



Georgia Department of Transportation

SR 105/US 441 Business
Interchange Widening Improvements
STP-2640(10), P.I. 132100
Habersham County, Georgia

Value Engineering Study Report
Preliminary Design Stage

January 2008

Design Consultant



Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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February 7, 2008

Ms. Lisa L. Myers
Design Review Engineer Manager
GDOT General Office
No. 2 Capitol Square, Room 266
Atlanta, Georgia 30334

re: STP-2640(10), P.I. 132100
SR 105/US 441 Widening Interchange Improvement
Habersham County, Georgia
Value Engineering Study Report

Dear Ms Myers:

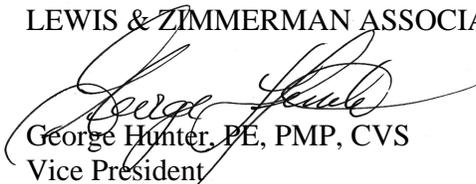
Lewis & Zimmerman Associates, Inc. (LZA) is pleased to submit four hard copies and one CD of the referenced value engineering (VE) study report. This report documents the results of the VE study conducted January 22-25, 2008 with members of ARCADIS, HNTB Corporation and Delon Hampton & Associates. This project has a current combined construction cost estimate of \$15.17 million and \$15.3 million for right of way.

The VE team developed nine alternatives and five design suggestions that provide improvements to the typical section and east end of the project.

We thank you, other DOT employees and the designers for assisting the team in completing this assignment. Please do not hesitate to call upon LZA for assistance in implementing the alternatives presented.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.



George Hunter, PE, PMP, CVS
Vice President

Attachments

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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 Georgia Department of Transportation (GDOT). The subject of the study was the SR 105/US 441 widening project (STP-2640(10), P.I. No.: 132100) located in Habersham County, Georgia which is being designed by Parsons Brinckerhoff. The plans were at the preliminary plan development stage at the time of the VE study.

The VE workshop was conducted January 22-25, 2008 in GDOT's offices in Atlanta using a multidisciplinary team comprised of highway design, structures and construction professionals. The team followed the six-phase VE Job Plan to guide its deliberations:

- Information Gathering
- Function Identification and Analysis
- Creative Idea Generation
- Evaluation of Creative Ideas
- Development of Alternatives
- Presentation of Results

PROJECT DESCRIPTION

Georgia Department of Transportation Project STP-2640(10) is the proposed widening of State Route (SR) 105/US 441 Business Route, southeast from its intersection with Cannon Bridge Road to North Main Street in downtown Cornelia. The total project length is 2.41 miles, including the SR 105/SR 365 interchange (see Figure 1: Project Location Map).

The purpose of this project is to improve the safety and operational capacity of SR 105 in the project limits. Secondly, the project supports regional and local economic development and recreational goals related to the development of a greenway and multi-use path along the former Tallulah Falls Railway line.

From Cannon Bridge Road to SR 365, the existing five-lane SR 105 will be widened to a six-lane, divided roadway with a 20-foot-wide raised concrete median, and curb and gutter along the outside edges of pavement. The interchange at SR 365 will be reconfigured from a partial cloverleaf design to a partial diamond-type interchange. Diamond entrance and exit ramps to southbound SR 365 will be constructed on the southbound side of SR 365, replacing the existing southbound exit loop ramp and relocating the southbound entrance ramp to form a new ramp intersection with SR 105. The existing SR 365 northbound entrance loop ramp from SR 105 and the existing northbound SR 365 diamond exit ramp to SR 105 in the southeast quadrant of the interchange will remain unchanged.

From the SR 365 interchange eastward to a point just west of the intersection with Camp Creek Road, existing SR 105 will be widened to a five-lane roadway, with a 12-foot-wide flush median, two-way left turn lanes, and outside curb and gutter. This section of the roadway will be widened along the northern side of the existing alignment and will encroach on the abandoned bed of the former Tallulah Falls Railway (see Figure 1).

Between the western side of the SR 365 interchange and Camp Creek Road, the project includes a 10-foot-wide, 4,600-foot-long, two-way multi-use path along the northern shoulder area, offset by 12 feet from the westbound SR 105 travel lanes. From Camp Creek Road eastward to downtown Cornelia, a potential future segment of the multi-use path could roughly follow the current alignment of existing Stonecypher Street, using part of its right-of-way. The proposed SR 105 project does not include construction of the multi-use path beyond Camp Creek Road. The Tallulah Falls Railroad Greenway LLC, in coordination with the City of Cornelia and the Georgia Mountains Regional Development Center (GMRDC), will identify funding sources for the construction and maintenance of any future segments of the multi-use path.

