



Georgia Department of Transportation

SR 53 Widening
STP-1267(8) Oconee County
P.I. No. 142060

Value Engineering Study Report
50% Design Stage

August 2007

Design Consultant
Moreland Altobelli Associates, Inc.

Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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September 13, 2007

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 STP-1267(8), P. I. No.142060, Widening and Reconstruction of SR 53/
Experiment Station Road, CR 264/Mars Hill Road, and CR 261 Oconee Connector from SR
15/Main Street to SR 316/University Parkway, Oconee 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 objective of the VE effort was to identify opportunities that would increase capacity and improve safety along the subject corridor, while reducing capital costs.

The project follows the existing alignment of SR 52/Experiment Station Road, CR 264/Mars Hill Road, and CR 261/Oconee Connector by widening the facility on both sides. Population and commercial growth within the region have been steadily increasing, so the objective of this project is to provide better traffic flows between the two heavily traveled state routes.

Although the design reflects a prudent, well engineered solution reflecting the needs of GDOT for this corridor, right-of-way costs have actually exceeded actual construction costs. Therefore, the VE team focused its efforts on reducing these costs without impeding traffic flow or safety.

We thank you and your staff for your hospitality and the use of your office space, and for providing the information necessary for the VE team to generate creative, alternative solutions for this project.

We are available to answer any questions you may have as you review this report and determine implementation.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

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

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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). The subject of the study was the SR 53/Mars Hill Road/Oconee Connector, STP-1267(8), P. I. No. 142060, Oconee County, Georgia. The project is being designed by Moreland Altobelli Associates, Inc. (MAAI).

PROJECT DESCRIPTION

The project is a combination of STP-1261(6) and STP-1267(8), now known as STP-1267(8), P. I. No. 142060, and includes Experiment Station Road (SR 53), Mars Hill Road (County Road (CR) 264), and the Oconee Connector (CR 261) from SR 15 in Watkinsville to University Parkway (SR 316).

The proposed construction will provide a four-lane urban roadway, two 12-ft. lanes in each direction with a 20-ft. raised grass median, 4-ft. bicycle lanes, and 5-ft. sidewalks on each side. A short, five-lane urban section (\pm 1,800 feet) will extend from the beginning of the project to just south of Veterans of Foreign Wars (VFW) Drive. The existing bridge culverts over Calls Creek, Butler Creek, Lampkin Branch, Barber Creek Tributary, and Parker Branch will be extended, and the existing bridge over Barber Creek will be widened to accommodate the new lanes.

CONSTRUCTION COSTS

The probable cost of construction, based on MAAI's cost estimate dated August 14, 2007, is \$28,279,958. In addition, right-of-way (ROW) costs, based on the Department's Preliminary Right of Way Cost Estimate, dated September 21, 2006, are \$45,230,816. MAAI's estimate did not include Engineering and Construction (E&C) or escalation markups, so the VE team added 10% for E&C and 13.69% for escalation, yielding a composite markup rate of 25.06%.

As a consequence, the final probable cost of construction is \$80,597,491 which includes a construction subtotal of \$35,366,674 and ROW costs of \$45,230,816.

CONCERNS AND OBJECTIVES

The project is relatively straightforward, with a functional purpose of increasing capacity and improving safety along the corridor. Population and commercial growth within the region have been steadily increasing, with no signs of immediate slow-down. The project provides for better traffic flows between two heavily traveled state routes: SR 15/Main Street in Watkinsville and SR 316/University Parkway, facilitating through-traffic between Athens to the north and Interstate Highway 20 to the south.

The project follows the existing alignment of SR 52/Experiment Station Road, CR 264/Mars Hill Road, and CR 261/Oconee Connector by widening the facility on both sides, leading to ROW costs that actually exceed construction costs.

The overall objective of the VE effort was to identify opportunities that would improve the value of the project in terms of fulfilling the basic functions of increasing capacity to accommodate economic development in the area while improving safety and, where logically possible and warranted, reducing capital cost. It is this last objective that was the driving force for most of the alternatives generated by the VE team, as the design reflects a prudent, well-engineered solution reflecting the needs of GDOT.

HIGHLIGHTS OF THE STUDY

Highlighted below are some of the ideas developed by the VE team during the workshop.

Alternative Numbers (Alt. Nos.) 1 and 2 address two different solutions to help reduce the cost of ROW. However, both solutions require a variance to GDOT's standards. Alt. No. 1 uses 11-ft-wide lanes throughout the project in lieu of the standard of 12-ft-wide lanes. This reduction amounts to more than \$4,330,000 in ROW costs without jeopardizing the effective increase in capacity, as the design and posted speeds will be a maximum of 45 miles per hour.

Alt. No. 2 reduces the as-designed, standard 16-ft. shoulders to 12-ft. shoulders. Even with this reduction, no loss of amenities is experienced, i.e., the sidewalks and bicycle lanes would remain a part of the project. ROW cost savings for this alternative are nearly \$4,000,000.

Numerous alternatives were developed to address the overall safety of the corridor. Alt. No. 36 provides a raised median at the beginning of the project along the only section of the corridor that is proposed to have a flush median. This is the location where SR 53/Experiment Station Road intersects with SR 15/Main Street containing many drives and businesses, creating a vast number of crossings, conflicts, and turning movements. Although users would be required to travel greater distances to make safer traffic movements, and an additional \$660,000 would be required, the safety of this section of the corridor is immensely improved.

Numerous "U" turns are proposed throughout the widening. "U" turns are inherently conflicting traffic movements that could lead to potential accident points. Alt. Nos. 17, 22, and 28 eliminate the "U" turns at VFW Drive, Watkinsville Bypass southbound ramps, and Cliff Dawson Road. Savings would be \$47,000, \$44,000 and \$44,000, respectively.

In a continuing effort to improve safety, Alt. No. 14 eliminates the proposed signal at Durham Street, and Alt. No. 26 eliminates the existing signal at the McDonald's south of Hog Mountain Road. The Durham Street intersection has an extremely low volume count and does not warrant a signal, thereby increasing traffic flow and eliminating unexpected stops and potential rear-end accidents. Savings for this alternative are about \$100,000. Access to McDonald's and other businesses can easily be achieved from Hog Mountain Road and other intersections/driveways along SR 53/Experiment Station Road, eliminating two signalized intersections within 500 feet of each other and saving nearly \$162,000.

It was stated during the presentation phase of the VE study that Durham Street was being realigned at SR 53/Experiment Station Road to accommodate the needs of the Oconee County Sheriff Department to facilitate the transfer of detainees between the Sheriff's compound and the courthouse on SR 15/Main Street. Two improvements to this concern are offered: Alt. No. 9 realigns Durham Street to be directly in front of the Sheriff's building in lieu of the current proposed intersection with the U.S. Post Office for a savings of more than \$1,790,000; and Alt. No. 7 extends Durham Street to the south to tie directly into the courthouse complex and avoid additional turns and delays in detainee exchanges. Although increasing costs by almost \$1,950,000, the efficiencies could outweigh the added costs.

SUMMARY

The Summary of Potential Cost Savings worksheet following this narrative outlines all of the alternatives and design suggestions developed by the VE team. Some of the alternatives are mutually exclusive or interrelated, so 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 Section 4 of this report.



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 Final Design Stage						
PRESENT WORTH OF COST SAVINGS						
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
1	Use 11-ft. lanes to reduce right-of-way costs	\$ 4,336,554		\$ 4,336,554		\$ 4,336,554
2	Use 12-ft. shoulders instead of 16-ft. shoulders	\$ 4,062,200		\$ 4,062,200		\$ 4,062,200
6	Reduce the number of 72-inch bulb tees for the bridge over Barber Creek	\$ 1,039,291	\$ 1,006,163	\$ 33,128		\$ 33,128
7	Realign Durham Street to the south to connect with the Courthouse Complex		\$ 1,195,101	\$ (1,195,101)		\$ (1,195,101)
9	Realign Durham Street to Oconee County Sheriff Department's parcel, i.e. on the north side	\$ 2,536,852	\$ 747,181	\$ 1,789,671		\$ 1,789,671
11	Eliminate Water Street access onto SR 53/Experiment Station Road		DESIGN SUGGESTION			
14	Eliminate signal at the Durham Street intersection	\$ 100,048		\$ 100,048		\$ 100,048
16	Cul-de-sac Harris Shoal Drive close to SR 53/Experiment Station Road and access Harris Shoal Park from VFW Drive	\$ 101,549	\$ 46,342	\$ 55,207		\$ 55,207
17	Eliminate "U" turn lane at VFW Drive	\$ 63,170	\$ 16,404	\$ 46,766		\$ 46,766
18	Replace the three 10-ft. x 8-ft. box culverts at Calls Creek with two 16-ft. x 9-ft. CON/SPAN® type culverts	\$ 390,187	\$ 232,111	\$ 158,076		\$ 158,076
20	Reduce the width of the southern Watkinsville Bypass ramps	\$ 136,729		\$ 136,729		\$ 136,729
21	Reduce the width of the northern Watkinsville Bypass ramps	\$ 68,333		\$ 68,333		\$ 68,333
22	Eliminate "U" turn lane on SR 53/Experiment Station Road at Watkinsville Bypass southbound ramp	\$ 60,203	\$ 16,404	\$ 43,799		\$ 43,799
23	Tie-in the Old Government Station Road as a driveway from SR 53 and eliminate upgrading Government Station Road	\$ 723,613		\$ 723,613		\$ 723,613
24	Upgrade the existing Old Government Station Road only	\$ 723,613	\$ 138,342	\$ 585,271		\$ 585,271
25	Retain the new realigned Government Station Road entrance drive and eliminate upgrading of the Old Government Station Road	\$ 188,802		\$ 188,802		\$ 188,802
26	Eliminate the existing traffic light at McDonald's south of Hog Mountain Road	\$ 166,763	\$ 5,110	\$ 161,653		\$ 161,653
27	Use a restrictive/traffic induced signal at the Rankin Road/School and CR 264/Mar Hills Road intersection		DESIGN SUGGESTION			



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 Final Design Stage						
PRESENT WORTH OF COST SAVINGS						
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
28	Eliminate "U" turn lane on CR 264/Mars Hill Road as it intersects with Cliff Dawson Road	\$ 60,203	\$ 16,404	\$ 43,799		\$ 43,799
29	Close the median opening at Windridge Office Park driveway on CR 264/Mars Hill Road and open a median at Windy Creek Road and provide an additional driveway to the office park from Windridge Drive		\$ 31,915	\$ (31,915)		\$ (31,915)
32	Close the median opening at Parcel 128 (south of Brookwood Drive) and allow "U" turns at the Crooked Creek Drive/Pebblestone Drive intersection	\$ 89,276	\$ 2,187	\$ 87,089		\$ 87,089
33	Replace the three 8-ft. x 8-ft. box culverts at Parker Branch with two 12-ft. x 9-ft. CON/SPAN® type culverts	\$ 304,346	\$ 169,731	\$ 134,615		\$ 134,615
35	Connect Hollow Creek Lane and Barber Creek Drive at a new intersection on CR 264/Mars Hill Road	\$ 100,048	\$ 375,508	\$ (275,460)		\$ (275,460)
36	Provide a raised median an SR 53/Experiment Station Road between VFW Drive and SR 15/Main Street		\$ 660,079	\$ (660,079)		\$ (660,079)
37	Use a pavement depth based on traffic volume for the Durham Street improvements/realignment	DESIGN SUGGESTION				
38	Replace the two 6-ft. x 6-ft. box culverts at Lampkin Branch with a 12-ft. x 7-ft. CON/SPAN® type culvert	\$ 93,645	\$ 54,266	\$ 39,379		\$ 39,379
40	Replace the two 5-ft. x 5-ft. box culverts at the unnamed tributary located at Station 232+00 with a 12-ft. x 6-ft. CON/SPAN® type culvert	\$ 55,039	\$ 39,169	\$ 15,870		\$ 15,870
41	Replace the two 5-ft. x 5-ft. box culverts at the unnamed tributary located at Station 232+00 with a 10-ft. x 5-ft. box culvert	\$ 55,039	\$ 54,870	\$ 169		\$ 169
42	Replace the two 7-ft. x 7-ft. box culverts at the unnamed tributary located at Station 288+00 with two 12-ft. x 8-ft. CON/SPAN® type culverts	\$ 132,013	\$ 112,066	\$ 19,947		\$ 19,947

STUDY RESULTS

INTRODUCTION

The results are the major feature of a value engineering 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 function analysis creative sessions.

RESULTS OF THE STUDY

The VE team generated 43 ideas for improvement during the Function Analysis and Speculation Phases of the workshop. The evaluation of these ideas was based upon 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, constructibility and soundness of the idea.

Of the ideas generated, 35 were sufficiently rated to warrant further investigation. Continued research and development of these ideas yielded 26 alternatives for improvement with an impact on project costs, and three design suggestions. These alternatives and design suggestions are presented in detail following this narrative and on the Summary of Potential Cost Savings worksheets.

EVALUATION OF ALTERNATIVES

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 are 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.



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 <i>Final Design Stage</i>						
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20	Reduce the width of the southern Watkinsville Bypass ramps	\$ 136,729		\$ 136,729		\$ 136,729
21	Reduce the width of the northern Watkinsville Bypass ramps	\$ 68,333		\$ 68,333		\$ 68,333
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24	Upgrade the existing Old Government Station Road only	\$ 723,613	\$ 138,342	\$ 585,271		\$ 585,271
25	Retain the new realigned Government Station Road entrance drive and eliminate upgrading of the Old Government Station Road	\$ 188,802		\$ 188,802		\$ 188,802
26	Eliminate the existing traffic light at McDonald's south of Hog Mountain Road	\$ 166,763	\$ 5,110	\$ 161,653		\$ 161,653
27	Use a restrictive/traffic induced signal at the Rankin Road/School and CR 264/Mar Hills Road intersection		DESIGN SUGGESTION			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: **1**

DESCRIPTION: **USE 11-FT. LANES TO REDUCE RIGHT-OF-WAY COSTS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design calls for the use of four 12-ft. lanes plus two 4-ft. bicycle lanes. It is noted that center lanes and all left and right turning lanes are also 12 ft. wide.

ALTERNATIVE: (Sketch attached)

Use four 11-ft-wide lanes throughout the project for all type lanes plus two 4-ft-wide bicycle lanes.

ADVANTAGES:

- Reduces 5 ft. of full depth pavement
- Reduces 5 ft. of right-of-way
- Reduces construction duration
- Reduces initial cost

DISADVANTAGES:

- Reduces lane widths
- Challenges a GDOT preference

DISCUSSION:

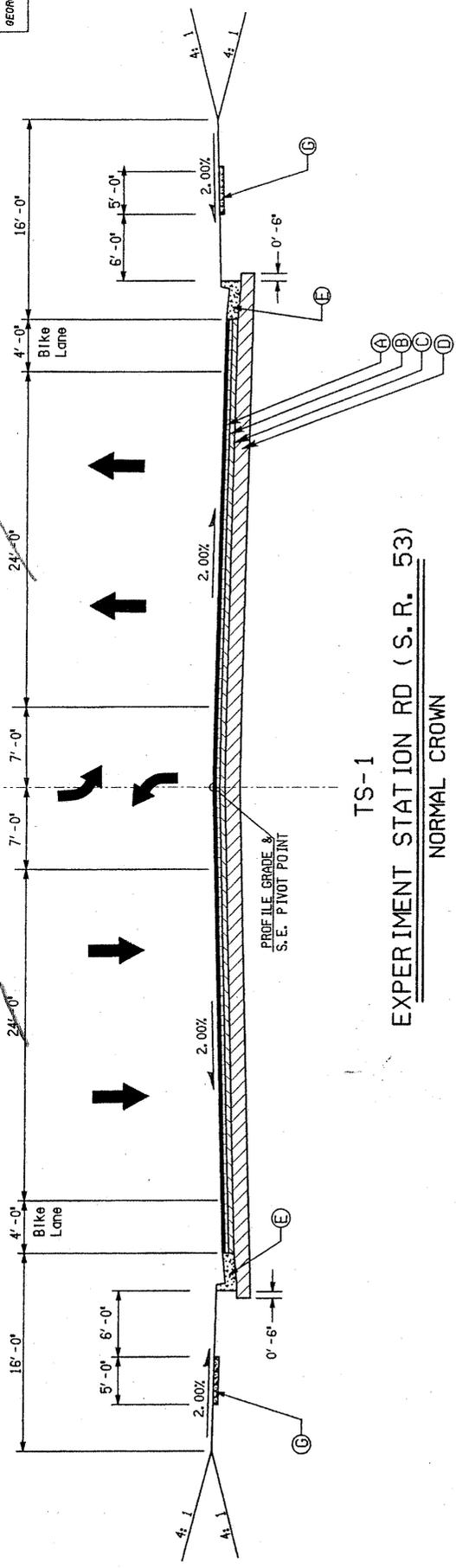
Eleven-ft-wide lanes exist in numerous facilities throughout Georgia including Interstate Highway 75 (I-75), I-85 and I-20 in Atlanta. Vehicles using these highways typically travel at over 65 miles per hour without problems in terms of road width. This project is being designed for 45 miles per hour; as such, 11-ft. lanes can be easily accommodated and would not impact the using public.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,336,554	—	\$ 4,336,554
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 4,336,554	—	\$ 4,336,554

Alt. #1
Sht. 2 of 4

SLOPE CONTROLS

22'-0" 24'-0" 22'-0" 24'-0"

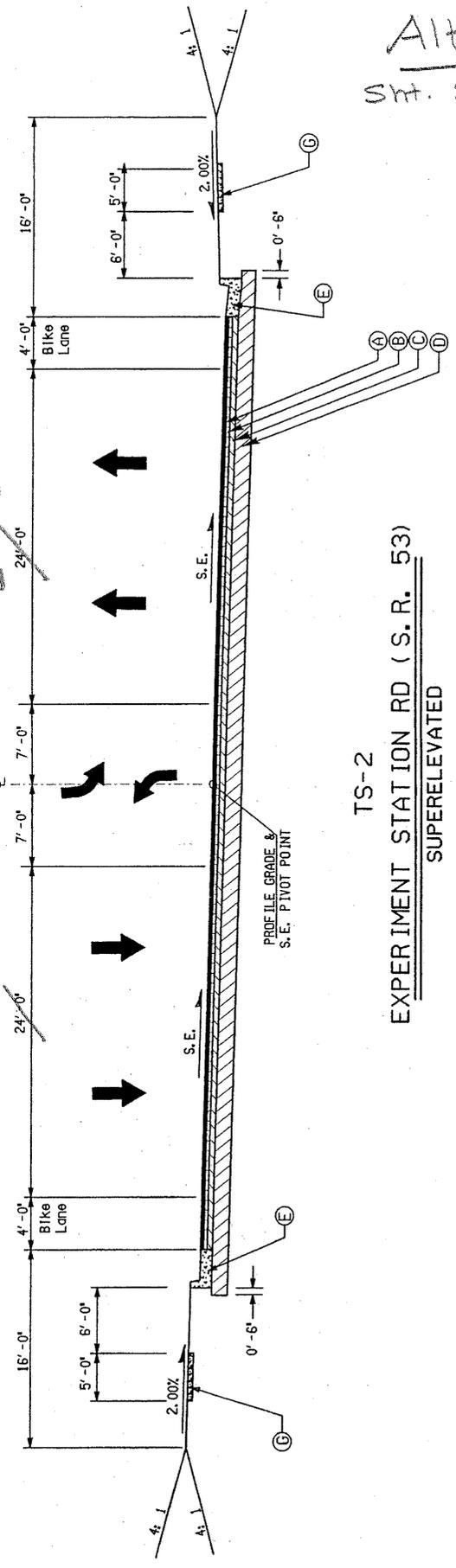


TS-1
EXPERIMENT STATION RD (S. R. 53)
NORMAL CROWN

STA 112+34 TO STA 118+50
STA 122+50 TO STA 126+91

FULL DEPTH
N. T. S.

22'-0" 24'-0" 22'-0" 24'-0"



TS-2
EXPERIMENT STATION RD (S. R. 53)
SUPERELEVATED

STA 108+60 TO STA 112+34
STA 126+91 TO STA 129+00

FULL DEPTH
N. T. S.

PLACEMENT TABLE

ALLOWED, SHALL BE PLACED AS DIRECTED BY
H RULES AND REGULATIONS FOR CONTROL
WAY, ALL DRIVEWAYS THAT ARE TO BE
CONCRETE, ASPHALT OR ASPHALT,
OR DRIVE, LEAVING OR IN BUILT,
WITH SURFACE COURSE WILL BE USED
AS INDICATED ON THE PLANS ARE FROM THE
CONTRACTOR SHALL CONSTRUCT NEW DRIVEWAYS

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

1

SHEET NO.: 3 of 4

Following construction items are affected by width reduction

Base & Paving :	\$12,356,540
Drainage :	3,627,146
Major Structures :	3,618,730
Grading & Earthwork :	2,828,150

22,430,566 for 56' width

normal roadway plus approximately 12' for intermittent center lane and various left & right turning lanes.

Thus, per foot pavement cost is $\frac{22,430,566}{(56+12)} = 329,861$

For 5' wide pavement, savings will be:

$$329,861 \times 5 = \$1,649,305 \times 1.2506 = 2,062,621$$

(markup)

Right of way : For the entire project, the total square feet of land to be acquired = 1,160,894
 Per sf land cost = $7,416,446 \div 1,160,894 = \6.39

Square feet of easement to be acquired = 1,145,758
 Per sf of easement cost = $3,098,863 \div 1,145,758 = \2.70

Improvements, Relocation & Damage Cost total : 2,512,000

Total land area saved = $5' \times 5,240 \times 5 \text{ miles} \times 3.10 = 144,200 \text{ sf}$
 (for side roads)

Assume half of it being R/W & half be easements, i.e., 72,050 sf

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 2

DESCRIPTION: **USE 12-FT. SHOULDERS INSTEAD OF 16-FT. SHOULDERS**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design calls for the use of 16-ft. shoulders throughout the project.

ALTERNATIVE: (Sketch attached)

Use 12-ft. shoulders throughout the project.

