i>			
TOTAL PROJECT	COST	PERCENT	CUM. PERCENT
Roadway	20,773,835	73.78%	73.78%
Bridge	3,489,000	12.39%	86.18%
ITS	2,372,000	8.42%	94.60%
Drainage	744,682	2.64%	97.25%
Erosion Control - Temporary	468,635	1.66%	98.91%
Signing and Marking	243,868	0.87%	99.78%
Erosion Control - Permanent	62,965	0.22%	100.00%
Construction Subtotal	\$ 28,154,985	100.00%	
Engineering and Construction @ 10.00%	\$ 2,815,499		
Inflation Based on 5.00% per annum for One Year 0.00%	\$ -		
Construction Total	\$ 30,970,484		
Net Right-of-Way	\$ 2,257,100		
Right-of-Way Scheduling Contingency 55.00%	\$ 1,241,405		
Right-of-Way Administration / Court Costs 60.00%	\$ 2,099,103		
Right-of-Way Inflation Factor 40.00%	\$ 2,239,043		
Right of Way Total	\$ 7,836,651		
GRAND TOTAL	\$ 38,807,135		
		Construction	10.00%
		Mark-Up:	
		ROW	247.20%
		Mark-Up:	



Costs in graph are not marked up.

FUNCTION ANALYSIS

A function analysis was performed to (1) define the requirements for each project element and (2) to ensure a complete and thorough understanding by the VE team of the basic function(s) needed to attain a given requirement. A Random Function Analysis worksheet for the project is attached. This part of the function analysis stimulated the VE team members to think in terms of the areas in which to channel their creative idea development.

Function Analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project, or if there are disproportionate amounts of money spent on support functions. These elements add cost to the final product but have a relatively low worth to the basic function.

In addition to the random function analysis, the VE Team Leader worked with members of the study team to develop a Function Analysis System Technique (F.A.S.T.) diagram. The F.A.S.T. diagram was used to show the flow of functions within the phases. It helps to confirm the project is addressing those issues that have been voiced by the owner as being important. The diagrams were generated by asking the key question, "What is the most important function to be accomplished by this phase?" The answer is characterized by a verb/noun pair. In turn, another question is asked: "Why?" The answer is again listed in a verb/noun pair, and the process continued from left to right. If the result is a true F.A.S.T. diagram, the flow of functions from right to left will answer the question, "Why?" No F.A.S.T. diagram is ever completed. The readers of this report may wish to challenge themselves to see how far they can carry the construction of the F.A.S.T. diagram.

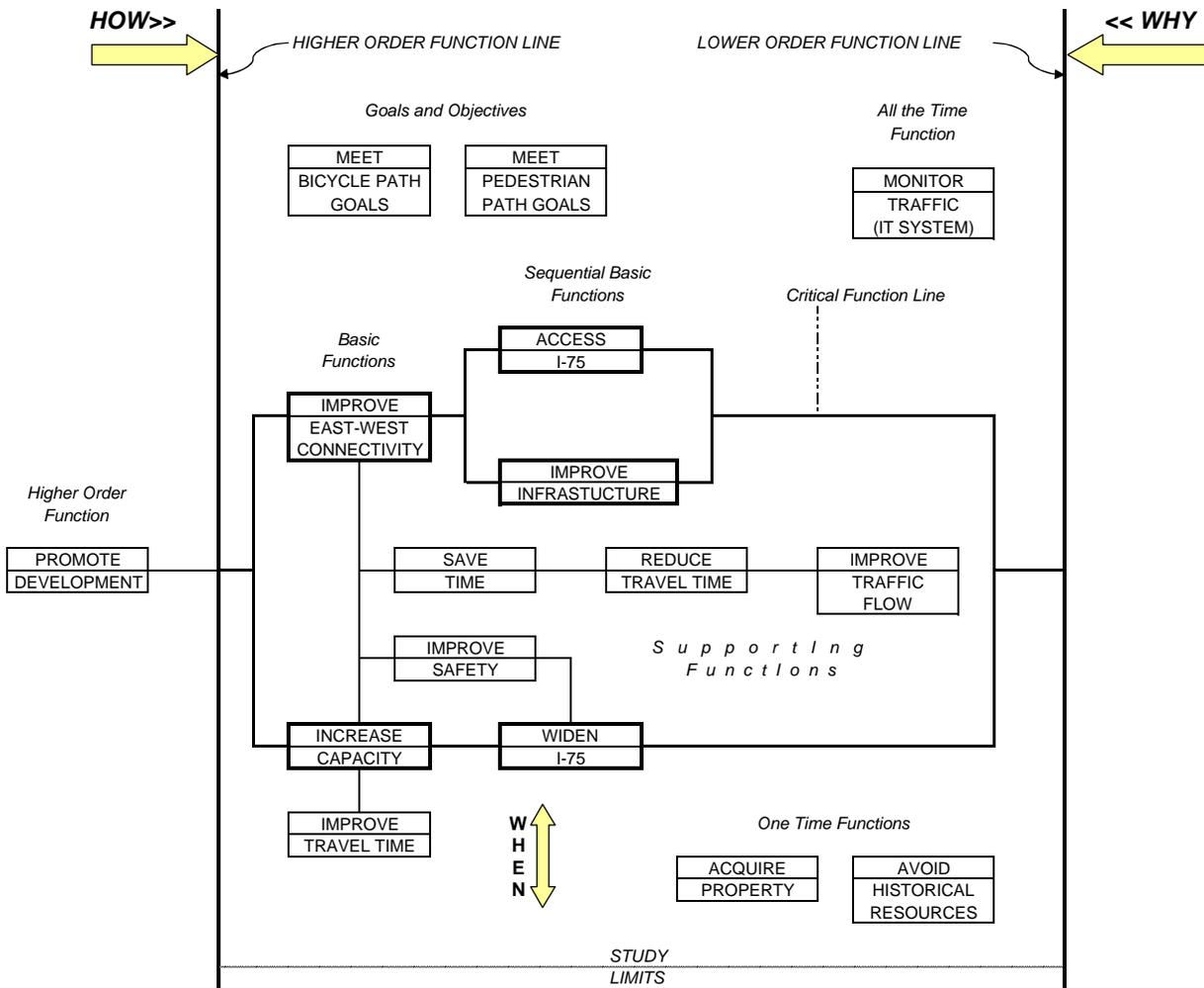
This F.A.S.T. diagram notes the critical function paths and identifies the project's basic functions as Improve/East-West Connectivity by Accessing/I-75 and Improving/Infrastructure and also to Increase/Capacity by Widening I-75, thereby improving/safety, facilitating/mobility, reducing/travel time, and improving arterial efficiency. The F.A.S.T. diagram follows the Random Function Analysis worksheet.