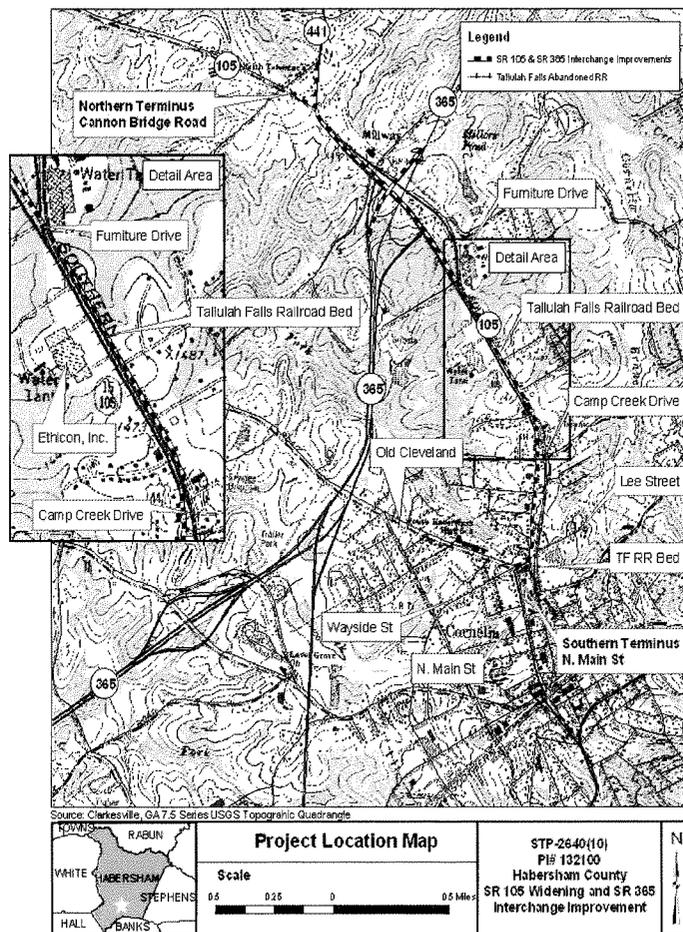


Figure 1: Project Location Map

The project is at the preliminary plans stage of development with a construction cost of \$15.1 million and a right-of-way cost of \$15.2 million for a combined cost of \$30.3 million. The project is scheduled to be let in April 2010.

KEY ISSUES AND STUDY OBJECTIVES

The following key issues were identified at the designer’s briefing:

- The environmental document included two feasible corridor-wide alternatives: the current design and a one-way pair through the urbanized section of the city of Cornelia.
- The one-way pair was dismissed as it impacts the same number of properties including historical properties and due to the poor operations of the connections between the pairs.
- The operational improvements to the SR 365/SR 105 interchange consist of diamond ramps along southbound SR 365. These improvements allow a free movement for the heavy ramp movement (southbound SR 365 to westbound SR 105) and increase the intersection spacing between the ramp termini and Mize Road intersections.

- A project design speed of 45 mph is proposed, except for the easterly end where a tight curve requires a reduction of design and posted speeds to 30 mph.
- Current design impacts five historical properties at east end of project.
- Seven commercial properties will require acquisition in the current design.
- The Wal-Mart, currently located at the west of SR 365, may be relocated to the east side of SR 365, closer to the city of Cornelia
- The project includes a portion of a regional trail being planned by a rail to trail organization: the Tallulah Falls Railroad Greenway LLC, in coordination with the City of Cornelia and the Georgia Mountains Regional Development Center. This will be constructed as part of the roadway project.
- Impacts to the historical, abandoned Tallulah Falls railroad bed can be mitigated with the proposed multi-use trail.
- The VE team was concerned with the 45 mph posted speed limit through the city of Cornelia due to the preponderance of driveway access.
- The current design proposes a 12-foot inner lane and an 11-foot outside lane.
- The urban shoulders vary from 10.5 feet to 11 feet throughout the project; GDOT standards call for 12 foot urban shoulders.

The VE team was charged with reviewing the current design and identifying potential cost savings for the existing design. The project is at the preliminary plan stage of project development with a preliminary plan field review projected for end of January and right-of-way plans projected for mid-February of this year.

RESULTS

Nine alternatives and five design suggestions were developed by the VE team to address the concerns and issues described above. Descriptions of the key alternatives (Alts) and design suggestions developed follow below.

Typical Section

Eight alternatives and two design suggestions were developed in this category. The following summarizes the key alternatives.

- Alts TS-1 and TS-2 suggest that GDOT review all 11-foot lane widths throughout the project and particularly within the town of Cornelia.
- Alts TS-5 and TS-6 recommend smaller curb and gutter sizes.
- Alts TS-7 and TS-9 recommend changes to the urban shoulders.
- Alts TS-10, TS-11, TS-12 and TS-13 are suggestions to change the sidewalk and multi-use path proposed in the current project.

East End

One alternative and three design suggestions were developed in this category.

- The key alternative in this category, Alt EE-2, proposes a one-way pair similar to the one provided by the designers and dismissed in the environmental document. The key difference is that the VE one-way pair would reduce the impacts to properties, both via the typical section proposed and the alignment at the west end. The operations of the one-way pair connections opposite Camp Creek Road and Circle Drive would need to be carefully analyzed. If the operations of these streets, as currently shown in the VE alternative drawings, are severely impacted, an alternative could be to create right-in and right-out at the cross street, leaving the connections for mainline “U-turn” operations only.
- Alts EE-3 and EE-5 would revise the connections at Clarkesville Street and improve the intersection spacing to Main Street.
- Alt EE-4 proposes speed management measures be added west of the urbanized section of the city of Cornelia.

All of the alternatives and design suggestions are summarized on the following table and detailed in the Study Results section of this report.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: SR 105/US 441 WIDENING STP-2640(10) <i>Georgia Department of Transportation</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
TYPICAL SECTION (TS)						
TS - 1	Provide all 11-ft. through lanes throughout the entire project	\$ 1,928,369	\$ 764,418	\$ 1,163,951		\$ 1,163,951
TS - 2	Provide all 11-ft. through lanes within the town of Cornelia	\$ 231,523	\$ -	\$ 231,523		\$ 231,523
TS - 5	Change SR 105 curb and gutter size to 6 in. x 24 in.			Design Suggestion		
TS - 6	Change SR 105 curb and gutter size to 8 in. x 24 in.			Design Suggestion		
TS - 7	From Station 149+00 to 192+00 shift alignment north 1.5 ft. to accommodate a 12-ft. urban shoulder	\$ -	\$ 34,766	\$ (34,766)		\$ (34,766)
TS - 9	Use 10-ft. urban shoulders in lieu of 11-ft. and 10.5-ft. throughout project	\$ 987,719	\$ 274,454	\$ 713,265		\$ 713,265
TS-10	Delay the construction of the 5-ft. sidewalk opposite the 10-ft. multi-use trail location	\$ 109,186	\$ -	\$ 109,186		\$ 109,186
TS-11	Delay the paving of the multi-use trail, only grade	\$ 218,371	\$ -	\$ 218,371		\$ 218,371
TS-12	Provide a 5-ft. sidewalk in lieu of the 10-ft. multi-use trail	\$ 109,186	\$ -	\$ 109,186		\$ 109,186
TS-13	Use asphalt concrete in lieu of concrete for the multi-use trail	\$ 218,370	\$ 111,812	\$ 106,558		\$ 106,558
EAST END (EE)						
EE-2	Use one-way SR 105 pairs between Camp Street Road and Clarkesville Road	\$ 4,121,215	\$ 307,490	\$ 3,813,725		\$ 3,813,725
EE-3	Eliminate the Clarkesville Street connection with SR 105			Design Suggestion		
EE-4	Revise speed limit at east end of project			Design Suggestion		
EE-5	Improve Lee Street, Clarkesville Street and Main Street intersection spacing			Design Suggestion		