ADVANTAGES:

- Reduces 4 ft. of right-of-way (assumed)
- Reduces 4 ft. of easement (assumed)
- Reduces construction duration
- Reduces initial cost

DISADVANTAGES:

- Driveways may become steeper
- Challenges a GDOT preference

DISCUSSION:

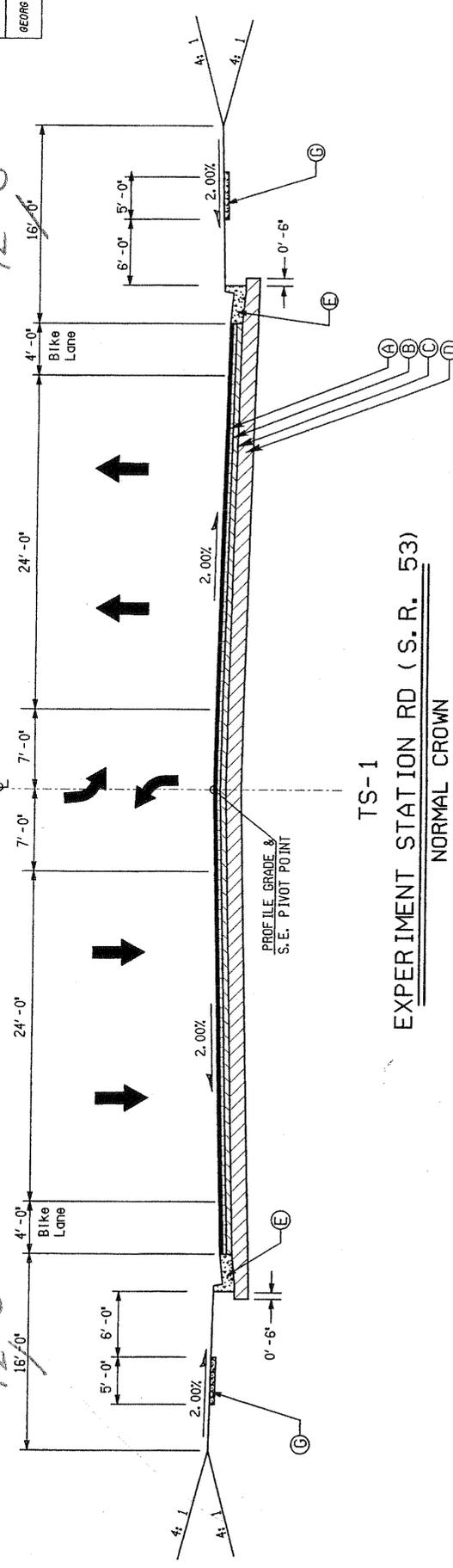
Twelve-ft. shoulders are commonly used in other areas of the State and would perform the necessary function at a substantial reduction in construction cost. A reduction in storm drain piping and culverts is also achieved.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,062,200	—	\$ 4,062,200
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 4,062,200	—	\$ 4,062,200

12'-0"

CONSTR. E

12'-0"



TS-1
EXPERIMENT STATION RD (S.R. 53)
 NORMAL CROWN

STA 112+34 TO STA 118+50
 STA 122+50 TO STA 126+91

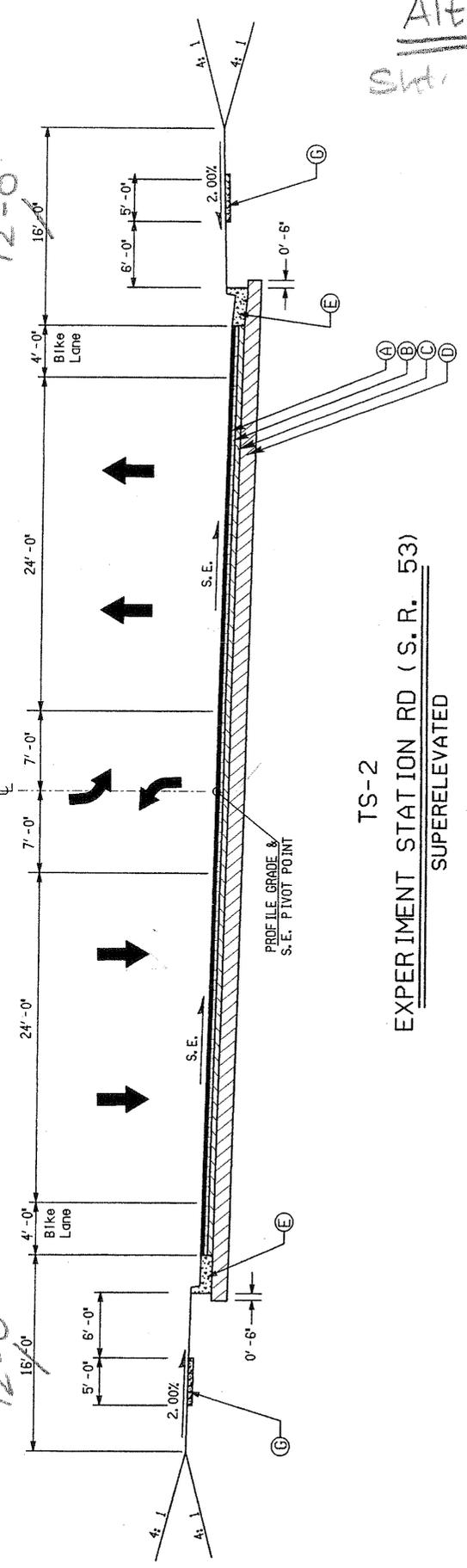
FULL DEPTH
 N. T. S.

Alt: 2
 Sht. 2 of 4

12'-0"

CONSTR. E

12'-0"



TS-2
EXPERIMENT STATION RD (S.R. 53)
 SUPERELEVATED

STA 108+60 TO STA 112+34
 STA 126+91 TO STA 129+00

FULL DEPTH
 N. T. S.

SLOPE CONTROLS

PLACEMENT TABLE

ALLOWED, SHALL BE PLACED AS DIRECTED BY THE RULES AND REGULATIONS FOR CONTROLLED TRAFFIC. ALL DRIVEWAYS THAT ARE TO BE CONSTRUCTED IN KIND, I.E., ASPHALT FOR ASPHALT, OR BITUMINOUS CONCRETE FOR ASPHALT, SHALL BE CONSTRUCTED ON THE PLANS INDICATED ON THE PLANS. THE CONTRACTOR SHALL CONSTRUCT NEW DRIVEWAYS AND DRIVEWAYS ON EXISTING DRIVEWAYS WHERE THEY

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.: 2

SHEET NO.: 3 of 4

Reduction in shoulder width will affect:

Grading & Earthwork :	2,828,150
Drainage pipes :	2,236,243
Box Culverts :	1,513,000
Landscaping :	979,500
Guardrail :	136,980
	<hr/>
	7,693,873

Total pavement width = $(16 + 4 + 24 + 7) \times 2 = 102'$

Per foot cost as it pertains to shoulders

= $7,693,873 / 102 = \$75,430$.

Total width saved = 8 feet.

Assume half of savings to occur in R/W (4') and other half to occur in acquiring easements.

R/W savings is \$6.39/sf } see Alt. 1
 & Easement saving is \$2.70/sf }

Total land saved = $8' \times 5 \text{ miles} \times 5,240 = 209,600 \text{ sf}$

Half of 209,600 = 104,800 sf

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 6

DESCRIPTION: **REDUCE THE NUMBER OF 72-IN. BULB TEES FOR THE
BRIDGE OVER BARBER CREEK**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The current design indicates that the County Road (CR) 264 bridge over Barber Creek is a 130-ft. single-span structure with a reinforced concrete deck having 15 72-in. bulb tees and reinforced concrete pile bents.

ALTERNATIVE: (Sketch attached)

Use 12 72-in. bulb tees for the new bridge on CR 264 over Barber Creek.

ADVANTAGES:

- Reduces the number of required beams
- Reduces construction time
- Reduces initial cost
- Minimizes overall maintenance
- Simplifies design and construction

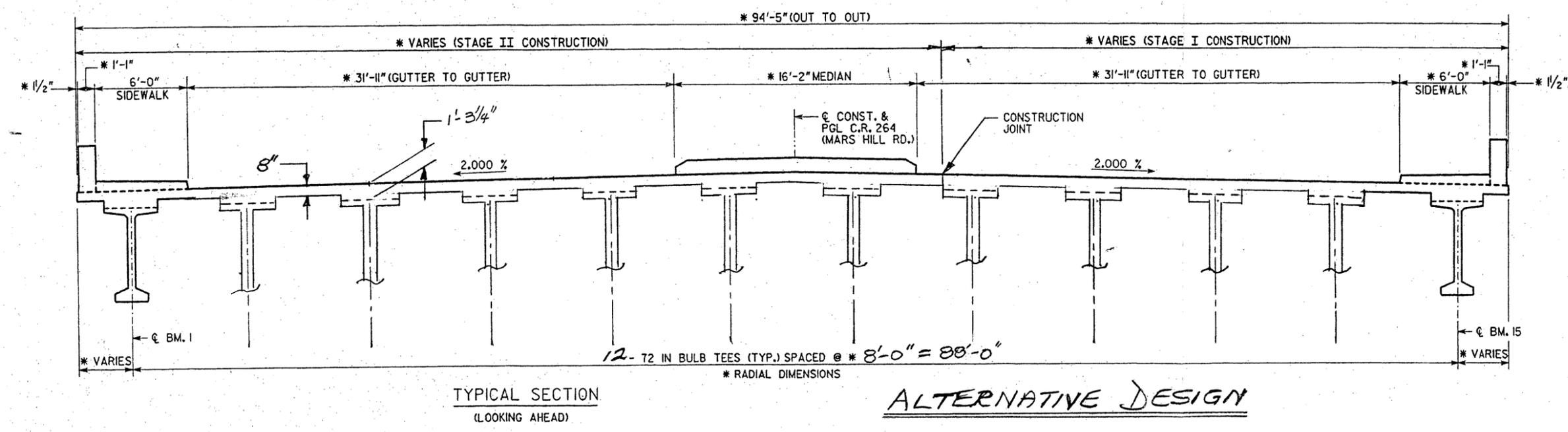
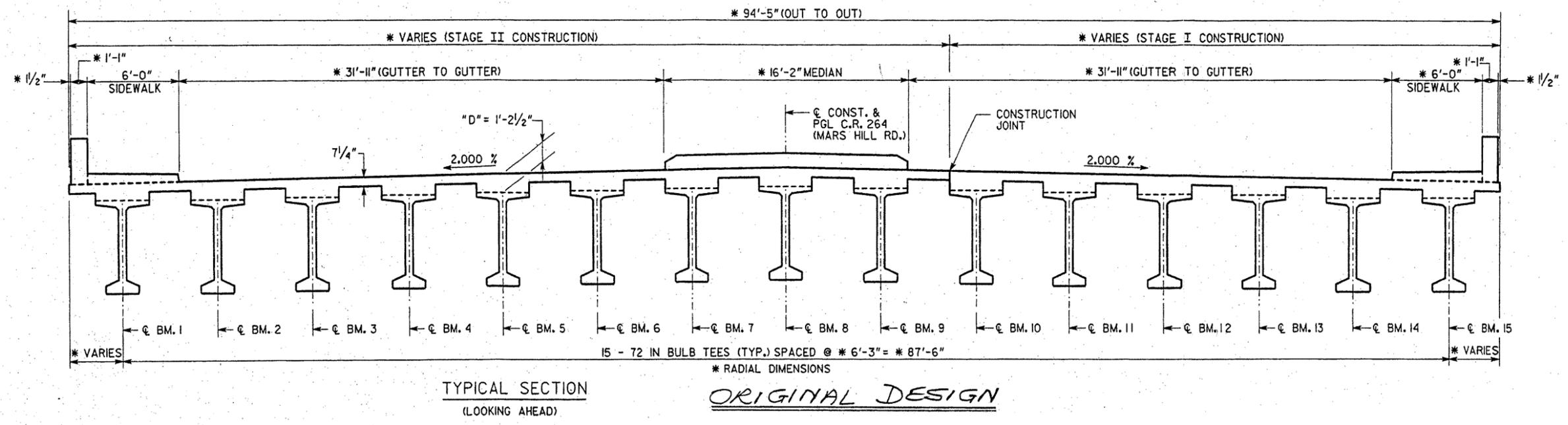
DISADVANTAGES:

- Increases deck slab thickness

DISCUSSION:

Reductions in any structural elements of a bridge will result in initial cost savings due to the fewer number of units and the time to erect them. Such is the case with this alternative where the total number of bulb tees can be reduced from 15 to 12. Elimination of structural units, without jeopardizing the integrity of the bridge, will simplify the design and construction of the new bridge, albeit with some increase in deck slab thickness.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,039,291	—	\$ 1,039,291
ALTERNATIVE	\$ 1,006,163	—	\$ 1,006,163
SAVINGS	\$ 33,128	—	\$ 33,128



CALCULATIONS



PROJECT: **STP-1267(8), P. I. No. 142060,**
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ALTERNATIVE NO.:

6

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

$$\text{Concrete Slab} = 0.15 \text{ kcf} \times 94.417' \times \frac{7.25''}{12} \times 130' = 1112.35 \text{ cf.}$$

$$72'' \text{ Bulb Tees} = 15 \text{ eq.} \times 130' = 1950 \text{ lin. ft.}$$

Proposed Estimate:

$$\text{Concrete Slab} = 0.15 \text{ kcf} \times 94.417' \times \frac{8''}{12} \times 130' = 1227.42 \text{ cf.}$$

$$72'' \text{ Bulb Tees} = 12 \text{ eq.} \times 130' = 1560 \text{ lin. ft.}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
*Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage*

ALTERNATIVE NO.: 7

DESCRIPTION: REALIGN DURHAM STREET TO THE SOUTH TO CONNECT
WITH THE COURTHOUSE COMPLEX

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original realignment of Durham Street ties into SR 53/Experiment Station Road just north of the U.S. Post Office. The southern end of Durham Street is not affected by this project.

ALTERNATIVE: (Sketch attached)

Realign Durham Street to the south to connect with North 3rd Street at the northwest corner of the courthouse complex and close the southern end of Durham Street as it connects Water Street.

ADVANTAGES:

- Provides a more direct access from the Sheriff's jail to the courthouse
- Better control of vehicular traffic between the Sheriff's office and the courthouse
- Reduces probability of impeding detainee transfers
- Improves overall detainee transfer security

DISADVANTAGES:

- Increases construction costs
- Takes out a residential parcel

DISCUSSION:

It is understood that Durham Street was being realigned to help facilitate the Oconee County Sheriff Department's transfer of detainees to and from the courthouse located on the southwest side of SR 15/Main Street between and North 3rd Street and Court Street. This solution, although increasing the initial cost of the project, provides a more direct route between the Sheriff Department and the courthouse.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 1,195,101	—	\$ 1,195,101
SAVINGS	\$ (1,195,101)	—	\$ (1,195,101)



Proposed route of
Durham Street to
Court house

CALCULATIONS



PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

7

SHEET NO.: 3 of 4

Length for extension of Durham St. to
Court House. = 750'

$$750' \times \$280/L.F. = \$210,000$$

Add' R/W (80' width w/o Easements)
Residential R/W \$2 S.F. | $750' \times 80' = 60,000 \text{ S.F.}$

Displacement of one Resident

$$\frac{\$900,000}{7} = \$128,570$$

Relocation Residential = \$20,000

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: **9**

DESCRIPTION: **REALIGN DURHAM STREET TO ALIGN WITH OCONEE
COUNTY SHERIFF DEPARTMENT'S NORTH ENTRANCE
DRIVE**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (Sketch attached)

The original realignment of Durham Street ties into SR 53/Experiment Station Road just north of the U.S. Post Office.

ALTERNATIVE: (Sketch attached)

Realign Durham Street to align with the Oconee County Sheriff Department's north entrance drive.

ADVANTAGES:

- Provides a more direct access from the Sheriff's jail to the Courthouse
- Better control of vehicular traffic between the Sheriff's office and the Courthouse
- Reduces probability of impeding detainee transfers
- Improves overall detainee transfer security
- Saves right-of-way costs – a business with two buildings – displacement/relocation

DISADVANTAGES:

- Increases construction cost
- Takes out a residential parcel
- Perceived loss of amenity: elimination of direct access from Durham Street to the U.S. Post Office

DISCUSSION:

It is understood that Durham Street was being realigned to help facilitate the Oconee County Sheriff Department's transfer of detainees to and from the courthouse located on the southwest side of SR 15/Main Street between and North 3rd Street and Court Street.

This alternative improves the terminus location of the Durham Street realignment directly onto the Oconee County Sheriff Department's north entrance drive.

The proposed signal would remain. However, due to the low volume of traffic at this intersection, this signal could be converted to a Sheriff Department induced/activated unit similar to emergency signals at fire stations.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,536,852	—	\$ 2,536,852
ALTERNATIVE	\$ 747,181	—	\$ 747,181
SAVINGS	\$ 1,789,671	—	\$ 1,789,671



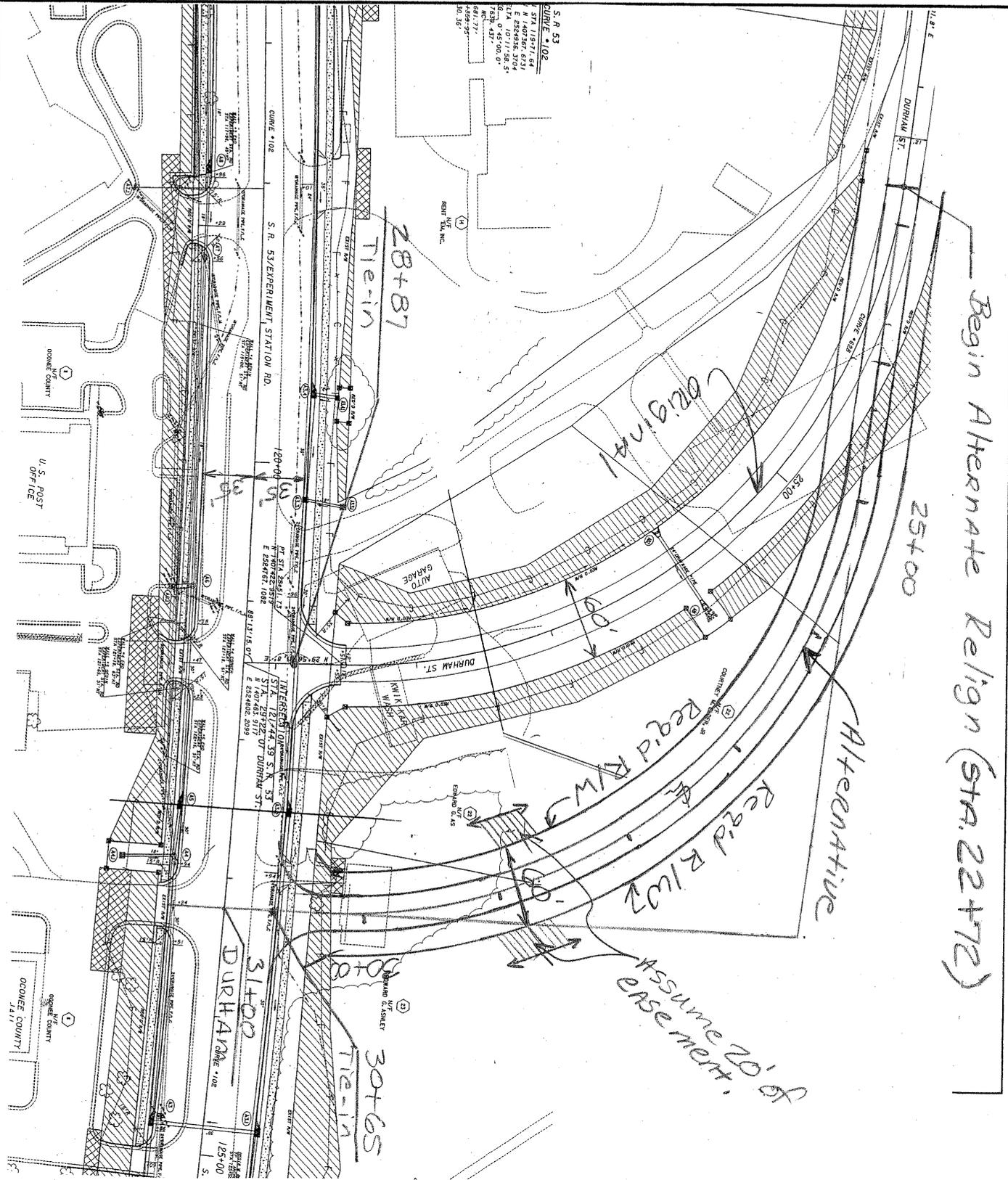
PROJECT: STP-1267(8), P. I. No. 142060,
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Final Design Stage

ALTERNATIVE NO.:

9

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 5



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CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
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 Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 9

SHEET NO.: 3 of 5

Following construction items are affected by width reduction

Base & Paving : \$12,356,540
 Drainage : 3,627,146
 Major Structures : 3,618,730
 Grading & Earthwork : 2,828,150

\$22,430,566 for 56' width

normal roadway plus approximately 12' width for center lane and various left & right turning lanes.

Thus, per foot pavement cost is $\frac{22,430,566}{(56+12)} = \$329,861/\text{Proj width-ft.}$

\$22,430,566

- \$3,618,730

\$18,811,836 (w/o major structures)

$\frac{\$18,811,836 - \text{Project}}{(56+12)} = \$276,645/\text{ft-width}$ ^{Project}

$\frac{\$276,645 \text{ Project/ft. width}}{(4.935 \times 1.1 \text{ miles})} = \$50,962 \text{ ft-width/mile}$ (Unit Cost)

10% for side Rd's & turn lanes

Unit cost per mile of Rdwy for Dusham St.

$\frac{\$50,962 \text{ ft-width/mi}}{5,280/\text{mi}} \times (24' + 6' + 6') = \$348/\text{ft-length}$

↑ ↑ shoulders
 TRADWAY

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 9

SHEET NO.: 4 of 5

Original Station of Realignment portion
 from P.T. STA. 29+22 - 35' =
 STA: 28+87 (see sketch)

Alternate station of Realignment
 from P.T. ST: 31+00 - 35' = STA 30+65
 Difference in Length STA. 30+65 - STA 28+87 = 178'

Additional Length of Alternate Realignment
 is 178' for cost purposes + 100' of Alignment
 = 278' in all for R/W COMPARISON

R/W Cost \$ 2.00/SF Residential
 Easement Cost \$ 1.00/ Residential

Add'l R/W = (60' width x 278') = 16,680 SF

Add'l Easement = (20'+20') x 278' = 11,120 S.F.