FUNCTION ANALYSIS SYSTEMS TECHNIQUE (F. A. S. T.)
INTERCHANGE CONSTRUCTION, SARDIS CHURCH ROAD AT I-75



NH-75-1(246), P. I. No. 311910

Georgia Department of Transportation, District 3
 Bibb County, Georgia



CREATIVE IDEA LISTING AND JUDGMENT OF IDEAS

During the Speculation Phase, numerous ideas, alternative proposals, and/or recommendations were generated using conventional brainstorming techniques as recorded on the following pages.

These ideas were then discussed and the advantages/disadvantages of each listed. The VE team compared each of the ideas with the current design to determine whether it improved value, was equal in value, or lessened the value of the solution.

The ideas were then ranked on a scale of 1 to 5 on how well the VE design team believed the idea met necessary criteria and program needs. The higher rated ideas were then developed into formal alternatives and included in the VE workshop. Some ideas were judged to have minimal cost impacts on the project but provided enhancements in the form of improved operations, efficiency, constructability, or potential to save unknown or hidden costs. These were given the designation "DS" which indicates a design suggestion. This designation is also used when an idea is difficult to price but improves the functionality of the project or system and is deemed to be of significant value to the owner, user, operator, or designer.

Typically, all ideas rated 4 or above are included in the Study Report. When this is not the case, an idea was combined with another related idea or discarded as a result of additional research that indicated the concept as not being cost effective or technically feasible.

All readers are encouraged to review the Creative Idea Listing worksheets since they may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: **INTERCHANGE CONSTRUCTION—SARDIS CHURCH ROAD AT I-75, Bibb County** SHEET NO.: **1 of 2**
Design Development

NO.	IDEA DESCRIPTION	RATING
1	Relocate interchange further south and use a diamond configuration	4
2	Do not construct further west than new development	4
3	Shift Nowell Road further south	3
4	Eliminate ditch on north side of Sardis Church Road	4
5	Reduce the median width of the minimization cross section to allow 12-ft. lanes	4
6	Relocate interchange north of current location and access I-75 from Skipper Road	2
7	Maintain historic <u>structures</u> and construct interchange as a diamond configuration	1
8	Connect the northbound I-75 off-ramp with a realigned Nowell Road	4
9	Realign the new Sardis Church Road bridge to be more perpendicular with I-75	2
10	Provide a southbound I-75 off-ramp north around the historic property to Sardis Church Road	2
11	Provide a northbound I-75 on-ramp from Skipper Road around historic property from Sardis Church Road	2
12	Use a SPUI (Single-Point Urban Interchange) at the proposed Sardis Church Road interchange	3
13	Do not construct the fourth lane on I-75	1
14	Eliminate the curbs, gutters, and sidewalks	4
15	Eliminate the sidewalks	4
16	Eliminate the bicycle lanes	2
17	Reevaluate the intersection of Skipper Road, Nowell Road, and Everett Drive	4
18	Provide a 6:1 cross slope on the I-75 mainline in lieu of 4:1	2
19	Use a cable barrier system on the I-75 mainline	DS
20	Eliminate Nowell Road improvements	1
21	Use a “T” intersection at Nowell Road and Nowell Road Connector	4
22	Tighten up/constrict the I-75 northbound off-ramp and the southbound on-ramp	3
23	Use steel bridge	2
24	Use elevated ramps to avoid historic properties from westbound Sardis Church Road to I-75 northbound and from I-75 southbound to Sardis Church Road	1
25	Have the I-75 mainline go over Sardis Church Road	1
26	Redevelop Skipper Road to four lanes and connect to collector-distributor system of the Hartley Bridge interchange and eliminate the Sardis Church Road interchange—provide a new bridge	1
27	Provide a diamond interchange at the present location and challenge SHPO (State Historic Preservation Office) and environmentalists	1

Function defined as: Action Verb Kind: B = Basic HO = Higher Order G = Goal
 Measurable Noun S = Secondary LO = Lower Order U = Unwanted
 RS = Required Secondary O = Objective