STUDY RESULTS

INTRODUCTION

This section presents the VE study findings developed during the VE study for the SR 105/US 441 widening project (STP-2640(10), P.I. No.: 132100) located in Habersham County, Georgia. The results portray economic, operational and project delivery benefits that can be realized by the Georgia Department of Transportation and its designers as described on alternatives presented within. Some of the alternatives will directly affect the project's design and will require coordination between the owner and the design team to determine the disposition of each alternative.

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

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

The capital cost comparisons used unit quantities contained in the project cost estimate prepared by the designers, whenever possible. If unit quantities were not available, published data bases, such as the one produced by the RS Means company, or team member or owner data bases were consulted. A composite markup of 10%, as described in the Value Analysis and Conclusions section of the report, was used to generate an all-inclusive project cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is usually included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons include improved facility operation, ease of maintenance, ease of construction, safer working conditions, reduction in project risk, etc. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) to track it through the value analysis process and thus facilitate referencing among the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Value Engineering Alternatives table. The Alt. No. includes a prefix that refers to a major project design category listed below:

DESIGN CATEGORY	PREFIX	NUMBER OF IDEAS
Typical Sections	TS	13
Bridge	BR	4
Interchange	I/C	0
West End Section	WE	2
East End Section	B	5
Typical Section	TS	2
Contract Packaging & Staging	CP	4
	Total:	24

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

KEY ISSUES

The following key issues were identified at the designer's briefing:

- The environmental document included two feasible corridor-wide alternatives: the current design and a one-way pair through the urbanized section of the city of Cornelia.
- The one-way pair was dismissed as it impacts the same number of properties including historical properties and due to the poor operations of the connections between the pairs.
- The operational improvements to the SR 365/SR 105 interchange consist of diamond ramps along southbound SR 365. These improvements allow a free movement for the heavy ramp movement (southbound SR 365 to westbound SR 105) and increase the intersection spacing between the ramp termini and Mize Road intersections.
- A project design speed of 45 mph is proposed, except for the easterly end where a tight curve requires a reduction of design and posted speeds to 30 mph.
- Current design impacts five historical properties at east end of project.
- Seven commercial properties will require acquisition in the current design.
- The Wal-Mart, currently located at the west of SR 365, may be relocated to the east side of SR 365, closer to the city of Cornelia
- The project includes a portion of a regional trail being planned by a rail to trail organization: the Tallulah Falls Railroad Greenway LLC, in coordination with the City of Cornelia and the Georgia Mountains Regional Development Center. This will be constructed as part of the roadway project.

- Impacts to the historical, abandoned Tallulah Falls railroad bed can be mitigated with the proposed multi-use trail.
- The VE team was concerned with the 45 mph posted speed limit through the city of Cornelia due to the preponderance of driveway access.
- The current design proposes a 12-ft. inner lane and an 11 ft. outside lane.
- The urban shoulders vary from 10.5 ft. to 11 ft. throughout the project; GDOT standards call for 12 ft. urban shoulders.

STUDY OBJECTIVES

The designer and GDOT requested that the VE team review the current design and identify potential cost savings. The project is at the preliminary plan stage of project development with a preliminary plan field review projected for January 31 and right of way plans expected by mid-February.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of nine alternatives and five design suggestions for consideration by the owner and designer.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

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

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

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



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: SR 105/US 441 WIDENING STP-2640(10) <i>Georgia Department of Transportation</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
TYPICAL SECTION (TS)						
TS - 1	Provide all 11-ft. through lanes throughout the entire project	\$ 1,928,369	\$ 764,418	\$ 1,163,951		\$ 1,163,951
TS - 2	Provide all 11-ft. through lanes within the town of Cornelia	\$ 231,523	\$ -	\$ 231,523		\$ 231,523
TS - 5	Change SR 105 curb and gutter size to 6 in. x 24 in.				Design Suggestion	
TS - 6	Change SR 105 curb and gutter size to 8 in. x 24 in.				Design Suggestion	
TS - 7	From Station 149+00 to 192+00 shift alignment north 1.5 ft. to accommodate a 12-ft. urban shoulder	\$ -	\$ 34,766	\$ (34,766)		\$ (34,766)
TS - 9	Use 10-ft. urban shoulders in lieu of 11-ft. and 10.5-ft. throughout project	\$ 987,719	\$ 274,454	\$ 713,265		\$ 713,265
TS-10	Delay the construction of the 5-ft. sidewalk opposite the 10-ft. multi-use trail location	\$ 109,186	\$ -	\$ 109,186		\$ 109,186
TS-11	Delay the paving of the multi-use trail, only grade	\$ 218,371	\$ -	\$ 218,371		\$ 218,371
TS-12	Provide a 5-ft. sidewalk in lieu of the 10-ft. multi-use trail	\$ 109,186	\$ -	\$ 109,186		\$ 109,186
TS-13	Use asphalt concrete in lieu of concrete for the multi-use trail	\$ 218,370	\$ 111,812	\$ 106,558		\$ 106,558
EAST END (EE)						
EE-2	Use one-way SR 105 pairs between Camp Street Road and Clarkesville Road	\$ 4,121,215	\$ 307,490	\$ 3,813,725		\$ 3,813,725
EE-3	Eliminate the Clarkesville Street connection with SR 105				Design Suggestion	
EE-4	Revise speed limit at east end of project				Design Suggestion	
EE-5	Improve Lee Street, Clarkesville Street and Main Street intersection spacing				Design Suggestion	