House Displacement: $\frac{\$900,000}{7 \text{ Houses}} = \$128,570/\text{House}$

R/W cost for PARCEL 22 Land & Business
 displacement: R/W = (100' x 60') = 6,000 S.F.

Easement (20'+20') x 100' = 4,000 S.F.

Displacement of two Buildings & Auto GARAGE & CARWASH
 $\frac{\$925,000}{3/\text{Bldg}} = \$308,330/\text{Bldg} \quad | \quad \$25,000/\text{Relocation}$

(Figures from R/W estimate dated 9/21/2008)

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 11

DESCRIPTION: **ELIMINATE THE WATER STREET ACCESS TO
SR 53/EXPERIMENT STATION ROAD**

SHEET NO.: 1 of 2

ORIGINAL DESIGN: (Sketch attached)

The present design indicates that Water Street ties into SR 53/Experiment Station Road allowing right-in/right-out only onto SR 53.

ALTERNATIVE: (Sketch attached)

Eliminate the Water Street access onto SR 53/Experiment Station Road by providing a cul-de-sac and driveway extension near the SR 53.

ADVANTAGES:

- Greatly increases safety in close proximity to the SR 15/SR 53 intersection
- Eliminates potential traffic conflicts
- Precludes illegal left turns from Water Street onto SR 53
- Improves pedestrian safety
- Provides a continuous sidewalk

DISADVANTAGES:

- Loss of amenity – access to/from SR 53 onto Water Street
- Could increase traffic on Nancy Drive

DISCUSSION:

The present design allowing right-in/right-out only movements into/from Water Street onto SR 53/Experiment Station Road is too close to the SR 15 (Main Street)/SR 53 intersection to allow for proper weaving length to the left turn lanes from SR 53 onto SR 15. Traffic conflicts will also be avoided by precluding right-out movements interfering with vehicles queuing to make a right turn onto SR 15 passing in front of Water Street.

Furthermore, as there is no median in this section of the facility, it would be possible for vehicles to make illegal left turns onto SR 53 from Water Street creating unsafe conditions and traffic conflicts.

The difference in cost would be minimal as most of the savings for the Water Street “tie-in” would be off-set by the cost of the cul-de-sac and driveway extension.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
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ALTERNATIVE NO.:

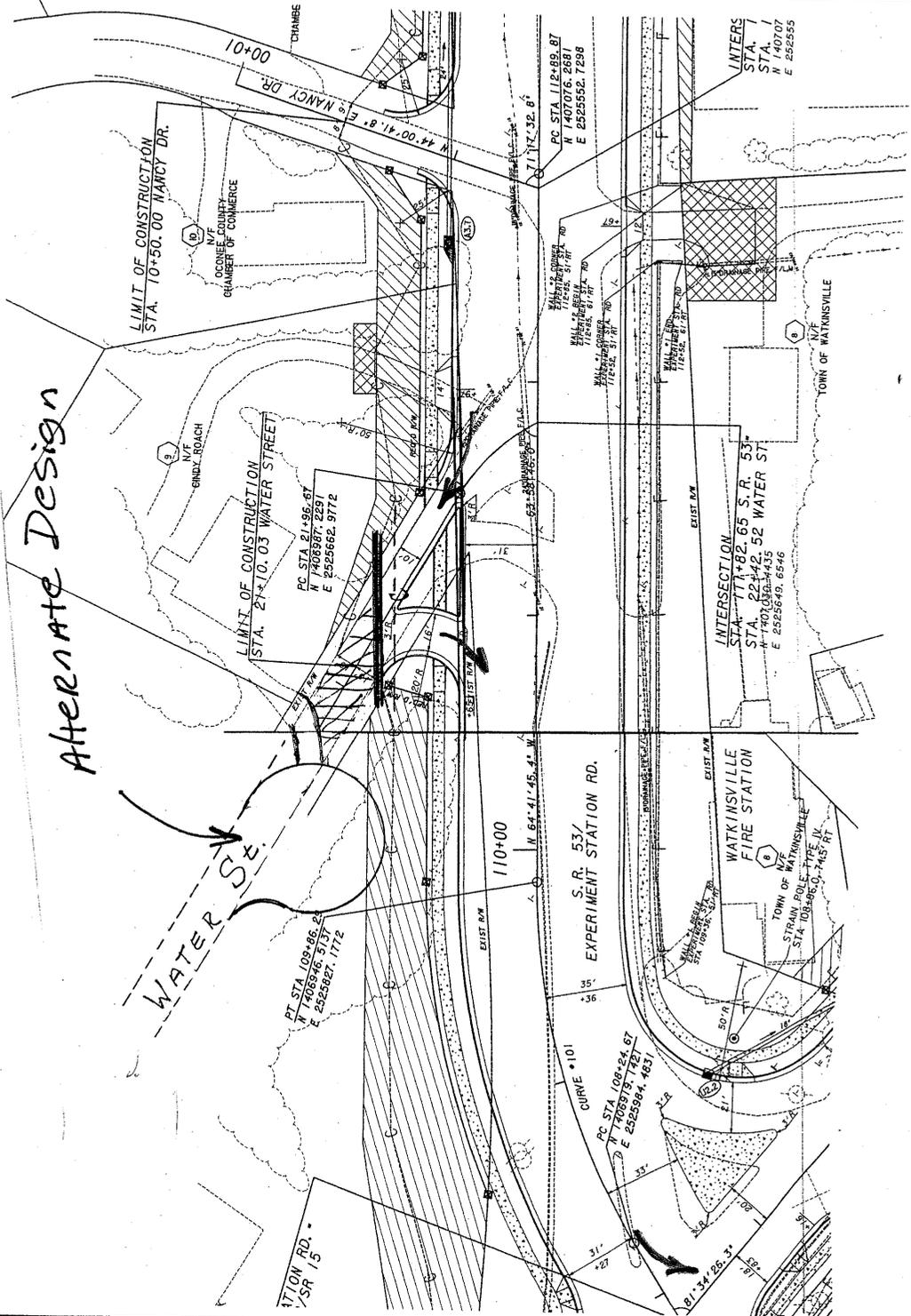
11

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 2

(←) Arrows show Traffic movement for Present Original Design.

ALTERNATE DESIGN



VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 14

DESCRIPTION: ELIMINATE SIGNAL AT THE DURHAM STREET
 INTERSECTION

SHEET NO.: 1 of 2

ORIGINAL DESIGN:

The current design calls for a 4-way traffic signal at the new Durham Street and US 53/Experiment Station Road intersection.

ALTERNATIVE:

Eliminate the signal at the Durham Street/Experiment Station Road intersection.

ADVANTAGES:

- Enhances traffic flow
- Reduces traffic congestion
- Reduces travel time
- One less traffic conflict
- Reduces initial cost

DISADVANTAGES:

- Loss of amenity
- More difficult to negotiate vehicular turning/cross movements at intersection

DISCUSSION:

It is understood that Durham Street is being realigned to help facilitate the Oconee County Sheriff Department's transfer of detainees to and from the courthouse located on the southwest side of SR 15/Main Street between and North 3rd Street and Court Street. As such, very low traffic volumes occur to warrant a signal at this location.

If a signal is imperative, it could be converted to a Sheriff Department induced/activated unit similar to emergency signals at fire stations.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 100,048	—	\$ 100,048
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 100,048	—	\$ 100,048

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO. **16**

DESCRIPTION: **CUL-DE-SAC HARRIS SHOAL DRIVE CLOSE TO
SR 53/EXPERIMENT STATION ROAD AND ACCESS HARRIS
SHOAL PARK FROM VFW DRIVE**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The present design eliminates the direct access of Harris Shoal Drive onto SR 53/Experiment Station Road and realigns Harris Shoal Drive to access VFW Drive just west of SR 53.

ALTERNATIVE: (Sketch attached)

Eliminate the proposed realignment of Harris Shoal Drive and the cul-de-sac near SR 53. Provide a driveway extension to the Harris Shoal Park maintenance building from the new cul-de-sac.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost
- Creates a safer park entry
- Minimizes maintenance

DISADVANTAGES:

- Loss of amenity – only one ingress/egress onto Harris Shoal Park
- Longer distance to travel for park entrance – approximately 1000 ft.

DISCUSSION:

The alternative would save construction costs by eliminating the realignment of Harris Shoal Drive and providing a cul-de-sac at the southern end of the roadway. Access to Harris Shoal Park is directed to the existing westernmost entrance along VFW Drive providing a safer entry to the Park.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 101,549	—	\$ 101,549
ALTERNATIVE	\$ 46,342	—	\$ 46,342
SAVINGS	\$ 55,207	—	\$ 55,207

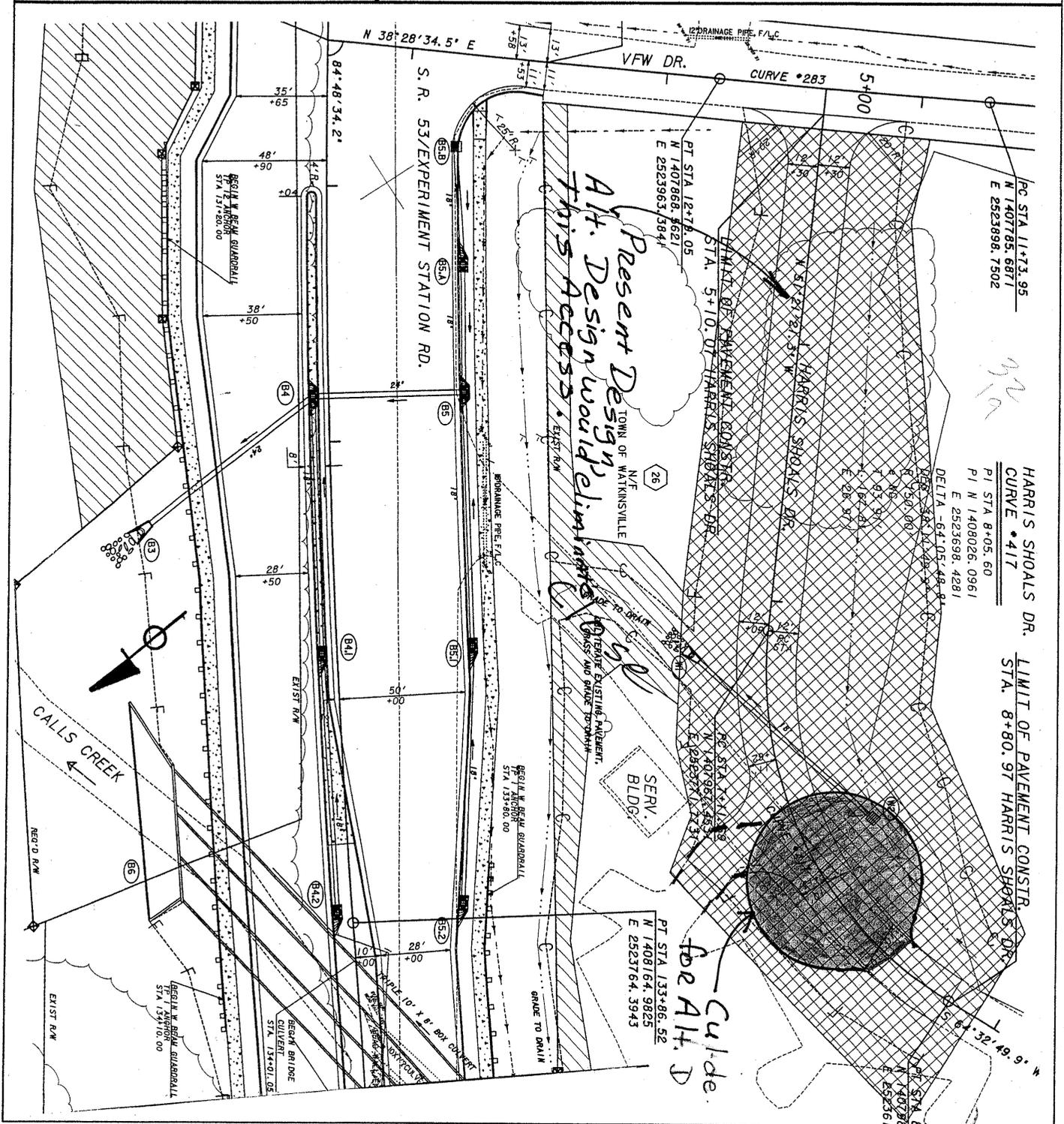


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ALTERNATIVE NO.: **16**

AS DESIGNED ALTERNATIVE

SHEET NO.: **2** of **6**



SKETCHES



PROJECT: **STP-1267(8), P. I. No. 142060,**
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Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.:

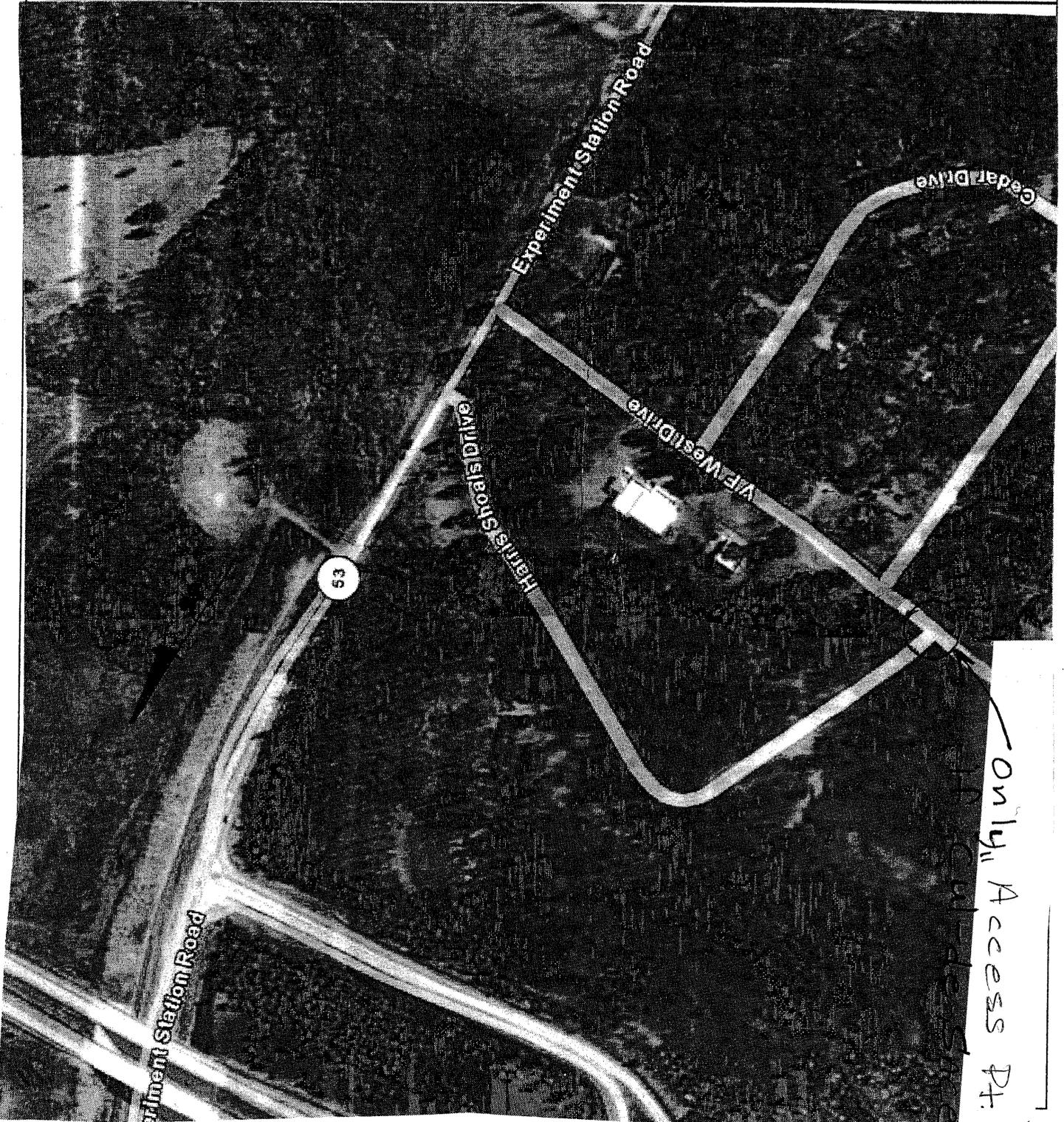
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Existing Conditions

AS DESIGNED

ALTERNATIVE

SHEET NO.: 3 of 6



Only Access Pt.

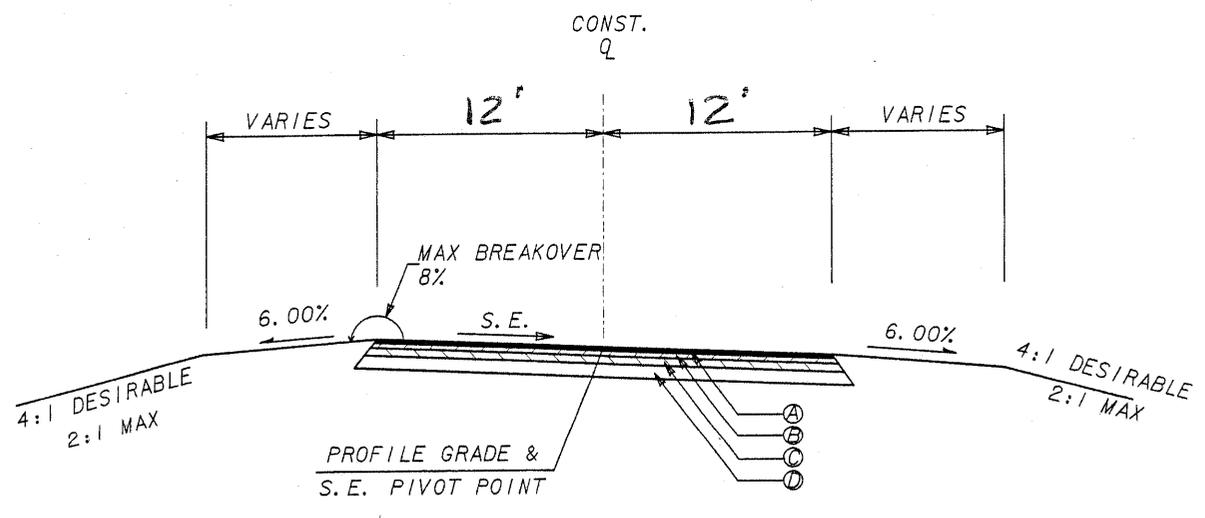
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ALTERNATIVE NO.:

16

AS DESIGNED ALTERNATIVE

SHEET NO.: 4 of 6



TS-27

Typical Pavement Section as
 Presently Designed

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

16

SHEET NO.: 5 of 6

Original / Present Design Cost for
 Realignment of Harris Shoats Drive to
 VFW West Drive in Lieu of SRS3 direct
 Access.

Use 350 of new alignment for cost
 comparison to Alternate Cut-de-Sac.

Sq. Ft. of Pavement for construction
 of Cut-de-Sac. 3,849 S.F.

$$\left(\frac{\$50,962 \text{ ft. width}}{5,280 \text{ mi}} \right) \times (24') = \$232 / \text{ft. Length}$$

↑ see Typical Section width

\$19.65 / SF - use for Cut-de-Sac Cost.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 17

DESCRIPTION: **ELIMINATE "U" TURN LANE AT VFW DRIVE**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original design calls for a southbound "U" turn lane on the SR 53/Experiment Station Road and corresponding eyebrow at VFW Drive.

ALTERNATIVE: (Sketch attached)

Eliminate the "U" turn lane and corresponding eyebrow at VFW Drive.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces construction time
- Reduces initial cost

DISADVANTAGES:

- Loss of a potential turning movement

DISCUSSION:

As there are no businesses or residents on the east side of SR 53/Experiment Station Road near the VFW Drive, the justification for a "U" turn lane at that location appears to be unwarranted. Should a "U" turn be necessary, southbound users would have to travel an additional 875 feet to Durham Street to make a safe turning movement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 63,170	—	\$ 63,170
ALTERNATIVE	\$ 16,404	—	\$ 16,404
SAVINGS	\$ 46,766	—	\$ 46,766

Alt. 17

Sheet 2 of 4

SECTION
FW DR.

N 38° 28' 34.5" E

VFW DR.

CURVE *283

S. R. 53/EXPERIMENT STATION RD.

PT STA 12+79.05
N 1407868.5621
E 2523963.3841

LIMIT OF PAVEMENT CONSTR.
STA. 5+10.07 HARRIS SHOALS DR.

N 51° 21' 21.3" W HARRIS SHOALS DR.

TOWN OF WATKINSVILLE
N/F

SERV. BLDG.

PC STA 7+41.69
N 1407967.4531
E 2523771.7731

PT STA
N 14081
E 25237

Eliminate U-TURN

Eliminate
Eye-Brow

130+00

84° 48' 34.2"

35' +65

48' +90

38' +50

28' +50

50' +00

28' +00

DR. 53

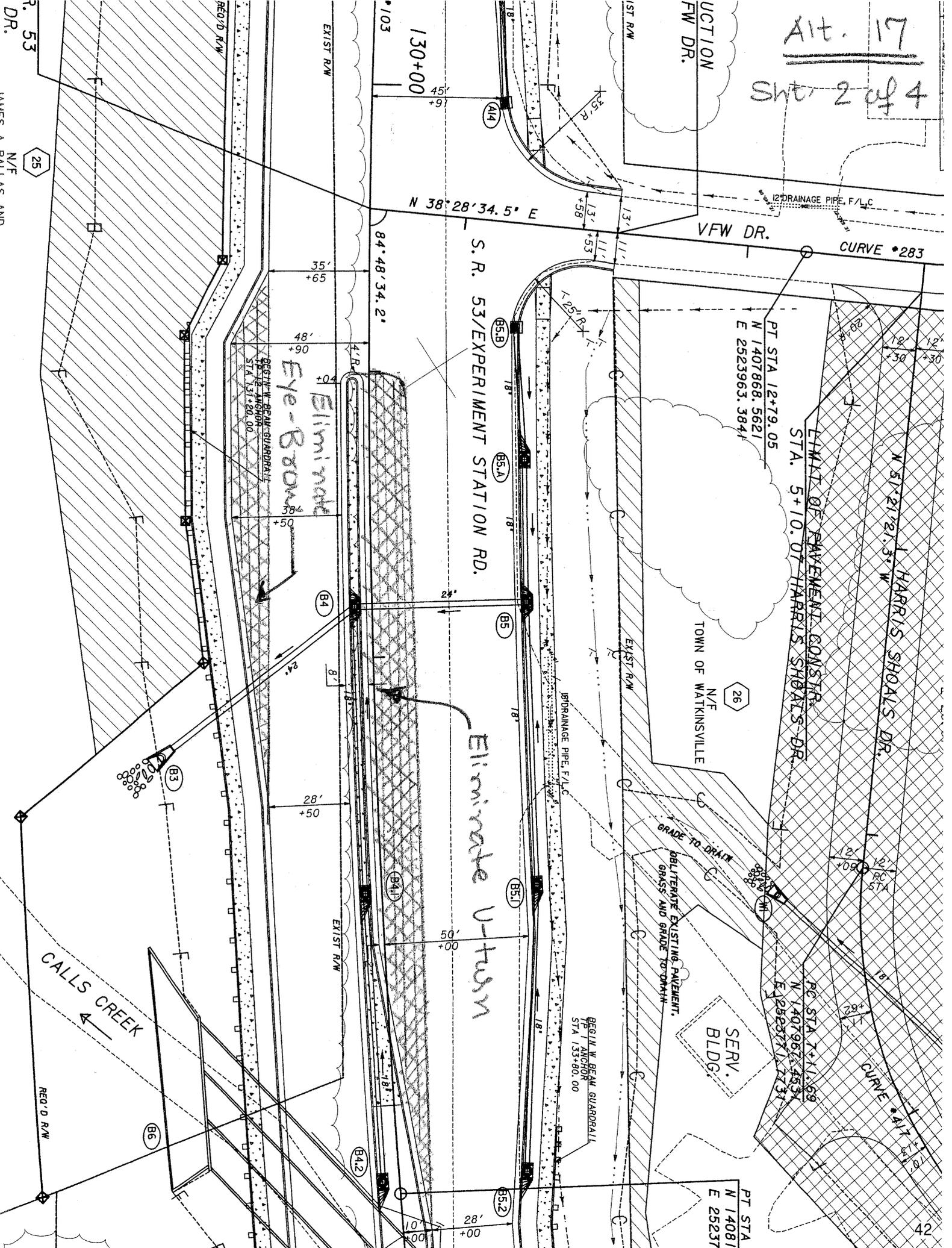
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CALLS CREEK

REQ'D R/W

REQ'D R/W



CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
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ALTERNATIVE NO.:

17

SHEET NO.: 3 of 4

U-turn

$$\frac{1}{2} \times 100 \times 12 + 200 \times 12 = 3,000 \text{ sf}$$

Eye-brow

$$\frac{1}{2} \times (90 - 65) \times (48 - 35) + (150 - 90) \times 13 + \frac{1}{2} \times 13 \times 100 = 1,592 \text{ sf}$$

$$\text{Total: } 3,000 + 1,592 = 4,592 \text{ sf}$$

To account for various left & right turn lanes, one can assume 12' center lane throughout the length of project. \therefore total pavement width = $5 \times 12 = 60'$

Add 10' for the side roads. This implies a total width of 66'.

$$\begin{aligned} \text{The total sf of pavement is } \therefore 5 \text{ miles} \times 5,240 \times 66 \\ = 17,29,200 \text{ sf} \end{aligned}$$

$$\text{The total cost of Paving} = 12,356,450$$

$$\therefore \text{ per sf, the cost of paving is } \frac{12,356,450}{17,29,200} = \$7.15$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: 18

DESCRIPTION: REPLACE THE THREE 10-FT. X 8-FT. BOX CULVERTS AT
 CALLS CREEK WITH TWO 16-FT. X 9-FT. CON/SPAN® TYPE
 CULVERTS

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The current design indicates the use of three 10-ft. x 8-ft. concrete box culverts with flared wing walls to span Calls Creek.

ALTERNATIVE: (Sketch attached)

Use two 16-ft. x 9-ft. CON/SPAN® type culverts in lieu of the aforementioned concrete box culverts at Calls Creek.

ADVANTAGES:

- Reduces initial cost
- Simplifies construction
- May improve hydraulics

DISADVANTAGES:

- May increase cost due to unknown cost of CON/SPAN® foundations
- May be a challenge to GDOT's preferences

DISCUSSION:

The typical cost of the CON/SPAN® type foundation could not be determined as the Bridge Foundation Investigation (BFI) Report was not available. It appears, however, that with the inclusion of the foundation, the CON/SPAN® type culverts will be more economical to construct than the typical triple 10-ft. x 8-ft. concrete box culverts.

The application of CON/SPAN® type culverts has been successfully used in other locations and DOTs across the country due to their inherent simplicity of design and installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 390,187	—	\$ 390,187
ALTERNATIVE	\$ 232,111	—	\$ 232,111
SAVINGS	\$ 158,076	—	\$ 158,076



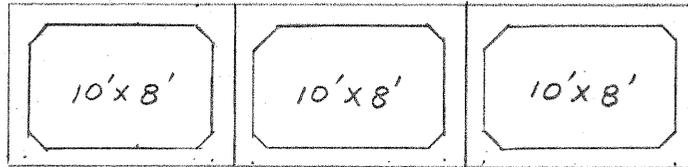
PROJECT: **STP-1267(8), P. I. No. 142060,**
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ALTERNATIVE NO.:

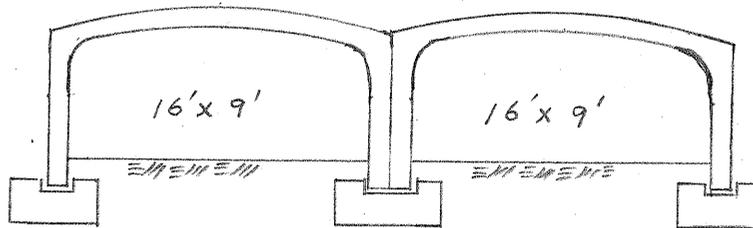
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AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
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Final Design Stage

ALTERNATIVE NO.:

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

Culvert length = 200'

Alternative Estimate:

Con/span length = 200'

Information from Contech's representative Steve Poole (678) 662-9331

Three 32'x10' con/span, 82' Long = \$253,708

Cost per lin. ft of 32'x10' con/span = $\frac{\$253,708}{320 \times 82'}$

= \$1031 per lin. ft.

Cost of 16'x9' con/span culvert = $\frac{\$1031 \times (16' \times 9')}{32' \times 10'}$

= \$464 per lin. ft.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
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ALTERNATIVE NO.: **20**

DESCRIPTION: **REDUCE THE WIDTH OF THE SOUTHERN WATKINSVILLE
BYPASS RAMP**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design calls for striped pavement between the left (northbound) and right (southbound) turn lanes of the Watkinsville Bypass ramp as it approaches the intersection with SR 53/Experiment Station Road.

ALTERNATIVE: (Sketch attached)

Remove the striped portion of the pavement and relocate the right turn lane to abut the left turn lane. In addition, relocate the guardrail and shoulders next to the right turn lane. The island work at the intersection would correspondingly be made smaller.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost

DISADVANTAGES:

- None apparent

DISCUSSION:

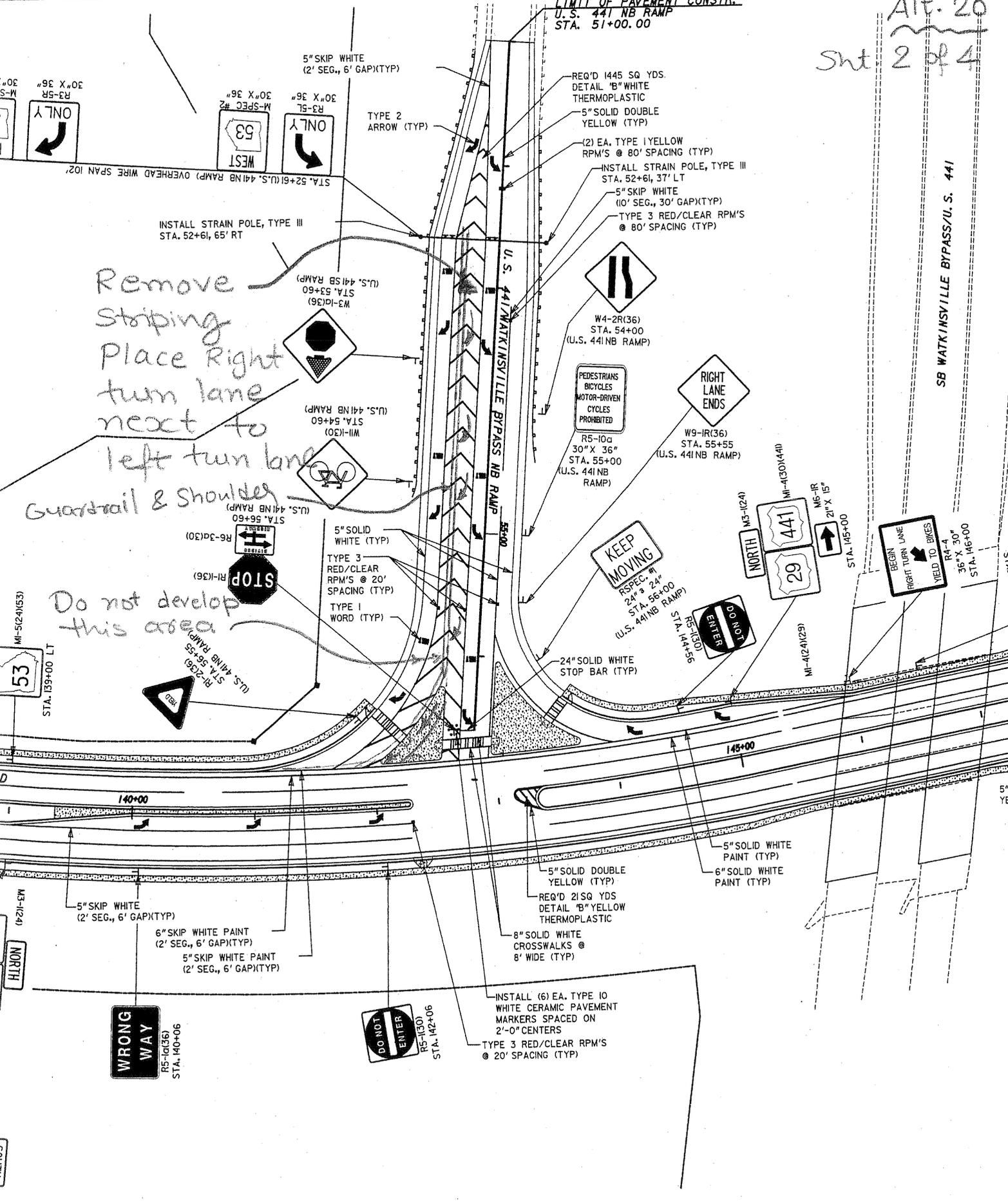
The design allows for 500-ft. of storage length providing for 25 vehicles on the ramp lanes. This storage space will more than adequately cover the expected design traffic in the year 2029. Therefore, there is no apparent need to provide the additional pavement for future expansion between the right and left turn lanes on the ramp.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 136,729	—	\$ 136,729
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 136,729	—	\$ 136,729

Alt. 20
Sht 2 of 4

LIMIT OF PAVEMENT CONSTR.
U.S. 441 NB RAMP
STA. 51+00.00

SB WATKINSVILLE BYPASS/U.S. 441



Remove striping
Place Right turn lane next to left turn lane
Guardrail & Shoulder

Do not develop this area

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:
 20

SHEET NO.: 3 of 4

$$\begin{array}{l}
 25 \times 185 + 120 \times 16 + \frac{1}{2} \times 25 \times 100 = 7,796 \text{ sf. of} \\
 \text{(straight)} \quad \text{(curvature)} \quad \text{(triangle)} \quad \text{area saved} \\
 \text{in terms of R/W,} \\
 \text{Paving \& earthwork} \\
 \text{and striping.}
 \end{array}$$

Since R/W plans are not available, assume
 half the savings in R/W & other half in easements.
 $\Rightarrow 7,796 \div 2 = 3,898 \text{ sf.}$

See Alt. 1 for per sf cost.

See Alt. 17 for paving costs

Earthwork costs - \$11.45/cy Average 5' high embankment

$$7,796 \times 5/9 = 4,331 \text{ cy}$$

The DOT already owns the R/W where
 expansion of the ramp is going to occur.
 \therefore R/W savings will not materialize.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: **21**

DESCRIPTION: **REDUCE THE WIDTH OF THE NORTHERN WATKINSVILLE
BYPASS RAMP**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design calls for striped pavement between the left (northbound) and right (southbound) turn lanes of the Watkinsville Bypass ramp as it approaches the intersection with SR 53/Experiment Station Road.

ALTERNATIVE: (Sketch attached)

Remove the striped portion of the pavement and relocate the right turn lane to abut the left turn lane. In addition, relocate the guardrail and shoulders next to the right turn lane. The island work at the intersection would correspondingly be made smaller.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost

DISADVANTAGES:

- None apparent

DISCUSSION:

The design allows for 400-ft. of storage length providing for 20 vehicles on the ramp lanes. This storage space will more than adequately cover the expected design traffic in the year 2029. Therefore, there is no apparent need to provide the additional pavement for future expansion between the right and left turn lanes on the ramp.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 68,333	—	\$ 68,333
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 68,333	—	\$ 68,333

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

21

SHEET NO.: 3 of 4

Paving

Approximately 400' in length & 12' wide striping
Area of Paving & earthwork saved is $400 \times 12 = 4,800$ '²

See Alt. 17 for paving costs

Earthwork costs \$11.45/cy

$$4,800 \times \frac{3}{9} = 1,600 \text{ cy}$$

Ave. 3' high
embankment

GOOT already owns the R/W where expansion
of the ramp is going to occur. Therefore,
R/W savings will not materialize

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: 22

DESCRIPTION: ELIMINATE "U" TURN LANE ON SR 53/EXPERIMENT
 STATION ROAD AT WATKINSVILLE BYPASS
 SOUTHBOUND RAMP

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original design calls for a southbound "U" turn lane on the SR 53/Experiment Station Road and corresponding eyebrow at the Watkinsville Bypass southbound ramp.

ALTERNATIVE: (Sketch attached)

Eliminate the "U" turn lane and corresponding eyebrow at the Watkinsville Bypass southbound ramp.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces construction time
- Reduces initial cost

DISADVANTAGES:

- Loss of a potential turning movement
- Harder to access USDA if traveler passes proposed signal at Government Station Road

DISCUSSION:

As there are no businesses (USDA access is further north) or residents on the east side of SR 53/Experiment Station Road at the Watkinsville Bypass southbound ramp, the justification for a "U" turn lane at that location appears to be unwarranted. Should a "U" turn be necessary, southbound users would have to travel an additional 2,200 feet to VFW Drive to make a safe turning movement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 60,203	—	\$ 60,203
ALTERNATIVE	\$ 16,404	—	\$ 16,404
SAVINGS	\$ 43,799	—	\$ 43,799

S. R. 53
CURVE #105

U.S.D.A. SOUTHERN
RESEARCH

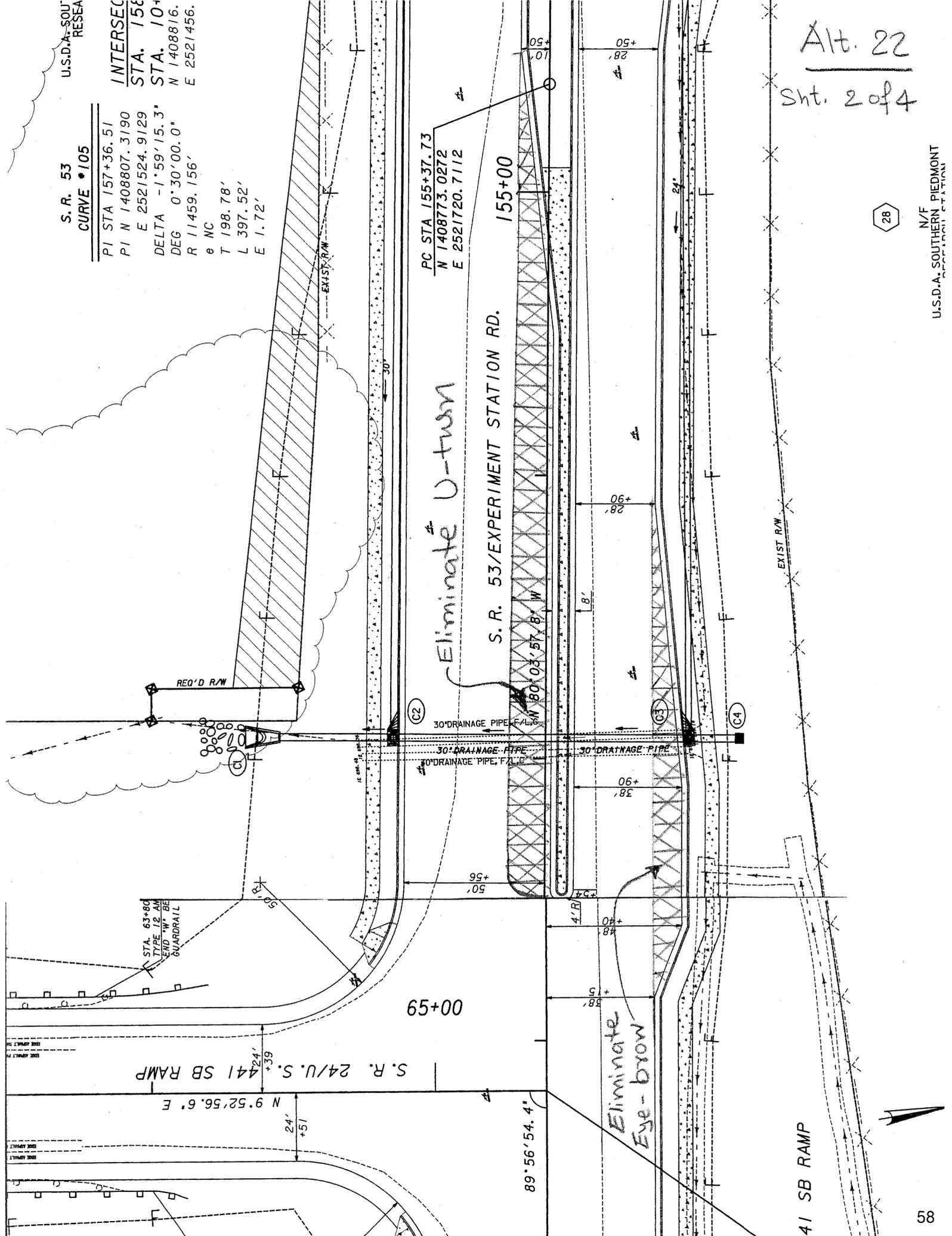
INTERSECTION
STA. 155+00
STA. 10+00
N 1408816.0' E 2521456.0'

PI STA 157+36.51
PI N 1408807.3190
E 2521524.9129
DELTA -1°59'15.3"
DEG 0°30'00.0"
R 11459.156'
e NC
T 198.78'
L 397.52'
E 1.72'

Alt. 22
Sht. 2 of 4

28

N/F
U.S.D.A. SOUTHERN PIEDMONT
RESEARCH



CALCULATIONS



PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

22

SHEET NO.: 3 of 4

U-turn:

$$200 \times 12 + \frac{1}{2} \times 100 \times 12 = 3,000 \text{ sf}$$

Eye-brow:

$$\frac{1}{2} \times 25 \times 13 + 50 \times 13 + \frac{1}{2} \times 13 \times 100 = 1,462 \text{ sf}$$

$$\text{Total} = 3,000 + 1,462 = 4,462 \text{ sf}$$

Cost of paving per sf = \$7.15

(See Alt. 17)

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
*Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage*

ALTERNATIVE NO.: 23

DESCRIPTION: TIE IN THE OLD GOVERNMENT STATION ROAD AS A
**DRIVEWAY FROM SR 53 AND ELIMINATE UPGRADING
 GOVERNMENT STATION ROAD**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design upgrades and realigns Government Station Road to Bishop Farm Parkway on SR 53/Experiment Station Road. The design also upgrades the existing USDA access road, known as the Old Government Road, to a two-lane roadway from SR 53/Experiment Station Road to the proposed realigned Government Station Road.

ALTERNATIVE: (Sketch attached)

Eliminate the proposed upgrade and realignment of Government Station Road to Bishop Farm Road on SR 53/Experiment Station Road and only upgrade the existing USDA access road – Old Government Road and a driveway entrance.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost
- Minimizes maintenance
- Not needed

DISADVANTAGES:

- Slight loss of access to the USDA compound – requiring southbound traffic to perform a “U” turn to access USDA

DISCUSSION:

The alternative would save construction costs by eliminating an upgrade that could be construed to be “outside” of the basic function of increasing capacity on SR 53. However, the driveway into USDA on Old Government Station Road would be upgraded.

It is assumed the required right-of-way that would be saved under the alternative would have been donated by the USDA Research Station.