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-1**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **PROVIDE 11-FT. THROUGH LANES THROUGHOUT THE ENTIRE PROJECT** SHEET NO.: **1 of 8**

ORIGINAL DESIGN: (Sketch attached)

The original design has a mixture of both 11-ft. lanes and 12-ft. lanes in the proposed design.

The current design indicates Bridge No. 1 over SR 365 has six travel lanes, one 12-ft. turning lane, a 4-ft. raised median, two sidewalks (10 ft. and 6 ft.) and two concrete barriers (1 to 2.5 ft. wide).

ALTERNATIVE: (Sketch attached)

For Bridge No. 1, use six 11-ft. travel lanes, one 12-ft. turning lane, a 4-ft. raised median, two sidewalks (10 ft. and 6 ft.) and two concrete barriers (1 to 2.5 ft. wide).

ADVANTAGES:

- Reduces right of way impacts
- Reduces right-of-way cost
- Reduces construction cost
- Attains a uniform typical section for construction

DISADVANTAGES:

- Non-standard
- Less space between adjacent vehicles

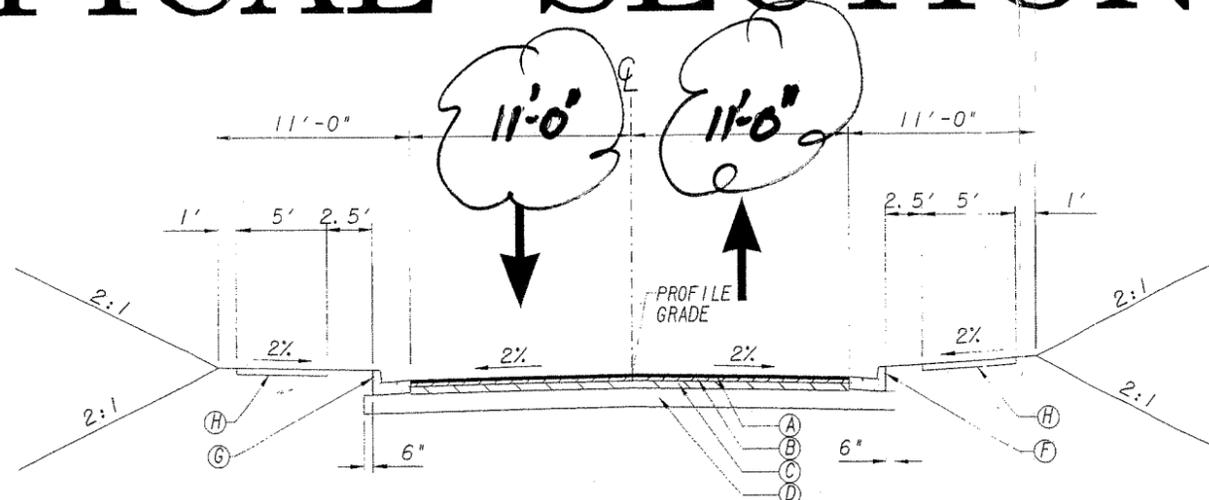
DISCUSSION:

GDOT should consider using 11-ft. lanes to provide a reduction in construction and right-of-way cost. Using 11-ft. lanes in the project will provide a more consistent typical section in construction.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,928,369	—	\$ 1,928,369
ALTERNATIVE	\$ 764,418	—	\$ 764,418
SAVINGS (Original minus Alternative)	\$ 1,163,951	—	\$ 1,163,951