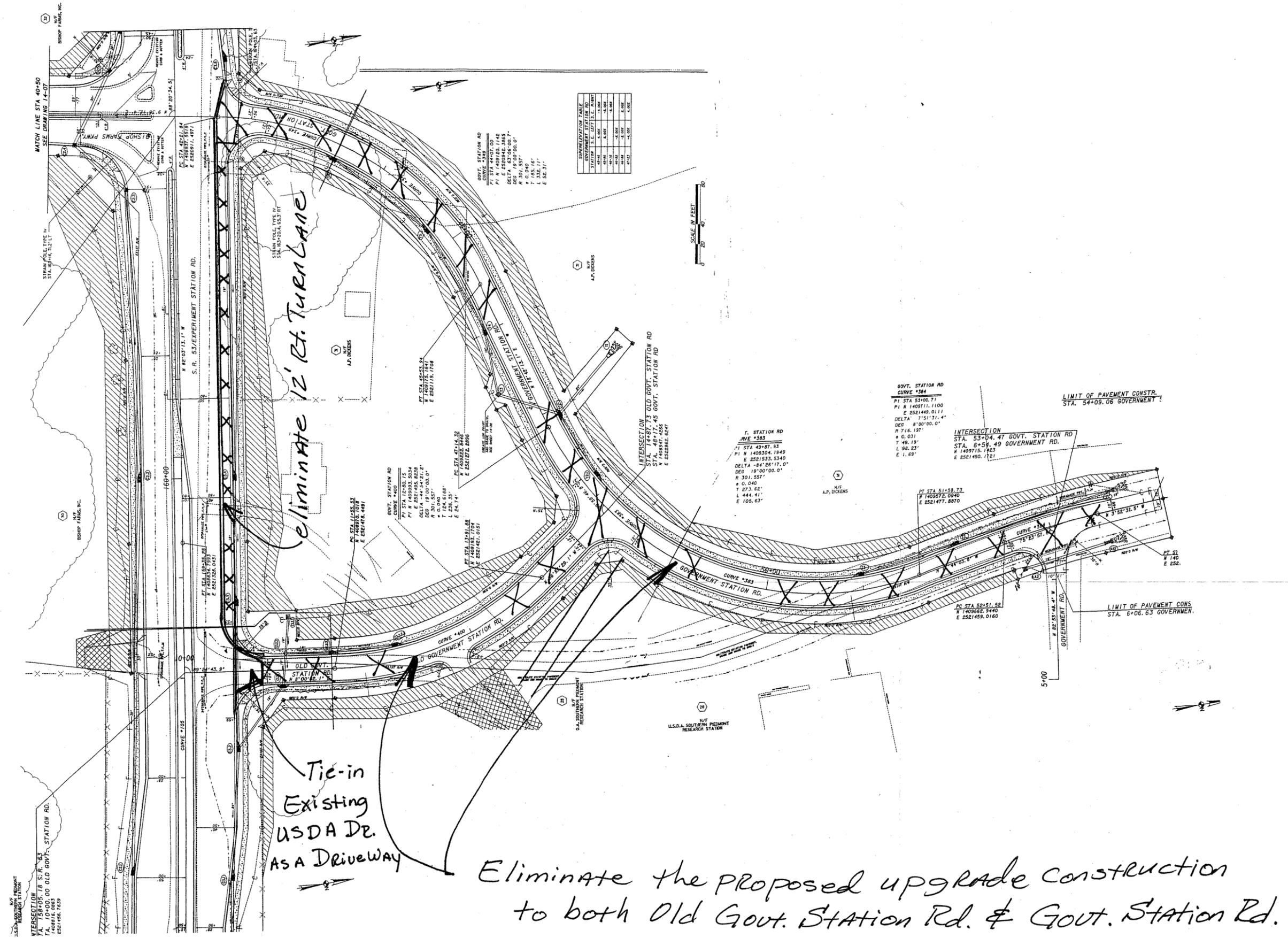
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 723,613	—	\$ 723,613
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 723,613	—	\$ 723,613

PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.: 23

SHEET NO.: 2 of 4

AS DESIGNED ALTERNATIVE



CALCULATIONS

PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: 23
SHEET NO.: 3 of 4

Length of Original Roadway for Old Gout. Station Rd. = 464'

Length of Original Roadway for Gout. Station Rd. Realignment:

$$\begin{aligned} (\text{STA. } 42+32 - \text{STA } 53+00) &= 1,068' \\ &+ 464' \\ \hline (\text{both Eds}) &= 1,532' \end{aligned}$$

add Sidewalks Old Gout. Station Rd = 516 s.y.
Realigned Gout. Station Rd. = $\frac{(2 \text{ side} \times 1,532' \times 5')}{9} = 1,702 \text{ s.y.}$
Total S.W. = 2,218 s.y.

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: 24

DESCRIPTION: UPGRADE THE EXISTING OLD GOVERNMENT STATION
ROAD ENTRANCE ONLY

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design upgrades and realigns Government Station Road to Bishop Farm Parkway on SR 53/Experiment Station Road. The design also upgrades the existing USDA access road, known as Old Government Station Road, to a two-lane roadway from SR 53/Experiment Station Road to the proposed realigned Government Station Road.

ALTERNATIVE: (Sketch attached)

Eliminate the proposed upgrade and realignment of Government Station Road to Bishop Farm Road on SR 53/Experiment Station Road and only upgrade the existing USDA access road – Old Government Station Road.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost
- Minimizes maintenance
- Not needed

DISADVANTAGES:

- Slight loss of access to the USDA compound – requiring southbound traffic to perform a “U” turn to access USDA

DISCUSSION:

The alternative would save construction costs by eliminating an upgrade that could be construed to be “outside” of the basic function of increasing capacity on SR 53. However, the driveway into USDA on Old Government Road would be upgraded.

It is assumed the required right-of-way that would be saved under the alternative would have been donated by the USDA Research Station.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 723,613	—	\$ 723,613
ALTERNATIVE	\$ 138,342	—	\$ 138,342
SAVINGS	\$ 585,271	—	\$ 585,271

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

24

SHEET NO.: 3 of 4

The length of the Original Roadway to be eliminated. (Old Gout. Station Rd)

$$\left[(STA 14+87.73) - 12' \right] - \left[(STA 10+00) + 12' \right] \approx 464'$$
 to get length at E.P. ↑

Adjust Rdwy Construction Unit Cost for Old Gout. Rd Typical Section

$$\frac{\$50,962/\text{ft} \cdot \text{wide}/\text{mi}}{5,280'/\text{mi}} \times (24' + 3' + 3') = \$290/\text{L.F. Length}$$

Plus sidewalks, Area for Side walks:

$$\left(\frac{464' \times 5'}{9 \text{ SF}} \right) \times 2 \text{ sides} = 516 \text{ S.Y.}$$

Length upgraded existing USDA driveway to a two-lane Roadway. = 340'
 sidewalks $\left(\frac{5' \times 340' \times 2 \text{ sides}}{9} \right) = 378 \text{ S.Y.}$

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: 25

DESCRIPTION: **RETAIN THE NEW REALIGNED GOVERNMENT STATION ROAD ENTRANCE DRIVE AND ELIMINATE UPGRADING OF THE OLD GOVERNMENT STATION ROAD**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design upgrades and realigns Government Station Road to Bishop Farm Parkway on SR 53/Experiment Station Road. The design also upgrades the existing USDA access road, known as Old Government Station Road, to a two-lane roadway from SR 53/Experiment Station Road to the proposed realigned Government Station Road.

ALTERNATIVE: (Sketch attached)

Eliminate the proposed upgrade and realignment of Old Government Station Road but retain the proposed realignment and upgrading of the Government Station Road.

ADVANTAGES:

- Simplifies design and construction
- Reduces construction time
- Reduces initial cost
- Minimizes maintenance
- Not needed

DISADVANTAGES:

- Loss of amenity – only one ingress/egress onto the USDA compound

DISCUSSION:

The alternative would save construction costs by eliminating an upgrade (Old Government Station Road) that may not be needed as the realigned and upgraded Government Station Road tie-in at SR 53 with Bishop Farm Parkway will provide an excellent, efficient, and safe ingress/egress to the USDA complex.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 188,802	—	\$ 188,802
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 188,802	—	\$ 188,802

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

25

SHEET NO.: 3 of 4

The length of the Original Roadway to be eliminated. (old Gout. Station Rd)

$$[(Sta 14+87.73) - 12'] - [(Sta 10+00) + 12'] \approx 464'$$
 to get length at E.P. ↑

Adjust Rdwy Construction Unit Cost for Old Gout. Rd Typical Section

$$\frac{\$50,962 / ft \cdot wide / mi}{5,280' / mi} \cdot (24' + 3' + 3') = \$ 290 / L.F. \cdot length$$

Plus sidewalks, Area for Side walks:

$$\left(\frac{464' \times 5'}{9 SF / S.Y.} \right) \times 2 \text{ sides} = 516 S.Y.$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/ OCONEE CONNECTOR <i>Oconee County, Georgia Department of Transportation, District 1 Final Design Stage</i>	ALTERNATIVE NO.:	26
DESCRIPTION:	ELIMINATE THE EXISTING TRAFFIC LIGHT AT MCDONALD'S SOUTH OF HOG MOUNTAIN ROAD	SHEET NO.:	1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original design indicates an existing 4-way traffic signal approximately 500 ft. south of the SR 53/Experiment Station Road/Hog Mountain Road intersection that is a major signalized intersection. Another, unsignalized intersection also exists approximately 530 ft. south of the McDonald's driveway intersection with SR 53/Experiment Station Road and Loch Lamond Circle.

ALTERNATIVE: (Sketch attached)

Eliminate the existing signal at McDonald's and continue the median through the intersection eliminating left and right turn lanes. However, retain the right-in/right-out from SR 53/Experiment Station Road.

ADVANTAGES:

- Improves safety
- Improves traffic flow
- Reduces construction duration
- Reduces initial cost
- Existing signal could be used elsewhere on the project

DISADVANTAGES:

- Slightly inconveniences users of businesses on both sides of the intersection
- Requires alternate routing to reach businesses

DISCUSSION:

It is noted that access to McDonald's and other businesses can easily be achieved from Hog Mountain Road and other intersections and driveways along SR 53/Experiment Station Road. The businesses on the west side of SR 53/Experiment Station Road are part and parcel of the shopping center complex so access is readily available from within the complex.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 166,763	—	\$ 166,763
ALTERNATIVE	\$ 5,110	—	\$ 5,110
SAVINGS	\$ 161,653	—	\$ 161,653

CALCULATIONS



PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

26

SHEET NO.: 3 of 4

Additional curb & Gutter: $130' \times 2 = 260'$
 Additional 18" ϕ Storm Drain: 12'

Savings

Pavement: $130 \times 20 + (170 \times 12 + \frac{1}{2} \times 100 \times 12) 2 = 7,880'{}^2$

Concrete: $(200 \times 4) \frac{2}{9} = 178 \text{ SY}$
 (Median Paving)

Relocate one signal to an another intersection

80,000 - 10,000 = \$70,000

(Cost of new signal) (Relocation Cost)

VALUE ENGINEERING ALTERNATIVE



PROJECT: STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: 27

DESCRIPTION: USE A RESTRICTIVE/TRAFFIC-INDUCED SIGNAL AT THE
RANKIN ROAD/SCHOOL AND CR 264/MARS HILLS ROAD
INTERSECTION

SHEET NO.: 1 of 1

ORIGINAL DESIGN:

The present design indicates the use of a 4-way traffic signal at the Rankin Road/School and CR 264/Mars Hill Road intersection that is approximately 1,000 feet north of an existing signalized intersection at Hog Mountain Road and CR 264/Mars Hill Road.

ALTERNATIVE:

Provide a restrictive, traffic-induced signal at the Rankin Road/School and CR 264/Mars Hill Road intersection during the school year only.

ADVANTAGES:

- Improves traffic flow
- Retains safety aspects of a signalized intersection at a school
- Reduces overall travel time
- Improves pedestrian safety when actually needed

DISADVANTAGES:

- May not be acceptable to businesses on the Rankin Road side of the highway

DISCUSSION:

Seasonal traffic flow is improved if the proposed restrictive/traffic induced signal is employed at this intersection with CR 264/Mars Hill Road as it would only be in operation during the school year or special events. As an option, this signal could be converted to a school/school bus induced/activated unit similar to emergency signals at fire stations.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR**

Oconee County, Georgia Department of Transportation, District 1

Final Design Stage

		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
28	Eliminate "U" turn lane on CR 264/Mars Hill Road as it intersects with Cliff Dawson Road	\$ 60,203	\$ 16,404	\$ 43,799		\$ 43,799
29	Close the median opening at Windridge Office Park driveway on CR 264/Mars Hill Road and open a median at Windy Creek Road and provide an additional driveway to the office park from Windridge Drive		\$ 31,915	\$ (31,915)		\$ (31,915)
32	Close the median opening at Parcel 128 (south of Brookwood Drive) and allow "U" turns at the Crooked Creek Drive/Pebblestone Drive intersection	\$ 89,276	\$ 2,187	\$ 87,089		\$ 87,089
33	Replace the three 8-ft. x 8-ft. box culverts at Parker Branch with two 12-ft. x 9-ft. CON/SPAN® type culverts	\$ 304,346	\$ 169,731	\$ 134,615		\$ 134,615
35	Connect Hollow Creek Lane and Barber Creek Drive at a new intersection on CR 264/Mars Hill Road	\$ 100,048	\$ 375,508	\$ (275,460)		\$ (275,460)
36	Provide a raised median on SR 53/Experiment Station Road between VFW Drive and SR 15/Main Street		\$ 660,079	\$ (660,079)		\$ (660,079)
37	Use a pavement depth based on traffic volume for the Durham Street improvements/realignment					
DESIGN SUGGESTION						
38	Replace the two 6-ft. x 6-ft. box culverts at Lampkin Branch with a 12-ft. x 7-ft. CON/SPAN® type culvert	\$ 93,645	\$ 54,266	\$ 39,379		\$ 39,379
40	Replace the two 5-ft. x 5-ft. box culverts at the unnamed tributary located at Station 232+00 with a 12-ft. x 6-ft. CON/SPAN® type culvert	\$ 55,039	\$ 39,169	\$ 15,870		\$ 15,870
41	Replace the two 5-ft. x 5-ft. box culverts at the unnamed tributary located at Station 232+00 with a 10-ft. x 5-ft. box culvert	\$ 55,039	\$ 54,870	\$ 169		\$ 169
42	Replace the two 7-ft. x 7-ft. box culverts at the unnamed tributary located at Station 288+00 with two 12-ft. x 8-ft. CON/SPAN® type culverts	\$ 132,013	\$ 112,066	\$ 19,947		\$ 19,947

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: **28**

DESCRIPTION: **ELIMINATE "U" TURN LANE ON CR 264/MARS HILL ROAD
AS IT INTERSECTS WITH CLIFF DAWSON ROAD**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design calls for a southbound "U" turn lane on the CR 264/Mars Hill Road and corresponding eyebrow as it intersect with Cliff Dawson Road.

ALTERNATIVE: (Sketch attached)

Eliminate the "U" turn lane and corresponding eyebrow at Cliff Dawson Road.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces construction time
- Reduces initial cost

DISADVANTAGES:

- Loss of a potential turning movement

DISCUSSION:

As there are no businesses or residents on the east side of CR 264/Mars Hill Road at the intersection with Cliff Dawson Road, the justification for a "U" turn lane at that location appears to be unwarranted. Should a "U" turn be necessary, southbound users would have to travel an additional 1,156 feet to Hill Creek Court to make a safe turning movement. It is also noted that there is a "U" turn lane 940 ft. south of the CR 264/Mars Hill Road and Woodlawn Road intersection.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 60,203	—	\$ 60,203
ALTERNATIVE	\$ 16,404	—	\$ 16,404
SAVINGS	\$ 43,799	—	\$ 43,799

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

28

SHEET NO.: 3 of 4

U-turn

$$200 \times 12 + \frac{1}{2} \times 100 \times 12 = 3,000 \text{ sf}$$

Eye-brow

$$\frac{1}{2} \times 25 \times 13 + 50 \times 13 + \frac{1}{2} \times 100 \times 13 = 1,462 \text{ sf}$$

$$\text{Total: } 3,000 + 1,462 = 4,462 \text{ sf}$$

Per Alt. 17, cost of paving = \$7.15/sf

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 29

DESCRIPTION: **CLOSE THE MEDIAN OPENING AT WINDRIDGE OFFICE
PARK DRIVEWAY ON CR 264/MARS HILL ROAD, OPEN A
MEDIAN AT WINDY CREEK ROAD AND PROVIDE AN
ADDITIONAL DRIVEWAY TO THE OFFICE PARK FROM
WINDRIDGE DRIVE**

SHEET NO.: 1 of 5

ORIGINAL DESIGN: (Sketch attached)

The present design indicates a median opening on CR 264/Mars Hill Road to access the driveway to the Windridge Office Park complex.

ALTERNATIVE: (Sketch attached)

Close the median opening on CR 264 to the Windridge Office Park and allow right-in/right-out only movement into/out of the office park at this location. Provide a median opening at Windy Creek Road and CR 264 and add a new eastern driveway into the Windridge Office Park from Windridge Drive.

ADVANTAGES:

- Relocates a median opening
- Provides two indirect access points to the office park
- Creates a safer office park entry

DISADVANTAGES:

- Loss of amenity – no median opening for access to office park from southbound traffic on CR 264 at the existing driveway
- Increases initial cost – new driveway off Windridge Drive
- Increases driving distance for some office park tenants

DISCUSSION:

The alternative would “relocate” the median opening at the Windridge Office Park to Windy Creek Road and add a new driveway on the eastern side of the office park from Windridge Drive. This affords entry to the office park from (1) Windridge Drive, (2) Windy Creek Road, and (3) CR 264 – depending on traveling direction. This alternative provides for a safer and better traffic circulation pattern on CR 264/Mar Hill Road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 31,915	—	\$ 31,915
SAVINGS	\$ (31,915)	—	\$ (31,915)

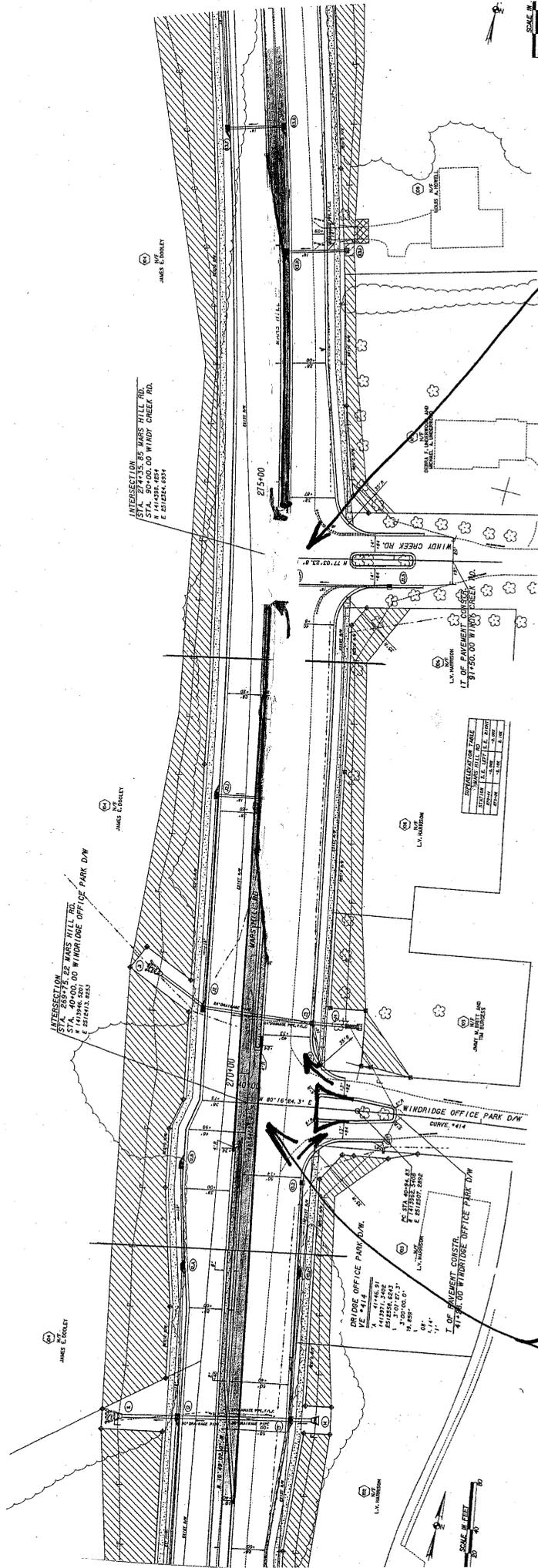
SKETCHES

PROJECT: **STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR**
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.: **29**

SHEET NO.: **2 of 5**

AS DESIGNED ALTERNATIVE



Windridge Office Park D/W will be Rt-in Rt-out Drive*
Close Median Opening At Windridge Office Park and move
Media Opening to Windy Creek Road

* An Additional Drive is Proposed on Windridge Drive under
the Alternate Design-see Sketch on Page 3.

SKETCHES



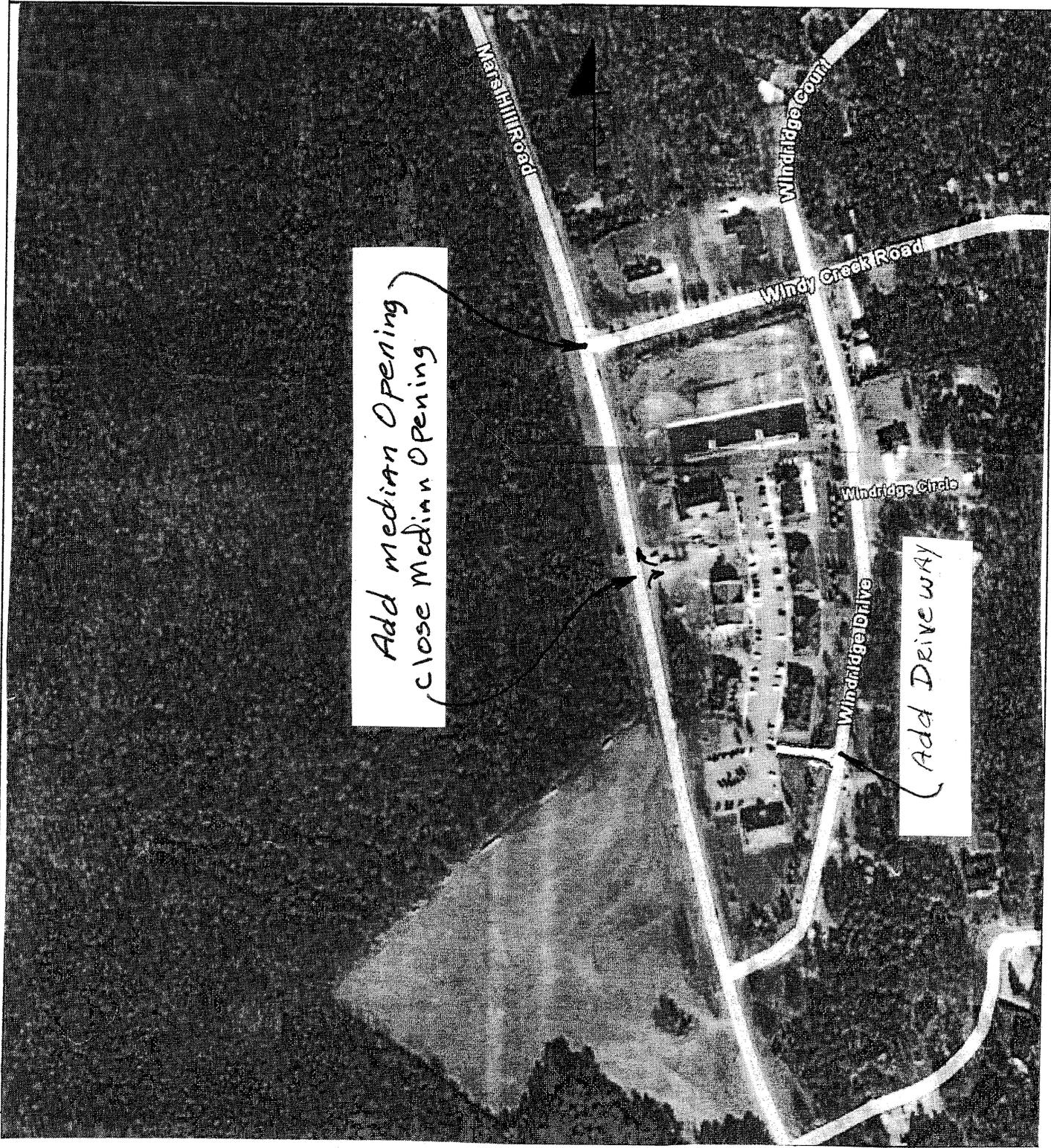
PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage *Existing Conditions*

ALTERNATIVE NO.:

29

AS DESIGNED ALTERNATIVE-DRIVEWAY

SHEET NO.: *3* of *5*



*Add Median Opening
(close Median Opening)*

Add Driveway

CALCULATIONS



PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

29

SHEET NO.: 4 of 5

No additional construction cost to move the median opening from Windridge Office Park Driveway to Windy Hill Creek Rd. - still only one median opening required.

Add'l cost for new (Alternative) Driveway to the Office Park from Windridge Drive.
Length of new Driveway = 110'
Width 24' for two-way traffic.
Use \$232/L.F. for Driveway Cost (from Alt. 16)

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 32

DESCRIPTION: **CLOSE THE MEDIAN OPENING AT PARCEL 128 (SOUTH
OF BROOKWOOD DRIVE) AND ALLOW "U" TURNS AT
CROOKED CREEK ROAD/PEBBLESTONE DRIVE
INTERSECTION**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design proposes a median opening at a driveway to parcel 128 just south of Brookwood Drive on CR 264/Mars Hill Road.

ALTERNATIVE: (Sketch attached)

Close/eliminate the median opening to Parcel 128 and allow "U" turns at the current median opening for Crooked Creek Drive/Pebblestone Drive intersection.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces construction time
- Reduces initial cost
- Improves traffic flow
- Provides for a safer facility

DISADVANTAGES:

- Loss of a potential turning movement

DISCUSSION:

The median opening does not appear to provide access to a public road or major traffic generator; therefore, at "face value," it does not appear to be warranted. The elimination of this median opening would improve safety along CR 264/Mars Hill and remove a potential conflict turning movement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 89,276	—	\$ 89,276
ALTERNATIVE	\$ 2,187	—	\$ 2,187
SAVINGS	\$ 87,089	—	\$ 87,089

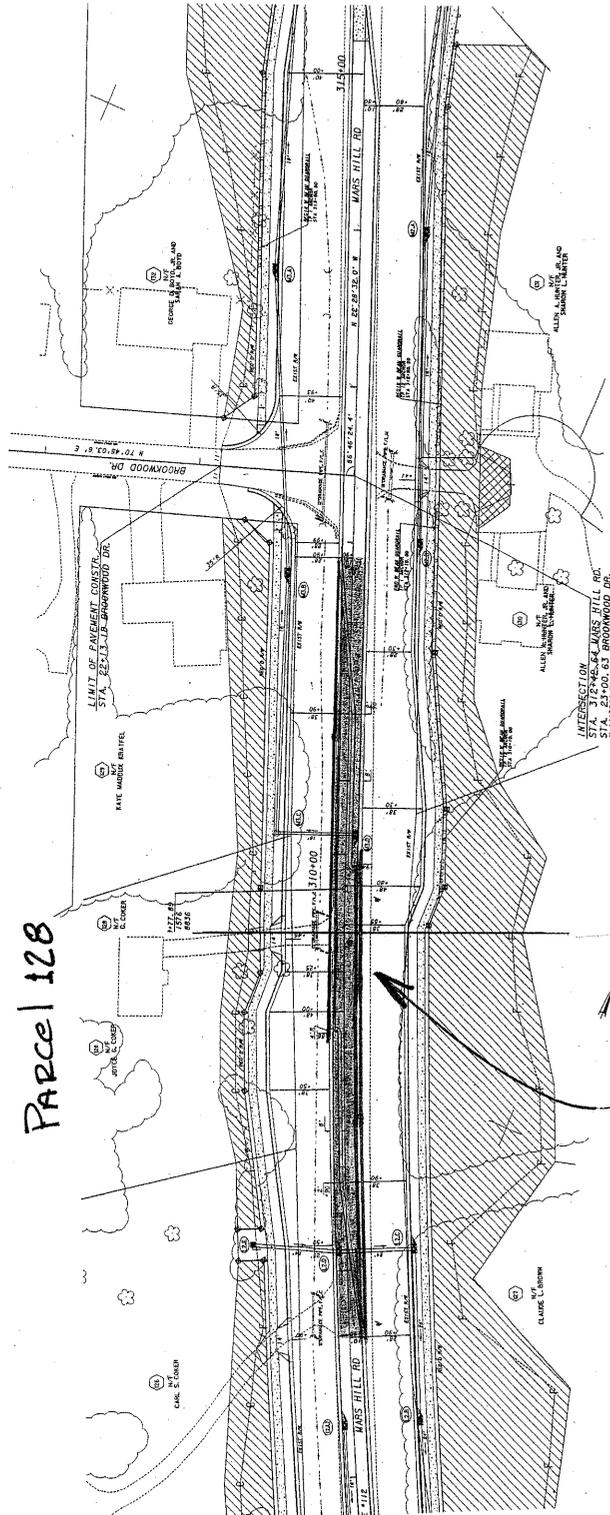
PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

32

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



Parcel 128

close median opening at
Parcel 128

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

32

SHEET NO.: 3 of 4

Length of Present Turn Lanes at Median opening to the Parcel 128 driveway. \downarrow for 12'

Avg. Length 12' turn lanes = 400' (use #116' L.F.)

Pavement Cost for 2-U-Turn "EL brows"
 Use S.F. cost because of irregular shape
 $(2EA \times \left[\left(100' \times \frac{10'}{2}\right) + (50' \times 10') + \left(25' \times \frac{10'}{2}\right) \right]) = 2,250 \text{ S.F.}$

The closed median will be grassed as shown on project Typical Section. So eliminating the median opening will be [^]Cost Savings.
 There should be no addition cost to close the Median Opening.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 33

DESCRIPTION: **REPLACE THE THREE 8-FT. X 8-FT. BOX CULVERTS AT
PARKER BRANCH WITH TWO 12-FT. X 9-FT. CON/SPAN®
TYPE CULVERTS**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The current design indicates the use of three 8-ft. x 8-ft. concrete box culverts with flared wing walls to span Parker Branch.

ALTERNATIVE: (Sketch attached)

Use two 12-ft. x 9-ft. CON/SPAN® type culverts in lieu of the aforementioned concrete box culverts at Parker Branch.

ADVANTAGES:

- Reduces initial cost
- Simplifies construction
- May improve hydraulics

DISADVANTAGES:

- May increase cost due to unknown cost of CON/SPAN® foundations
- May be a challenge to GDOT's preferences

DISCUSSION:

The typical cost of the CON/SPAN® type foundation could not be determined as the Bridge Foundation Investigation (BFI) Report was not available. It appears, however, that with the inclusion of the foundation, the CON/SPAN® type culverts will be more economical to construct than the typical triple 8-ft. x 8-ft. concrete box culverts.

The application of CON/SPAN® type culverts have been successfully used in other locations and DOTs across the country due to their inherent simplicity of design and installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 304,346	—	\$ 304,346
ALTERNATIVE	\$ 169,731	—	\$ 169,731
SAVINGS	\$ 134,615	—	\$ 134,615

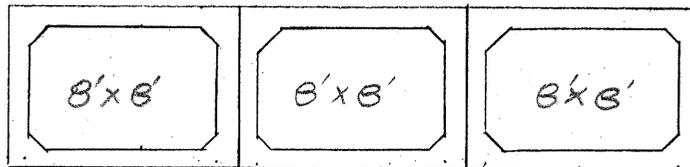
PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

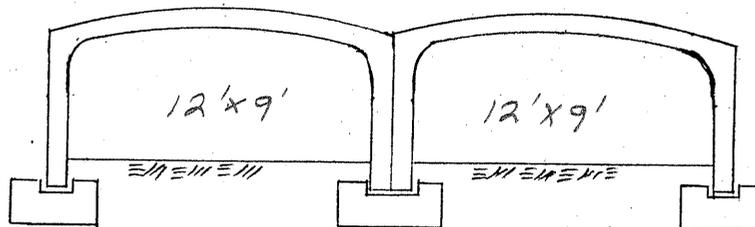
33

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

33

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

Culvert length = 195'

Alternate Estimate:

Cost per lin. ft. of 32'x10' conspan = \$1031

Cost per lin. ft. of 12'x9' conspan = $\frac{\$1031 * (12'x9')}{32'x10'}$

= \$348

12'x9' con/span length = 195'

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 35

DESCRIPTION: **CONNECT HOLLOW CREEK LANE AND BARBER CREEK
DRIVE AT A NEW INTERSECTION ON CR 264/MARS HILL
ROAD**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The present design proposes a “T” intersection at Barber Creek Drive and CR 264/Mars Hill Road with a median opening.

ALTERNATIVE: (Sketch attached)

Connect Hollow Creek Lane with the current median opening at Barber Creek Drive and CR 264/Mars Hill Road.

ADVANTAGES:

- Improves accessibility from the residential area west side of CR 264
- Takes advantage of an existing median opening
- Reduces traffic demand at the Epps Bridge Road intersection with SR 264

DISADVANTAGES:

- Increases initial cost

DISCUSSION:

This alternative affords direct access onto CR 264/Mars Hill Road from Hollow Creek Lane across from Barber Creek Drive. This would help alleviate some of the traffic at the intersection of CR 264/Mars Hill Road and relocated Epps Bridge Road. This reduction could potentially eliminate the warrant for the signal at said intersection.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 100,048	—	\$ 100,048
ALTERNATIVE	\$ 375,508	—	\$ 375,508
SAVINGS	\$ (275,460)	—	\$ (275,460)

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

35

SHEET NO.: 3 of 4

Length of new Rdwy for Hollow Crt Lane
 $310' + 350' = 660'$ of new Roadway

S.F. of add'l R/W

292

$$\left[370' \times \frac{100'}{2} + (80' \times 100') \right] = 26,500_{SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 36

DESCRIPTION: **PROVIDE A RAISED MEDIAN AT SR 53/EXPERIMENT
STATION ROAD BETWEEN VFW DRIVE AND SR 15/MAIN
STREET**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original design proposes a flush 14-ft. full-depth asphalt median from VFW Drive to SR 15/Main Street on SR 53/Mars Hill Road.

ALTERNATIVE: (Sketch attached)

Construct a raised 20-ft., full depth asphalt median from VFW Drive to SR 15/Main Street on SR 53/Mars Hill Road. Provide "U" turn lanes at the signalized intersection of SR 53/Mars Hill Road and Durham Street.

ADVANTAGES:

- Improves safety of both intersections
- Improves overall traffic flow

DISADVANTAGES:

- Increases initial cost
- Inconvenient to patrons wishing to make turns without going through an intersection

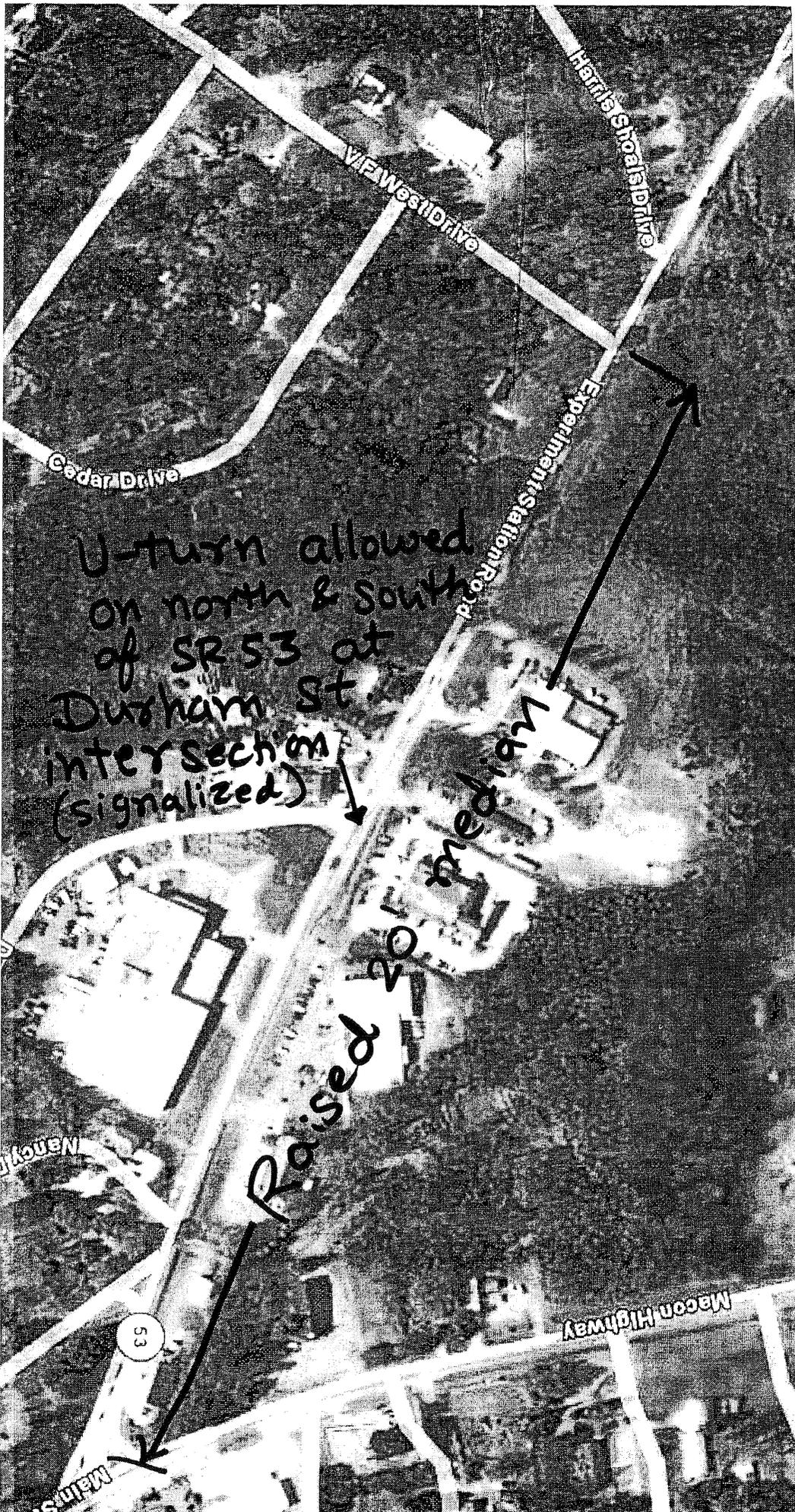
DISCUSSION:

Owing to the number of businesses on this section of the facility, traffic is expected to be heavy. To reduce traffic hazards, a raised median will be highly effective in terms of traffic calming, safety, and improved traffic flow.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 660,079	—	\$ 660,079
SAVINGS	\$ (660,079)	—	\$ (660,079)

Alt. 36

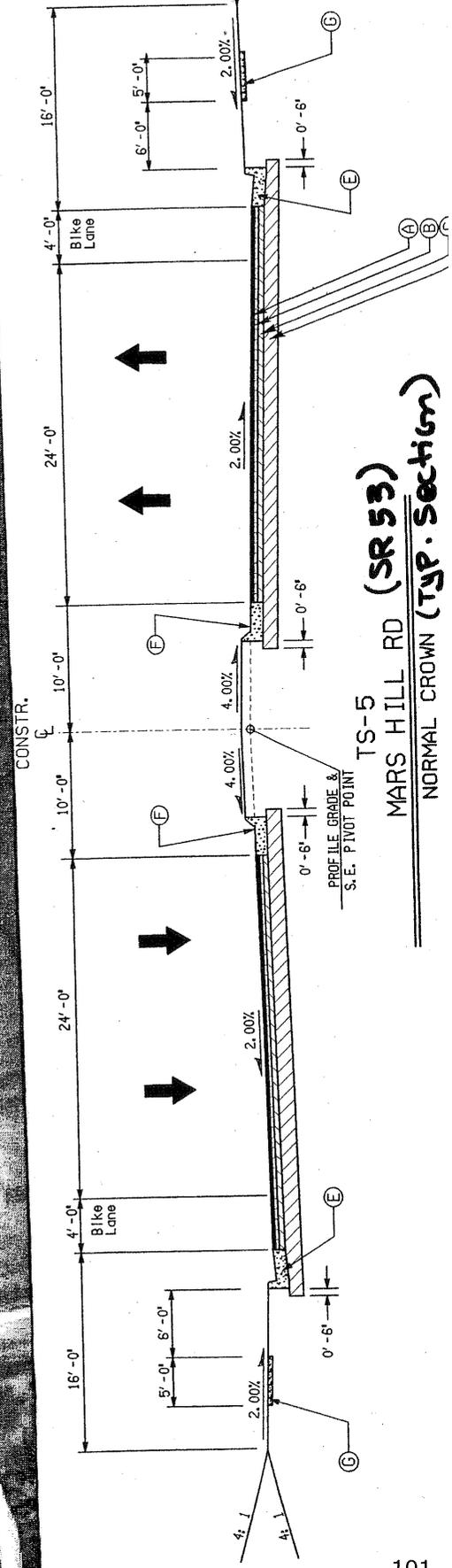
Sht. 2 of 4



U-turn allowed
on north & south
of SR 53 at
Durham St
inter section
(signalized)

Raised 20' median

W 1927



CONSTR.

TS-5
MARS HILL RD (SR 53)
NORMAL CROWN (TYP. Section)

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
 SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
 Final Design Stage

ALTERNATIVE NO.:

36

SHEET NO.: 3 of 4

The 20' median ^{on SR 53} will begin approximately at STA. 108+25 at its intersection with SR 15. It will end at Durham Street intersection at approximate station of 121+00 with a 100' of taper & 200' of U-turn storage length. The median will begin again approximately at STA. 121+75 and end at the intersection with VFW drive at an approximate station of 130+00. A 100' taper & 200' of U-turn storage length with eye-bowls will be provided at both ends.

$$\text{Total curb length} : [(121+00 - 108+25) + (130+00 - 121+75)] \times 2 = 4,200'$$

Median paving will be one each at intersection with SR 15 & VFW Drive and two at Durham Street.

$$4 \times 200 \times 4' \text{ wide} + \frac{1}{2} \times \frac{100}{2} \times \left(\frac{6+4}{2}\right) \times 4 \text{ times} = 2100' \text{ or } 233 \text{ sy}$$

(median only at half the taper)

The flushed median as shown is 14'. Add 6' of full depth pavement at the Durham Street intersection.

$$(121+75 - 121+00) \times 6 = 450 \text{ sf}$$

Six feet of additional R/W will be necessary.

$$(130+00 - 108+00) \times 6 = 13,200 \text{ sf of high-end commercial area}$$

Add lump sum cost of removing existing pavement and grading the median.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 37

DESCRIPTION: **USE A PAVEMENT DEPTH BASED ON TRAFFIC VOLUME
FOR THE DURHAM STREET IMPROVEMENTS/
REALIGNMENT**

SHEET NO.: 1 of 1

ORIGINAL DESIGN:

The cost estimate for the project does not differentiate the cost between road types, i.e., the cost for the full depth pavement on the mainline is used for all side and surface street improvements and relocation. This is particularly true at the Durham Street improvements/relocation and at the Harris Shoal Park Road.

ALTERNATIVE:

Use a pavement thickness commensurate with the anticipated/document future traffic flow.

ADVANTAGES:

- May decrease the overall cost of the project
- Correctly applies proper pavement thickness

DISADVANTAGES:

- None apparent

DISCUSSION:

It is understood that a pavement study has not been conducted for the project and will be forthcoming. This design suggestion merely identifies a potential source of savings when compared to the current bottom line of the cost estimate.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: **38**

DESCRIPTION: **REPLACE THE TWO 6-FT. X 6-FT. BOX CULVERTS AT
LAMPKIN BRANCH WITH A 12-FT. X 7-FT. CON/SPAN®
TYPE CULVERTS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The current design indicates the use of two 6-ft. x 6-ft. concrete box culverts with flared wing walls to span Lampkin Branch.

ALTERNATIVE: (Sketch attached)

Use a 12-ft. x 7-ft. CON/SPAN® type culvert in lieu of the aforementioned concrete box culverts at Lampkin Branch.

ADVANTAGES:

- Reduces initial cost
- Simplifies construction
- May improve hydraulics

DISADVANTAGES:

- May increase cost due to unknown cost of CON/SPAN® foundations
- May be a challenge to GDOT's preferences

DISCUSSION:

The typical cost of the CON/SPAN® type foundation could not be determined as the Bridge Foundation Investigation (BFI) Report was not available. It appears, however, that with the inclusion of the foundation, the CON/SPAN® type culvert will be more economical to construct than the typical double 6-ft. x 6-ft. concrete box culverts.