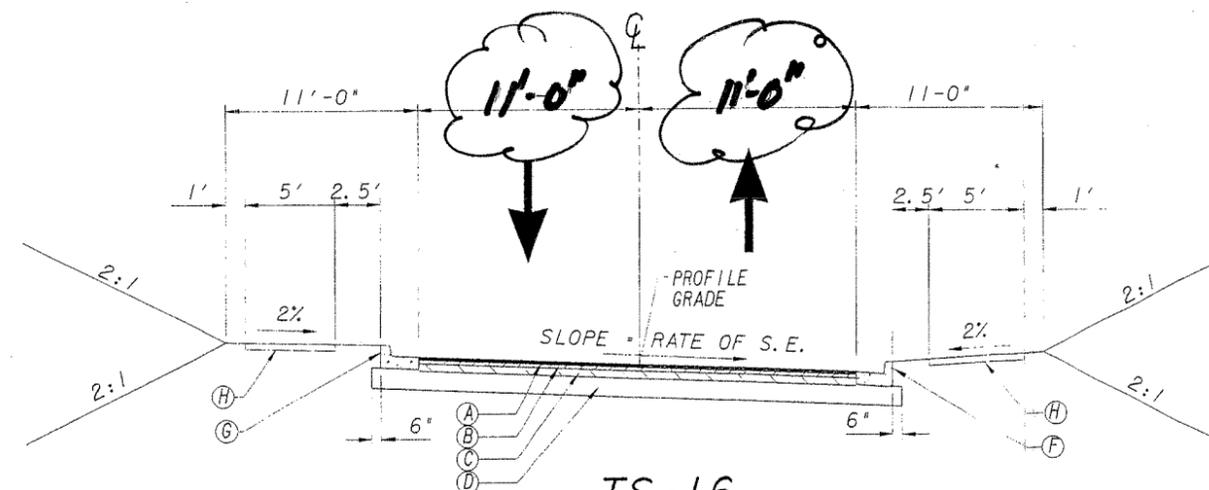
TYPICAL SECTIONS

ALT TS-1
SHT 2 OF 8



TS-15
TANGENT SECTION
FURNITURE DRIVE / C.R. 35 /
VFW POST ROAD

APPLIES TO STA. 10+00.00 TO STA. 10+68.58
STA. 15+97.30 TO END



TS-16
SUPERELEVATED SECTION
FURNITURE DRIVE / C.R. 35 /
VFW POST ROAD

APPLIES TO STA. 10+68.58 TO STA. 15+97.30

CAMP CREEK ROAD
LEE STREET / BONN COURT
APPLIES TO STA. 10+00.00 TO END
SEE GENERAL NOTES FOR SUPERELEVATION TRANSITIONS

REQUIRED PAVEMENT

- Ⓐ RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME (165 LB/SY)
- Ⓑ RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (220 LB/SY)
- Ⓒ RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (880 LB/SY)
- Ⓓ GR AGGR BASE CRS, 10 INCH, INCL MATL
- Ⓔ RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
- Ⓕ CONC CURB & GUTTER, 8 IN X 24 IN, TP 2, GA. STD. 9032 B
- Ⓖ CONC CURB & GUTTER, 8 IN X 30 IN, TP 2, GA. STD. 9032 B
- Ⓗ CONC SIDEWALK, 4 IN

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	
2:1	ALL	OVER 10'

* REQUIRES GUARDRAIL

△ SLOPE 6% OR RATE OF S.E. WHICHEVER IS

- SLOPE AS FOLLOWS:
S.E. RATE OF 2% OR LESS, USE 6%
S.E. RATE OF 3%, USE 5%
S.E. RATE OF 4%, USE 4%
S.E. RATE OF 5%, USE 3%
S.E. RATE OF 7%, USE 1%

○ ALGEBRAIC DIFFERENCE IN PAVING AND SHO SLOPES NOT TO EXCEED 8%

ALTERNATIVE DESIGN



3340 PEACHTREE RD, NE
SUITE 2400, TOWER PLACE 100
ATLANTA, GA 30326-1001

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

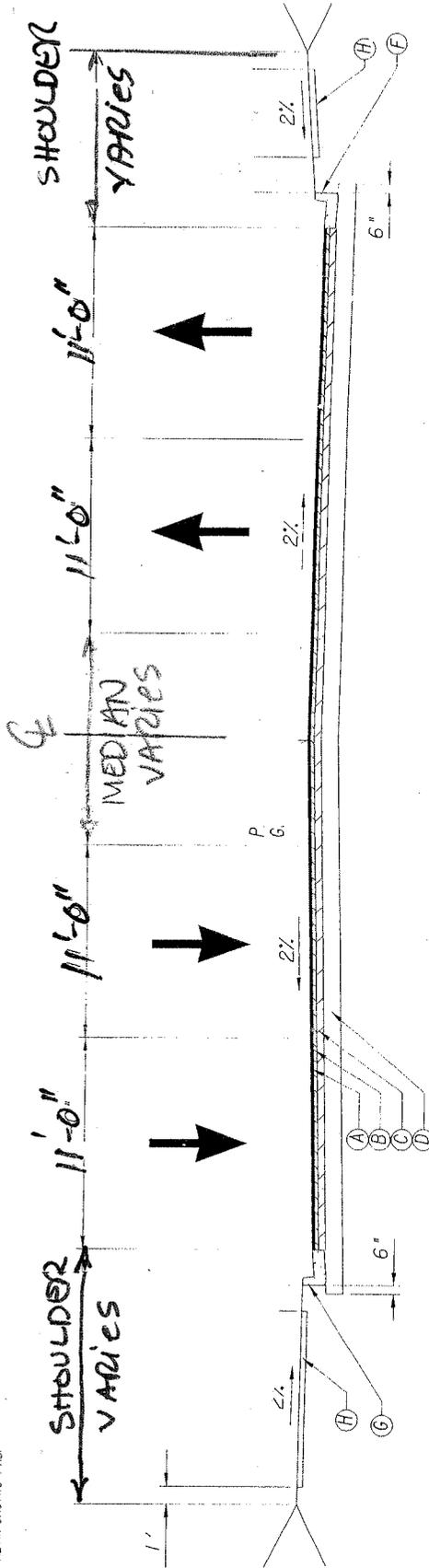
OFFICE:
TYPICAL SECTION
FURNITURE DRIVE / VFW POST ROAD
CAMP CREEK ROAD / LEE STREET
SR 105/US 441
COUNTY: HABERSHAM

PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-1

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 3 of 8



S. R. 105 / U. S. 441
APPLIES TO STA. 99+50 to 226+50

ADJUSTING THE LENGTH FOR THIS UNIT PRICE BID. REINFORCING FAB.