The application of CON/SPAN® type culverts have been successfully used in other locations and DOTs across the country due to their inherent simplicity of design and installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 93,645	—	\$ 93,645
ALTERNATIVE	\$ 54,266	—	\$ 54,266
SAVINGS	\$ 39,379	—	\$ 39,379

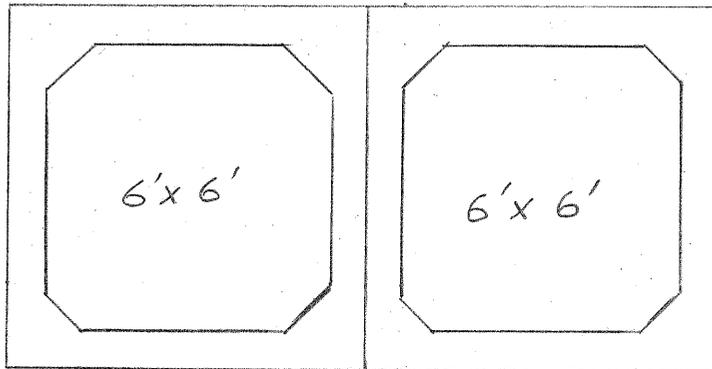
PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

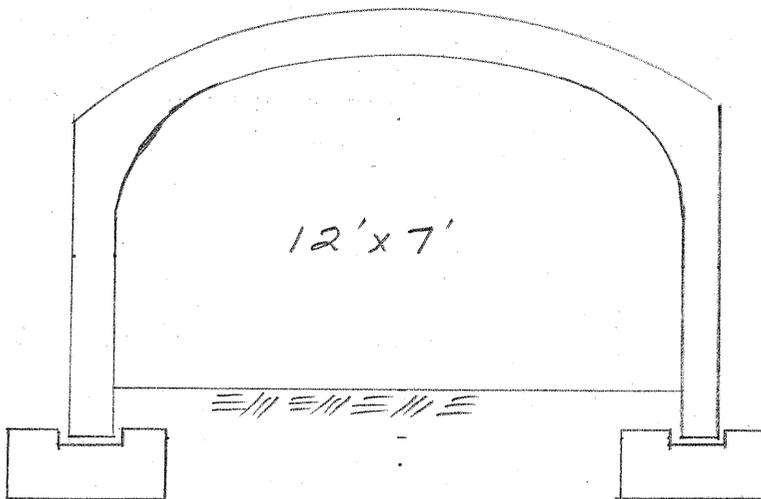
38

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

38

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

Culvert Length = 160'

Alternative Estimate:

Conspan Length = 160'

Cost per lin. ft of 32'x10' conspan = \$1031

Cost per lin. ft of 12'x7' conspan = $\frac{\$1031 \times (12' \times 7')}{32' \times 10'}$
= \$271

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 40

DESCRIPTION: **REPLACE THE TWO 5-FT. X 5-FT. BOX CULVERTS AT THE
UNNAMED TRIBUTARY LOCATED AT STATION 232+00
WITH A 12-FT. X 6-FT. CON/SPAN® TYPE CULVERT**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The current design indicates the use of two 5-ft. x 5-ft. concrete box culverts with flared wing walls to span the unnamed tributary located at Station 232+00.

ALTERNATIVE: (Sketch attached)

Use a 12-ft. x 6-ft. CON/SPAN® type culvert in lieu of the aforementioned concrete box culverts at the unnamed tributary located at Station 232+00.

ADVANTAGES:

- Reduces initial cost
- Simplifies construction
- May improve hydraulics

DISADVANTAGES:

- May increase cost due to unknown cost of CON/SPAN® foundation
- May be a challenge to GDOT's preferences

DISCUSSION:

The typical cost of the CON/SPAN® type foundation could not be determined as the Bridge Foundation Investigation (BFI) Report was not available. It appears, however, that with the inclusion of the foundation, the CON/SPAN® type culvert will be more economical to construct than the typical double 5-ft. x 5-ft. concrete box culvert.

The application of CON/SPAN® type culverts have been successfully used in other locations and DOTs across the country due to their inherent simplicity of design and installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 55,039	—	\$ 55,039
ALTERNATIVE	\$ 39,169	—	\$ 39,169
SAVINGS	\$ 15,870	—	\$ 15,870

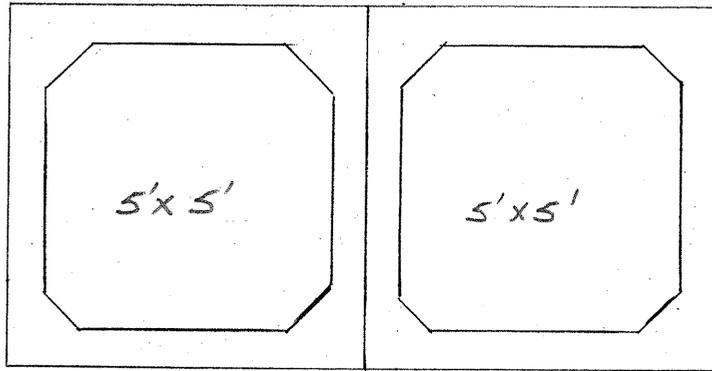
PROJECT: **STP-1267(8), P. I. No. 142060,**
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ALTERNATIVE NO.:

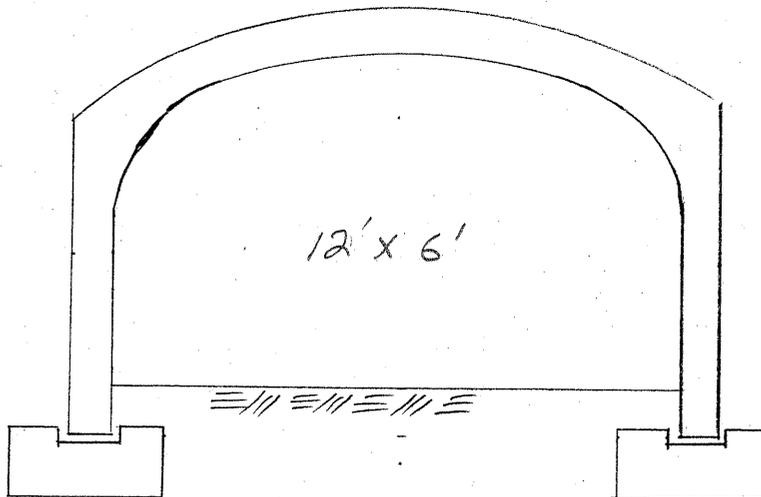
40

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

40

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

Culvert length = 135'

Alternative Estimate:

Con/span length = 135'

Cost per lin. ft. of 32'x10' Conspan = \$1031

Cost per lin. ft. of 12'x6' Conspan = $\frac{\$1031 * (12'x6')}{32'x10'}$
= \$232

VALUE ENGINEERING ALTERNATIVE



PROJECT: **STP-1267(8), P. I. NO. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
*Oconee County, Georgia Department of Transportation, District 1
Final Design Stage*

ALTERNATIVE NO.: 42

DESCRIPTION: **REPLACE THE TWO 7-FT. X 7-FT. BOX CULVERTS AT THE
UNNAMED TRIBUTARY LOCATED AT STATION 288+00
WITH TWO 12-FT. X 8-FT. CON/SPAN® TYPE CULVERT**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The current design indicates the use of two 7-ft. x 7-ft. concrete box culverts with flared wing walls to span the unnamed tributary located at Station 288+00.

ALTERNATIVE: (Sketch attached)

Use two 12-ft. x 8-ft. CON/SPAN® type culverts in lieu of the aforementioned concrete box culverts at the unnamed tributary located at Station 288+00.

ADVANTAGES:

- Reduces initial cost
- Simplifies construction
- May improve hydraulics

DISADVANTAGES:

- May increase cost due to unknown cost of CON/SPAN® foundation
- May be a challenge to GDOT's preferences

DISCUSSION:

The typical cost of the CON/SPAN® type foundation could not be determined as the Bridge Foundation Investigation (BFI) Report was not available. It appears, however, that with the inclusion of the foundation, the CON/SPAN® type culverts will be more economical to construct than the typical double 7-ft. x 7-ft. concrete box culverts.

The application of CON/SPAN® type culverts have been successfully used in other locations and DOTs across the country due to their inherent simplicity of design and installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 132,013	—	\$ 132,013
ALTERNATIVE	\$ 112,066	—	\$ 112,066
SAVINGS	\$ 19,947	—	\$ 19,947

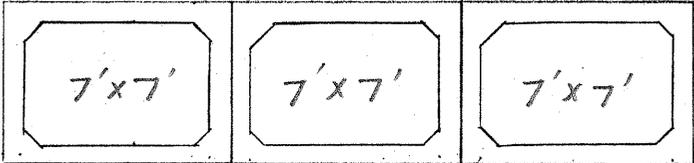
PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

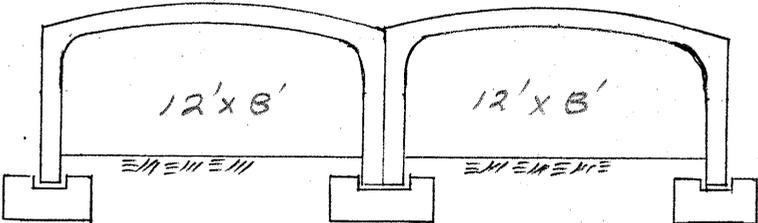
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AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: STP-1267(8), P. I. No. 142060,
SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

ALTERNATIVE NO.:

42

SHEET NO.: 3 of 4

Calculations:

Original Estimate:

Culvert length = 145'

Alternative Estimate:

Con/span length = 145'

Cost per lin. ft. of 32'x10' con/span = \$1031

$$\begin{aligned} \text{Cost per lin. ft. of 12'x8' con/span} &= \frac{\$1031 \times (12 \times 8)}{32 \times 10} \\ &= \$309 \end{aligned}$$

PROJECT DESCRIPTION

INTRODUCTION

This project consists of the widening and reconstruction of State Route 53 (SR 53) (Experiment Station Road), County Road (CR) 264 (Mars Hill Road), and CR 261 (The Oconee Connector) from SR 15 (Main Street) to SR 316 (University Parkway) northwest of Watkinsville, approximately one mile south of the Oconee County line. The project consists of widening the existing two lane roadway to a four-lane divided roadway. The project length is approximately 4.969 miles and is scheduled for a January 2009 letting.

The existing typical section along the corridor is a two-lane roadway with variable width grassed shoulders and partial curb and gutter as it approaches Hog Mountain Road with a posted speed limit of 45 miles per hour (mph). The roadways provide primary access for the residential communities northwest of Watkinsville to and from SR 316 and the major shopping and employment centers in Clarke County, including the University of Georgia and the nearby City of Athens. As this area continues to develop, severe congestion and operational safety problems are occurring at local intersections along the project corridor. A three-year history of accidents on Experimental Station Road and Mars Hill Road indicate accident rates over two times that of the state average for its functional classification of Rural Major Collector. The base year traffic in 2002 was 20,000 vehicles per day (VPD), and in the design year of 2022, it is estimated to be 34,800 VPD.

The proposed construction will provide a four-lane urban roadway, two 12-ft. lanes in each direction with a 20-ft. raised grass median, 4-ft. bicycle lanes, and 5-ft. sidewalks on each side. A short five-lane urban section (1,800 feet±) will extend from the beginning of the project to just south of VFW Drive. The existing bridge culverts over Calls Creek, Butler Creek, Lampkin Branch, Barber Creek Tributary, and Parker Branch will be extended, and the existing bridge over Barber Creek will be widened to accommodate the new lanes. The project will provide a level-of-service (LOS) of "C" or above for the morning and afternoon peak hours through the 2022 design year. Traffic will be maintained on existing roadways during construction.

NEED AND PURPOSE

The proposed improvements serve two primary purposes: (1) to provide additional traffic capacity and improved access to accommodate the 2029 design hour traffic volumes; and (2) to improve traffic safety by separating oncoming traffic and providing turn-lanes at local intersections.

Within the project corridor, Experiment Station Road, Mars Hill Road, and the Oconee Connector are rural two-lane north-south facilities with a 24-ft. typical section of pavement. Currently, the existing land use along the proposed corridor is primarily single family residential with a number of churches, two county public schools, county police and sheriff departments, as well as a number of shopping centers, fast food restaurants, and professional businesses. As this area continues to develop, severe congestion and operational safety problems are occurring at local intersections along the project corridor. With a posted speed of 45 mph, heavy peak hour traffic volumes conflict with multiple left and right turning movements into driveways, side streets and cross streets, creating extreme delay

and unsafe traffic conditions through the project corridor. Currently, the left-turn lanes at signalized intersections do not provide sufficient storage capacity for left-turning vehicles.

The logical southern terminus for the project is the intersection of Experiment Station Road with Main Street in downtown Watkinsville. This intersection currently serves as the terminus for Experiment Station Road and Main Street accommodating the majority of the turning movements to and from SR 53 and serving as the primary route through Watkinsville. Maintaining the existing terminus in downtown Watkinsville will continue to provide access to and from a number of federal and state routes, and is therefore selected as the logical southern terminus for the proposed improvements.

The logical northern terminus for the proposed improvements is a rural principal arterial that interchanges with Athens Perimeter Highway (US 78/SR 10 Loop) and distributes traffic to the northern residential areas of Watkinsville, as well as the Athens metropolitan area. The intersection of the Oconee Connector (CR 261) and University Parkway (SR 316), a multi-lane facility already programmed for additional improvement, was chosen as the logical northern terminus for the project.

The subsequent traffic analysis of the 2029 design year traffic further substantiates the need and purpose of this project. The improvements to widening and dividing the roadway with a 20-ft. median, creating median breaks with designated left-turn lanes, and installing traffic signals at the major intersections will accommodate design year capacity volumes and improve safety concerns throughout the length of the project.

The proposed improvements in this concept, programmed in the State Transportation Improvement Program, will widen the programmed two-lane segment of roadway between Epps Bridge Road, Mars Hill Road intersection and University Parkway to a four-lane divided roadway consistent with the typical section outlined in this concept. It is planned at a later date to ultimately create a full interchange at University Parkway upon conversion of University Parkway to a limited access facility.

CONSTRUCTION COSTS

The probable cost of construction, based on MAAI's cost estimate dated August 14, 2007, is \$28,279,958. In addition, right-of-way (ROW) costs, based on Department's Preliminary Right of Way Cost Estimate, dated September 21, 2006, are \$45,230,816.

MAAI's cost estimate did not include Engineering and Construction (E&C) or escalation markups. As such, the VE team added the E&C markup at 10% and derived the escalation at 13.69%, yielding an effective, composite markup rate of 25.06%. The escalation rate is based on 8.00% per annum (derived from the Department's recent experience) for 2.83 years representing the mid-point of construction. Said mid-point is June 2010 based on a let date of January 2009 and a construction duration of 36 months; i.e., January 2012. For additional information, please see the Cost Estimate Summary and Cost Histograms section of the report.

As a consequence, the final probable cost of construction is \$80,597,491 which includes a construction subtotal of \$35,366 and ROW costs of \$45,230,816.

VALUE ANALYSIS AND CONCLUSIONS

INTRODUCTION

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

- Value Engineering Workshop Agenda
- Value Engineering Workshop Participants
- Economic Data
- Cost Estimate Summary and Cost Histograms
- 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

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

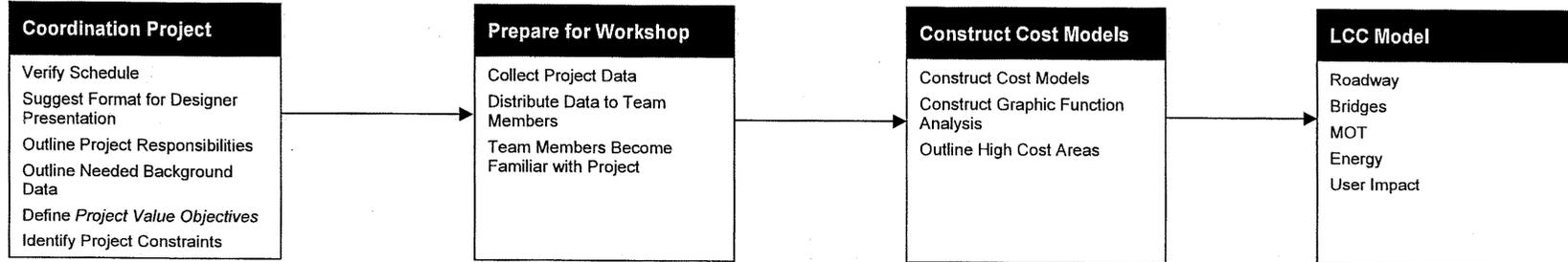
The VE workshop was a three and a half-day effort (see attached agenda). During the workshop, the VE job plan was followed. The job plan guided the search for high cost areas in the project and included procedures for developing alternative solutions for consideration. It includes six phases:

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

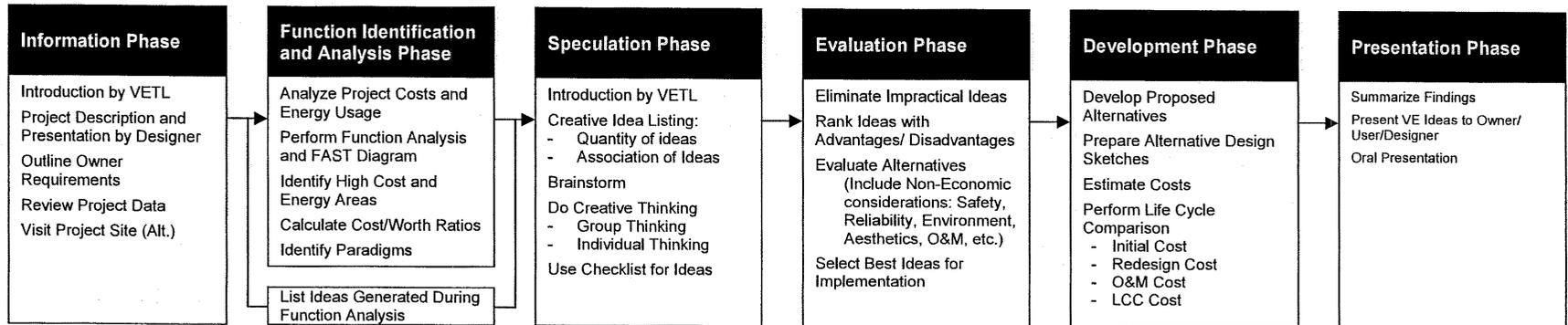


Value Engineering Study Task Flow Diagram

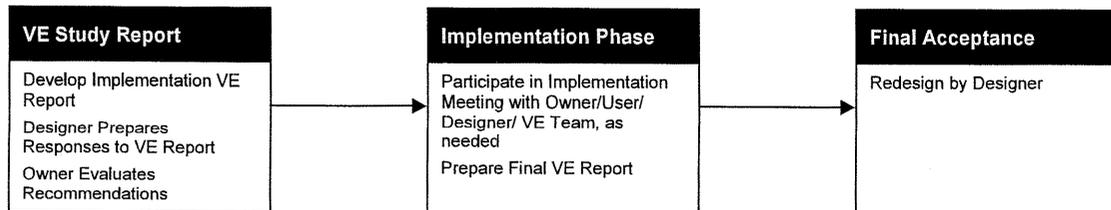
Preparation Effort



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 first day of the session. Following the presentation, the VE team discussed the project using the following documents:

- Approved Project Concept Report, Department of Transportation, State of Georgia, Interdepartment Correspondence, Office of Preconstruction for STP-1267 (6) and (8), P.I. Nos. 141980/142060, Oconee County; dated September 22, 2002;
- Half Size Drawings entitled Plan and Profile of Proposed S.R. 53/Mars Hill Rd/Oconee Connector; Oconee County; STP-1267(8); P.I. No. 142060; prepared by Moreland Altobelli Associates, Inc. for the State of Georgia Department of Transportation; undated;
- Preliminary Field Plan Review Inspection Report for Project Number STP-1287(8) Oconee/PI No. 142060; Widening and Reconstruction of SR 53/Experiment Station Road CR 26/Mars Hill Road and CR 261/Oconee Connector from SR 15 to SR 316; Inspection Date: January 30, 2007; Report Date: February 2007; prepared by the Georgia, Department of Transportation;
- Preliminary Right of Way Cost Estimate for project STP-1267(8), Oconee County; P.I. No. 142060; prepared by the State of Georgia Department of Transportation office of Right of Way; dated September 21, 2006;
- Estimate Report for File "97981C" for project STP-1267(8), Oconee County; P.I. No. 142060; prepared by Moreland Altobelli Associates, Inc. for the State of Georgia Department of Transportation; dated August 14, 2007;
- General Highway Map, Oconee County, Georgia, 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 1987;
- GDOT Design Policy Manual, a Georgia Department of Transportation Publication, Version 2.0; dated May 21, 2007 and revised June 1, 2007;
- Google Earth Aerials, undated;
- Traffic Signal Installation Chart, undated;
- Earthwork Calculation from Station 40+00.00 to 56+00.00, dated April 3, 2007; and
- Earthwork Calculation for Mainline from Station 106+50.00 to 370+50.00, dated August 29, 2007.

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 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 MAAI 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 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.

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 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 1-5, with the best ideas rated 5. Total 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 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 an 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.

Presentation Phase

The last phase of the VE workshop 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 MAAI 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 Value Engineering Study Report. Personnel from GDOT and MAAI 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. Lewis & Zimmerman Associates, Inc. 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 28-hour Value Engineering (VE) study on the following project: STP-1267(8), P. I. No. 142060, STATE ROUTE 53 (SR 53) – Experimental Station Road 246 (CR 246) - MARS HILL ROAD/CR 261 - OCONEE CONNECTOR. The project is located in Oconee County, Georgia. It is expected the owner, the Georgia Department of Transportation (GDOT) and the design consultant, Moreland Altobelli Associates, Inc. (MAAI), 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 August 27 - 30, 2007. The study will be conducted in the Engineering Services' Conference Room, Room 264 of 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, and Value Engineering Coordinator, who can be reached at 404-651-7468.

Monday, August 27th

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 MAAI are to present information concerning the projects 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.

Tuesday, August 28th

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**

Wednesday, August 29th

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**

4:00 pm – 5:00 pm **Commence Summary Worksheets for Information oral Presentation**

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 worksheets will form the basis of the informal oral presentation.

Thursday, August 30th

8:00 am - 9:00 am **Finalize Summary Worksheets and Prepare for Oral Presentation Strategies**

9:00 am – 11:00 am **Informal Oral Presentation**

The VE team presents its alternatives to the owner and design team representatives 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.

11:00 am **Adjourn**

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise on the 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	Highway Engineer	ARCADIS U.S., Inc.
Pareesh J. Parikh, PE	Construction Specialist/ Transportation Engineer	Delon Hampton and Associates
Molapo R. M. Kgabo, PE	Bridge/Structural Engineer	HNTB Corporation
Luis M. Venegas, PE, CVS-Life, LEED® AP	Value Engineering Facilitator/ Team Leader	Lewis & Zimmerman Associates

OWNER'S/DESIGNER'S PRESENTATION

GDOT and MAAI representatives presented an overview of the projects on Monday, August 27, 2007. 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'S FINAL PRESENTATION

The VE team conducted an informal presentation on Thursday, August 30, 2007 to GDOT and MAAI representatives. Copies of the draft Summary of Potential Cost Savings worksheets were provided for interim use by GDOT and MAAI personnel.