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.:

TS-1

SHEET NO.: 3 of 8

11' LANES THROUGHOUT THE ENTIRE PROJECT

$$2.404 \text{ MILES} \times 5280 \frac{\text{FT}}{\text{MILE}} = 12,693.12 \text{ FT.}$$

$$12,693.12 \text{ FT} \times 2 \text{ FT} = 25,386.24 \text{ FT.}^2$$

$$= 2820.69 \text{ SY} \cdot (0.05) = 141.03 \text{ SY}$$

$$A = 2820.69 + 141.03$$

$$= \underline{2961.72 \text{ SY}} \text{ TOTAL SY REDUCTION } (\$59.50/\text{SY})$$

$$= \underline{\$176,222.34}$$

RIGHT-OF-WAY REDUCTION

$$\text{TOTAL LENGTH} = 11,175 \text{ LF} \times 2 \text{ FT} = 22,350.00 \text{ SF} / 43560$$

$$= \underline{0.513 \text{ ACS}}$$

EASEMENTS (COMMERCIAL)

$$0.513 \text{ ACS} \times 112,500 = \underline{\$57,712.50}$$

MULTIPLIER

$$\times 9.3295$$

$$\underline{\$538,429} \text{ (TOTAL RIGHT OF WAY)}$$

ADDITIONAL 11' LANE REDUCTION IN 6-LANE SECTION

STATION 110+00 TO 150+00

$$\frac{4000 \text{ LF} \times 2 \text{ FT REDUCTION}}{9 \text{ SF/SY}} = 889 \text{ SY}$$

$$\text{@ } \$59.50 \text{ SY}$$

$$\frac{4000 \text{ LF} \times 2 \text{ FT}}{43,560 \text{ AC/SF}}$$

$$= 0.184 \text{ AC EASEMENT REDUCTION}$$



PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **TS-1**

BRIDGE REDUCTION

SHEET NO.: **6** of **8**

Original Design

Deck Area:

$$= (18.9375' + 12.4792') \times 287.7813'$$

$$= 9,041 \text{ sf.}$$

Alternative Design

Deck Area:

$$= (15.9375' + 9.4792') \times 287.7813'$$

$$= 7,315 \text{ sf.}$$

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-1

SHEET NO.: 7 of 8

Main Line Pavement Section Cost: (SR105)

AC

(12.5mm) : $165 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$65.79 = \$5.43/\text{sy}$

(19mm) : $220 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$63.21 = \$6.95/\text{sy}$

(25mm) : $880 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$63.99 = \$28.16/\text{sy}$

10" GAB = \$18.96/sy

Total Cost: $\$59.54/\text{sy}$

Unit prices above are from the Designer's cost estimate.

COST WORKSHEET



PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **TS-1**

SHEET NO.: **8** of **8**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
<u>PAVEMENT REDUCTION</u>							
2' REDUCTION THROUGHOUT	SY	2962	59.50	176,222			
2' REDUCTION (6-LANE SECTION)	SY	889	59.50	52,896			
<u>BRIDGE REDUCTION</u>							
DECK AREA	SF	9041	95	858,895	7315	95	694,925
SUBTOTAL CONSTRUCTION				= 1,088,013			
MARK-UP 10%				108,801	10%	69,493	
→ CONSTRUCTION TOTAL				1,196,814			
<u>RIGHT-OF-WAY EASEMENT</u>							
2' REDUCTION THROUGHOUT	AC	.513	112,500	57,713			
2' REDUCTION (6-LANE SECTION)	AC	.184	112,500	20,700			
SUBTOTAL				= 78,413			
MARK-UP 8.3295				653,141			
→ RIGHT OF WAY TOTAL				= 731,554			
Subtotal							
Markup (%) at							
TOTAL				1,928,368	764,418		

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-2**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **PROVIDE 11-FT. THROUGH LANES WITHIN THE TOWN OF CORNELIA** SHEET NO.: **1 of 5**

ORIGINAL DESIGN:

East of Furniture Drive, the current design calls for a 12-ft. two-way left turn lane (TWLT) twin roadbeds separating parallel roadbeds consisting of an 11-ft. inside lane and a 12-ft. outside lane beginning at Station 190+00.

ALTERNATIVE: (Sketch attached)

Build all four through lanes at 11-ft. width, retaining the 12-ft. TWTL through the city limits of Cornelia, beginning at Station 190+00 (near Walnut Street) to the easterly terminus.

ADVANTAGES:

- Reduces right-of-way impacts
- Reduces construction and right of way costs
- Attains a uniform typical section

DISADVANTAGES:

- Non-standard
- Less space between adjacent vehicles

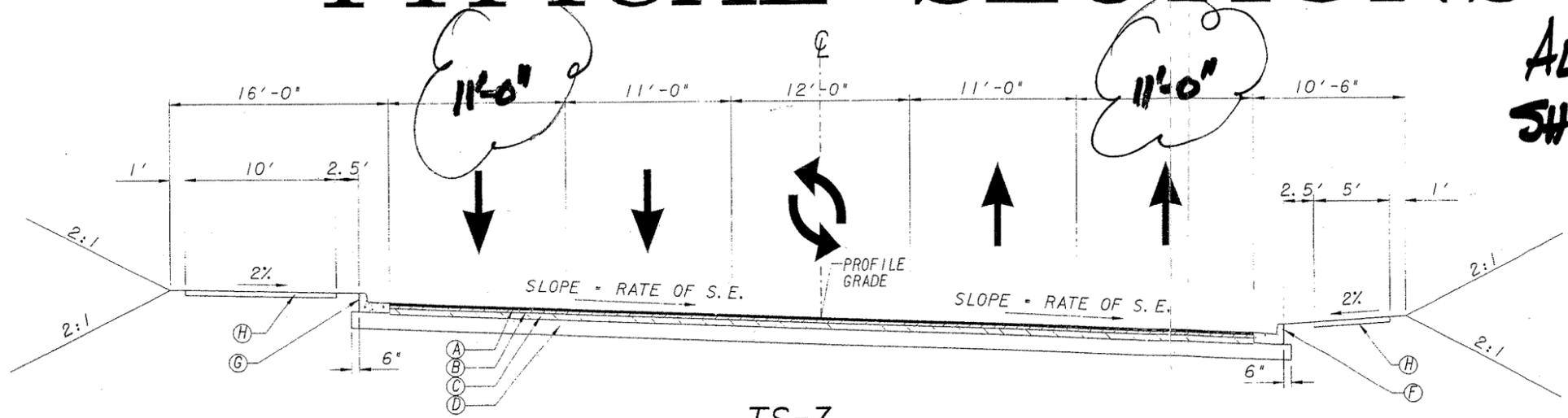
DISCUSSION:

This alternative recognizes that the critical portion of the project related to right of way impacts is within the city of Cornelia. This alternative reduces the right of way impacts by reducing the lane widths of the outer lanes from 12 ft. to 11 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 231,523	—	\$ 231,523
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 231,523	—	\$ 231,523

TYPICAL SECTIONS

ALT TS-2
SHT 2 OF 5



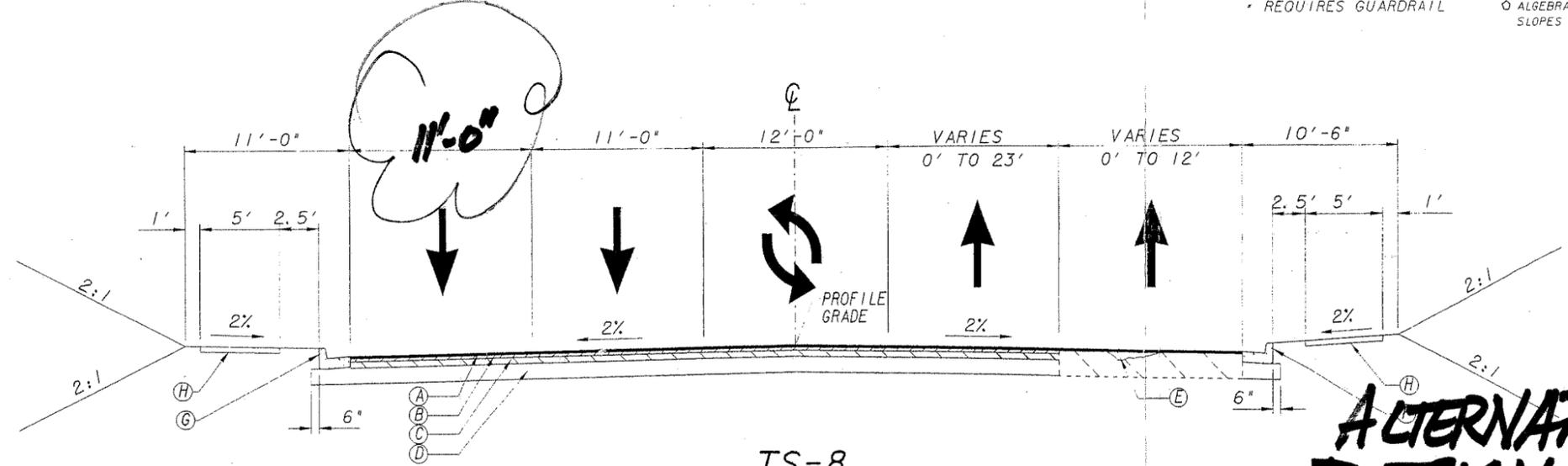
TS-7
SUPERELEVATED SECTION
S. R. 105 / U. S. 441

APPLIES TO STA. 192+00.00 TO STA. 198+50.00
SEE GENERAL NOTES FOR SUPERELEVATION TRANSITIONS

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

* REQUIRES GUARDRAIL

Δ SLOPE 6% OR RATE OF S. E. WHICHEVER
□ SLOPE AS FOLLOWS:
S. E. RATE OF 2% OR LESS, USE 6%
S. E. RATE OF 3%, USE 5%
S. E. RATE OF 4%, USE 4%
S. E. RATE OF 5%, USE 3%
S. E. RATE OF 7%, USE 1%
○ ALGEBRAIC DIFFERENCE IN PAVING AND SLOPES NOT TO EXCEED 8%



TS-8
TANGENT SECTION
S. R. 105 / U. S. 441

APPLIES TO STA. 199+95.76 TO STA. 212+42.52
STA. 218+26.36 TO STA. 218+42.79
STA. 225+13.53 TO 226+50.00

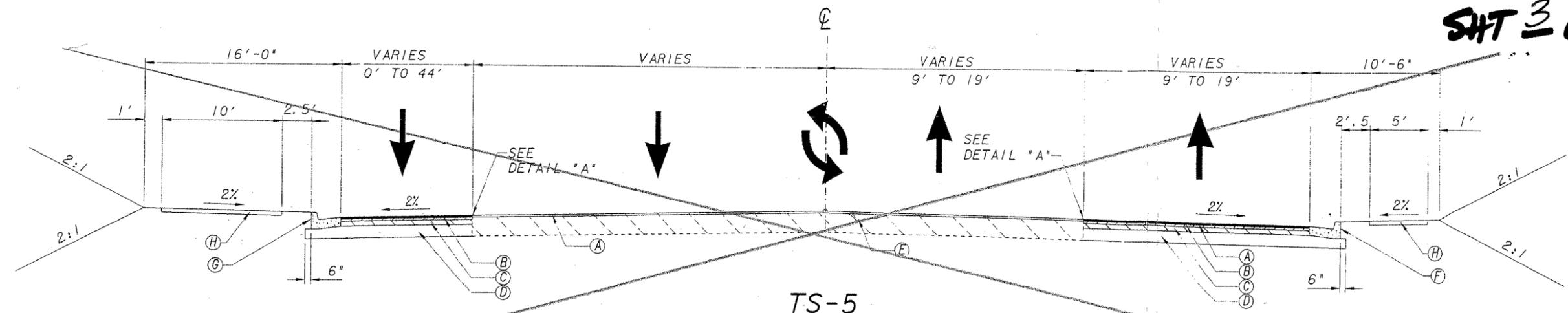
- REQUIRED PAVEMENT**
- Ⓐ RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME
 - Ⓑ RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME
 - Ⓒ RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME
 - Ⓓ GR AGGR BASE CRS, 10 INCH, INCL MATL
 - Ⓔ RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
 - Ⓕ CONC CURB & GUTTER, 8 IN X 24 IN, TP 2, GA. STD. 9032 B
 - Ⓖ CONC CURB & GUTTER, 8 IN X 30 IN, TP 2, GA. STD. 9032 B
 - Ⓗ CONC SIDEWALK, 4 IN