A copy of the meeting participants is attached for reference.

VALUE ENGINEERING ATTENDEES

MEETING PARTICIPANTS



PROJECT: STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 <i>Final Design Stage</i>		Date: August 27 – 30, 2007
NAME & E-MAIL (PLEASE PRINT)	ORGANIZATION/TITLE	PHONE/FAX
Name: Bill Duvall, PE GDOT Employee No.: em: bill.duval@dot.state.ga.us	Organization: State of Georgia Department of Transportation (GDOT), Office of Bridge Design Title: Assistant State Bridge Engineer	ph: 404-656-5308 cell: fx: 404-651-7076
Name: James (Mag) Magnus, CPESC GDOT Employee No.: em: james.mahnus@dot.state.ga.us	Organization: GDOT, Office of Construction Title: Assistant State Construction Engineer	ph: 404-656-5306 cell: fx: 404-656-3507
Name: M. Brad McManus, PE GDOT Employee No.: em: brad.mcmanus@dot.state.ga.us	Organization: GDOT, Office of Road and Airport Design Title: Design Group Manager	ph: 404-656-5407 cell: fx: 404-657-0653
Name: Gerald A. Milligan GDOT Employee No.: em: jerry.milligan@dot.state.ga.us	Organization: GDOT, Office of Right of Way Title: Supervisor Appraisal Estimator	ph: 770-986-1541 cell: fx: 770-986-1558
Name: Lisa L. Myers GDOT Employee No.: em: lisa.myers@dot.state.ga.us	Organization: GDOT, Engineering Services Title: Design Review Engineer Manager, Value Engineering Coordinator	ph: 404-651-7468 cell: fx: 404-463-6131
Name: Brian K. Summers, PE GDOT Employee No.: em: brian.summers@dot.state.ga.us	Organization: GDOT, Engineering Services Title: Project Review Engineer	ph: 404-651-6846 cell: fx: 404-463-6131
Name: Ken Werho GDOT Employee No.: em: ken.werho@dot.state.ga.us	Organization: GDOT, Office of Traffic Safety and Design Title: Design Review Engineer	ph: 404-635-8144 cell: fx: 404-635-8116
Name: Ron Wishon GDOT Employee No.: em: ron.wishon@dot.state.ga.us	Organization: GDOT, Engineering Services Title: Assistant Project Review Engineer	ph: 404-651-7470 cell: fx: 404-463-6131
Name: Brian C. Evans GDOT Employee No.: em: bevans@moreland-altobelli.com	Organization: Moreland Altobelli Associates, Inc. (MAAI) Title: Project Engineer	ph: 770-263-5945 cell: 678-357-7254 fx: 770-263-0166
Name: Brad Hale, PE GDOT Employee No.: em: bhale@moreland-altobelli.com	Organization: MAAI Title: Vice President	ph: 770-263-5945 cell: 678-457-6316 fx: 770-263-0166

VALUE ENGINEERING ATTENDEES

MEETING PARTICIPANTS



PROJECT: STP-1267(8), P. I. No. 142060, SR 53 / MARS HILL ROAD / OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 <i>Final Design Stage</i>		Date: August 27 – 30, 2007
NAME & E-MAIL (PLEASE PRINT)	ORGANIZATION/TITLE	PHONE/FAX
Name: Joseph A. Leoni, PE GDOT Employee No.: em: joe.leoni@arcadis-us.com	Organization: ARCADIS Title: Roadway QA / QC Manager	ph: 770-431-8666 cell: 770-294-9970 fx: 770-435-2666
Name: Paresh J. Parikh, PE GDOT Employee No.: em: pparikh@delonhampton.com	Organization: Delon Hampton & Associates, Chartered Title: Manager, Engineering Services	ph: 404-524-8030 cell: fx: 404-524-2575
Name: Molapo R. M. Kgabo, PE GDOT Employee No.: em: mkgabo@hntb.com	Organization: HNTB Corporation Title: Structural / Bridge Engineer	ph: 404-946-5740 cell: 770-362-5101 fx: 404-841-2820
Name: Luis M. Venegas, PE, CVS-Life, LEED® AP, FSAVE GDOT Employee No.: em: lvenegas@lza.com	Organization: Lewis & Zimmerman Associates, Inc. Title: Value Engineering Facilitator	ph: 770-992-3032 cell: 678-488-4287 fx: 770-435-2666
Name: GDOT Employee No.: em:	Organization: Title:	ph: cell: fx:
Name: GDOT Employee No.: em:	Organization: Title:	ph: cell: fx:
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ECONOMIC DATA

The VE team developed economic criteria used for evaluation with information gathered from the State of Georgia Department of Transportation and Moreland Altobelli Associates, Inc. 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:	2007
Construction Start Up:	±2009 (January)
Construction Duration:	±36 Months (January 2012)
Economic Planning Life:	35 years for Pavement
Economic Planning Life:	50 years for Bridge
Discount Rate/Interest:	2.50% (Extrapolated from latest United States Office of Management and Budget Circular A-94, Appendix C – January 2007)

Inflation/Escalation Rate:	8.00% (Per GDOT)
Uniform Present Worth (UPW) Factor:	23.1452 for 35 years 28.3623 for 50 years
Cost of Power:	\$0.07 / kWhr (kilowatt hour) (assumed)

Operation and Maintenance Costs (*Industry Norms*):

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 Mark-Up for Construction: 25.06% (1.2506)
(Composed of: Engineering and Construction at 10.00% and Escalation at 13.69% [8.00% per year for 2.83 years].)

Composite Mark-Up (Right-of-Way): 247.20% (3.4720)
(Composed of: Scheduling Contingency at 55.00%; Administration / Court Costs at 60.00%; and Inflation Factor at 40.00 %.)

COST ESTIMATE SUMMARY AND COST HISTOGRAMS

The VE Team Leader prepared a cost model for the project that follows 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 Estimate Report for file “97981C” construction cost estimate which was prepared by Moreland Altobelli Associates, Inc. dated August 14, 2007. 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:

- Base and Paving
 - Recycled Asphaltic Concrete
 - Aggregate Base Course
- Drainage
 - Drop Inlets
 - Storm Piping
- Major Structures
 - Box/Bridge Culverts
 - Bridge
 - Retaining Wall
- Concrete Work
 - Curb and Gutter
 - Sidewalk
- Grading and Earthwork
 - Drop Inlets
 - Storm Piping

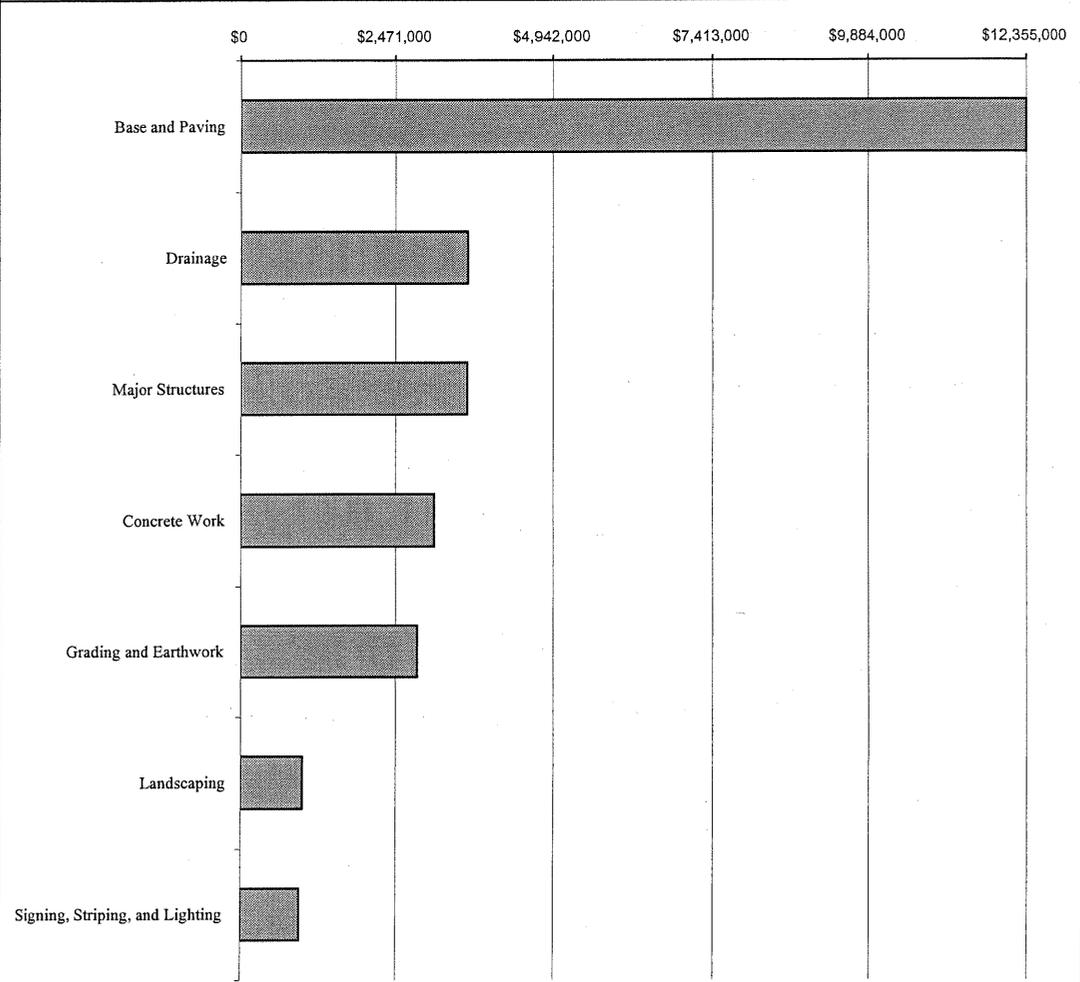
DESIGNER’S COST ESTIMATE

The cost estimate, as described above, did contain sufficiently detailed information to perform the VE effort. It is noted, however, that a 10% mark-up rate for Engineering and Construction was added by the VE team as this line item was omitted from the cost estimate. Escalation was also added based on 8.00% per annum (derived from the Department’s recent experience) for 2.83 years representing the mid-point of construction. Said mid-point is June 2010 based on a let date of January 2009 and a construction duration of 36 months; i.e., January 2012.

COST HISTOGRAM

Project: STP-1267(8) SR 53 / MARS HILL ROAD / OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

TOTAL PROJECT - SR 53 / MARS ROAD / OCONEE CONNECTOR	COST	PERCENT	CUM. PERCENT
Base and Paving	12,356,540	43.69%	43.69%
Drainage	3,627,146	12.83%	56.52%
Major Structures	3,618,730	12.80%	69.32%
Concrete Work	3,095,298	10.95%	80.26%
Grading and Earthwork	2,828,150	10.00%	90.26%
Landscaping	979,500	3.46%	93.72%
Signing, Striping, and Lighting	930,000	3.29%	97.01%
Miscellaneous Items	557,614	1.97%	98.99%
Traffic Control	150,000	0.53%	99.52%
Guardrail	136,980	0.48%	100.00%
Construction Subtotal	\$ 28,279,958	100.00%	
Engineering and Construction at*	10.00%	\$ 2,827,996	
Inflation Based on 8.00% per annum for 2.83 Years**	13.69%	\$ 4,258,720	Construction
Construction Total	\$ 35,366,674	Mark-Up: 25.06%	
Right-of-Way Costs; STP-1267(8)	\$ 13,027,309		
Right-of-Way Subtotal	\$ 13,027,309		
Scheduling Contingency	55.00%	\$ 7,165,020	
Administration / Court Costs	60.00%	\$ 12,115,397	
Inflation Factor	40.00%	\$ 12,923,091	ROW
Right-of-Way Total	\$ 45,230,817	Mark-Up: 247.20%	
GRAND TOTAL	\$ 80,597,491		



Costs in graph are not marked-up.

* Engineering and Construction rate is a GDOT standard.

** Escalation rate provided by GDOT based on immediate past experience.

FUNCTION ANALYSIS

Function Analysis was performed to define the requirements for each project element and 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 for each phase. The F.A.S.T. diagrams were used to show the flow of function 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 projects' basic functions as accommodate/known growth by Reducing/Travel Time and Increasing/Capacity, and Improving/Safety by Reducing/Traffic Conflicts and Improving/Access. The F.A.S.T. diagram follows the Random Function Analysis worksheet.

RANDOM FUNCTION ANALYSIS



PROJECT: **STP-1267(8), P. I. No. 142060,**
SR 53/MARS HILL ROAD/OCONEE CONNECTOR
 Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

SHEET NO.: 1 of 1

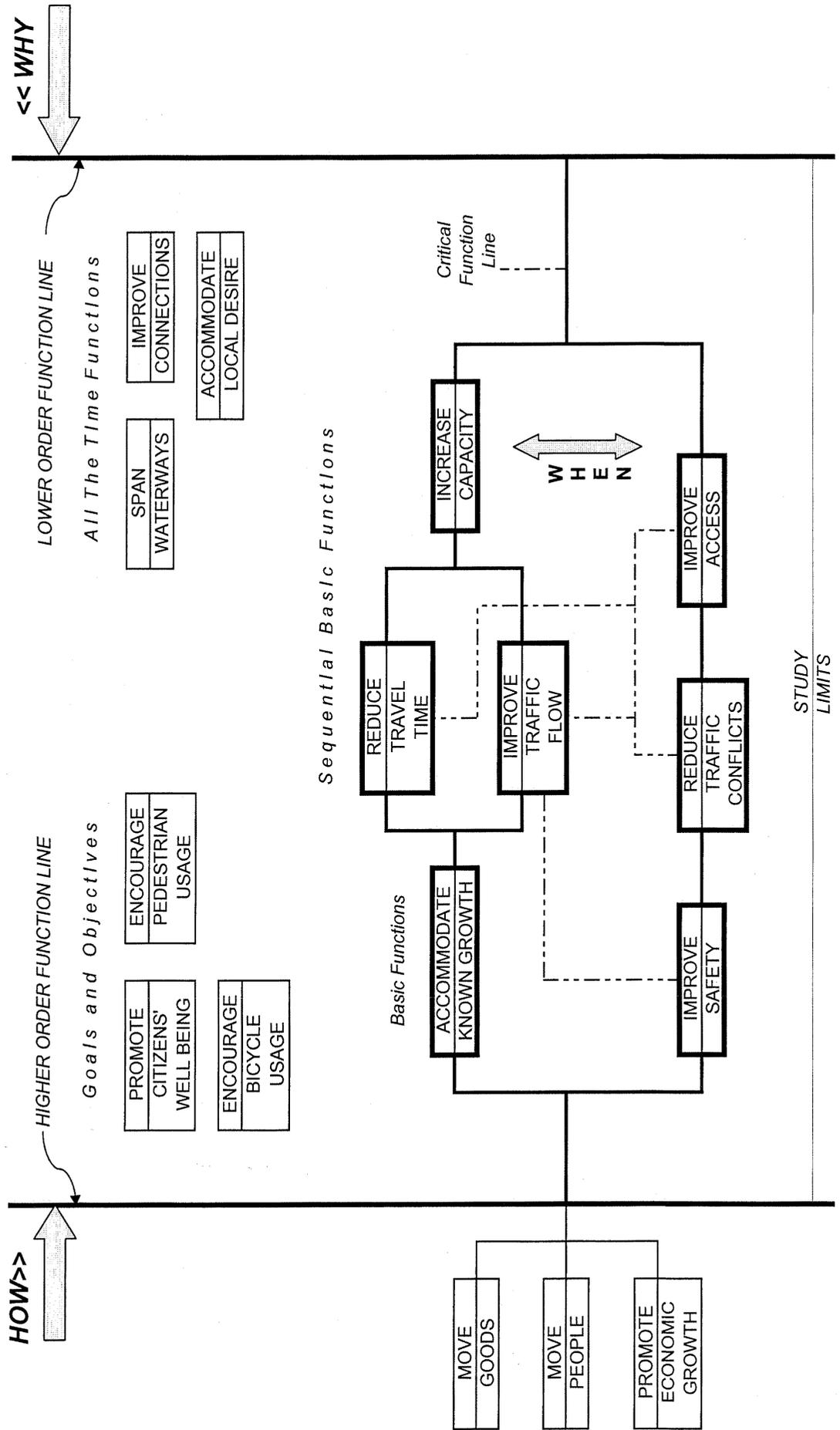
DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
WIDENING AND RECONSTRUCTION OF EXPERIMENTAL STATION ROAD (SR 53), MARS HILL ROAD (CR 264), and the OCONEE CONNECTOR (CR 261)			
Add lanes	Increase	Capacity	B₁
Raise median; signalize intersection; dedicated turning lanes; minimize crossing traffic; maximize the use of right-in/right-out movements	Improve	Safety	B₂
Add lanes; dedicated turning lanes	Improve	Traffic Flow	B₁
Use sidewalks	Promote	Pedestrian Usage	S
Use dedicated bicycle lanes	Promote	Bicycle Usage	S
Realign Durham Street	Accommodate	Local Desires	RS
Add lanes; synchronize/interconnect	Reduce	Travel Time	B₁
Use dedicated turning lanes; realign termini intersections; signalize intersection	Improve	Connection (SR 316 and US 441)	B₁
Improve connection between Main Street (SR 15) and SR 316/US 29 in Watkinsville	Promote	Economic Growth	HO
Add lanes; dedicated turning lanes; maximize the use of right-in/right-out movements	Improve	Access	B₂
Use dedicated turning lanes; maximize the use of right-in/right-out movements	Reduce	Traffic Conflicts	B₂
New bridge; new culverts	Span	Waterways	RS
Add lanes	Accommodate	Known Growth	B₁

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

FUNCTION ANALYSIS SYSTEMS TECHNIQUE (F. A. S. T.)
SR 53 / MAR HILL ROAD / OCONEE CONNECTOR



STP-1267(8); P. I. No. 142060
 Georgia Department of Transportation, District 1
 Oconee 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 discussed and the advantages/disadvantages of each listed. The VE design team compared each of the ideas with the concept solution determining whether it improved value, was equal in value, or lessened the value of the solution.

The ideas were 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 suggestions. 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 5 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 and Evaluation worksheets since they may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: **STP-1267(8), P. I. No. 142060, SR 53/MARS HILL ROAD/
OCONEE CONNECTOR**
Oconee County, Georgia Department of Transportation, District 1
Final Design Stage

SHEET NO.: 1 of 2

NO.	IDEA DESCRIPTION	RATING
1	Use 11-foot lanes to reduce right-of-way costs	4
2	Use 12-foot vs. 16-foot shoulders to reduce right-of-way costs	4
3	Reduce the number of signalized intersections	See Others
4	Reduce the number of media openings	See Others
5	Use a flush median throughout	3
6	Reduce the number of beams on the new bridge	5
7	Realign Durham Street in the southside	4
8	Eliminate bicycle only lanes and use a multi-use trail on one side only	2
9	Realign Durham Street to Oconee County Sheriff Department's parcel; i.e., on the north side	4
10	Eliminate Nancy Drive access to State Route (SR) 53	2
11	Eliminate Water Street access to SR 53	4
12	Eliminate Nancy Drive and Water Street access to SR 53	2
13	Realign the intersection of SR 53 with SR 15 to the eastern most future City Hall entrance	1
14	Eliminate signal at Durham Street (Sheriff activated)	4
15	Eliminate signal at VFW Drive	2
16	Eliminate realigned (east) access to Harris Shoal Park; i.e. cul-de-sac existing	4
17	Eliminate "U" turn lane at VFW Drive	4
18	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at Calls Creek	4
19	Use a two barrel box culvert in lieu of a three barrel culvert at Calls Creek	4
20	Reduce the width of the south Watkinsville Bypass ramps	5
21	Reduce the width of the north Watkinsville Bypass ramps	5
22	Eliminate "U" turn lane at north on/off ramps	4
23	Tie the existing USDA entrance drive with SR 53	4
24	Upgrade the existing USDA entrance drive	4
25	Keep the new USDA entrance drive with eliminate upgrade of the existing USDA drive	4
26	Eliminate the existing traffic light at McDonald's south of Hog Mountain Road	5

Rating: 1 → 2 = Not to be Developed; 3 - 4 = Varying Degree of Development Potential; 5 = Most Likely to be Developed;
DS = Design Suggestion; ABD = Already Being Done; N/A = Not Applicable

CREATIVE IDEA LISTING



PROJECT:	STP-1267(8), P. I. No. 142060, SR 53/MARS HILL ROAD/ OCONEE CONNECTOR Oconee County, Georgia Department of Transportation, District 1 <i>Final Design Stage</i>	SHEET NO.: 2 of 2
NO.	IDEA DESCRIPTION	RATING
27	Use a restrictive/traffic induced signal at the Rankin Road/School intersection	DS
28	Eliminate "U" turn lane at Cliff Dawson Road	4
29	Eliminate existing access/median opening between Windridge Drive and Windy Creek Road on Mars Hill Road and provide access on Windridge Drive; provide a median opening at Windy Creek Road on Mars Hill Road	4
30	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at Barber Creek Tributary	4
31	Use a two barrel box culvert in lieu of a three barrel culvert at Barber Creek Tributary	4
32	Eliminate media opening south of Brookwood Drive and allow "U" turns at Crooked Creek Road	5
33	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at Parker Branch	4
34	Use a two barrel box culvert in lieu of a three barrel culvert at Parker Branch	4
35	Connect Hollow Creek Lane and Barber Creek Drive at new intersection and possibly eliminate signal at Epps Bridge Road	4
36	Provide a raised median at the SR 53/SR 15 intersection on SR 53	4
37	Use a pavement depth based on traffic volume on the Durham Street improvements/realignment	4
38	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at Lampkin Branch	4
39	Use a two barrel box culvert in lieu of a three barrel culvert at Lampkin Branch	4
40	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at unnamed tributary at STA 232+100	4
41	Use a two barrel box culvert in lieu of a three barrel culvert unnamed tributary at STA 232+100	4
42	Use a CON/SPAN [®] type culvert in lieu of multi-tube culvert at unnamed tributary at STA 315+50	4
43	Use a two barrel box culvert in lieu of a three barrel culvert unnamed tributary at STA 315+50	4
Rating: 1 → 2 = Not to be Developed; 3 – 4 = Varying Degree of Development Potential; 5 = Most Likely to be Developed; DS = Design Suggestion; ABD = Already Being Done; N/A = Not Applicable		