ALTERNATIVE DESIGN

	3340 PEACHTREE RD, NE SUITE 2400, TOWER PLACE 100 ATLANTA, GA 30328-1001	GEORGIA DEPARTMENT OF TRANSPORTATION	REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:
				TYPICAL SECTION S. R. 105/U. S. 441 COUNTY: HABERSHAM

TYPICAL SECTIONS ALT TS-2

SHT 3 OF 5

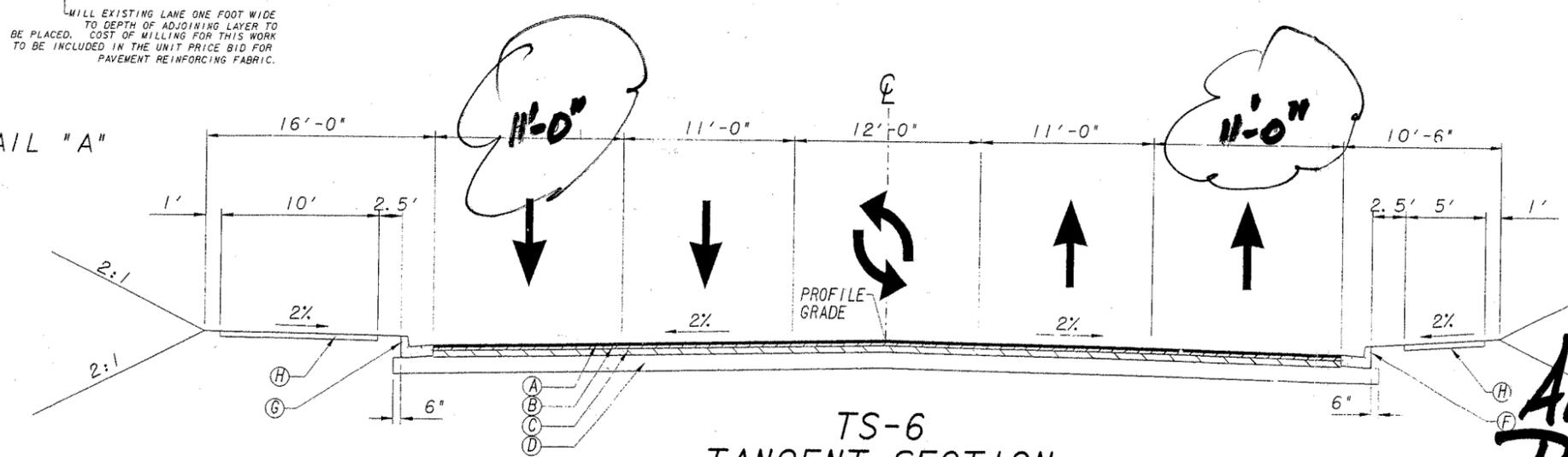
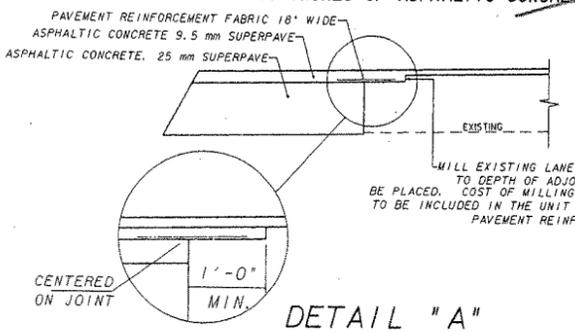


TS-5
TANGENT SECTION
S. R. 105 / U. S. 441
APPLIES TO STA. 149+45.70 TO STA. 157+00.00
STA. 173+18.00 TO STA. 179+54.42

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

* REQUIRES GUARDRAIL

TYPICAL SECTION DETAIL TO BE USED WHEN EXISTING PAVEMENT IS TO BE RESURFACED WITH LESS THAN TWO INCHES OF ASPHALTIC CONCRETE



TS-6
TANGENT SECTION
S. R. 105 / U. S. 441
STA. 190+00 TO STA. 192+00.00

- REQUIRED PAVEMENT**
- (A) RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME
 - (B) RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME
 - (C) RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME
 - (D) GR AGGR BASE CRS, 10 INCH, INCL MATL
 - (E) RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
 - (F) CONC CURB & GUTTER, 8 IN X 24 IN, TP 2, GA. STD. 9032 B
 - (G) CONC CURB & GUTTER, 8 IN X 30 IN, TP 2, GA. STD. 9032 B
 - (H) CONC SIDEWALK, 4 IN

▲ SLOPE 6% OR RATE OF S.E. WHI
□ SLOPE AS FOLLOWS:
S.E. RATE OF 2% OR LESS, USE 2%
S.E. RATE OF 3%, USE 3%
S.E. RATE OF 4%, USE 4%
S.E. RATE OF 5%, USE 5%
S.E. RATE OF 7%, USE 7%
○ ALGEBRAIC DIFFERENCE IN PAVT SLOPES NOT TO EXCEED 8%

ALTERNATIVE DESIGN

REVISION DATES	

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)

ALTERNATIVE NO.:

Georgia Department of Transportation

TS-2

CORNERUM: STA. 190+00 - STA. 226+50

SHEET NO.:

4 of 5

PROVIDE 4, 11-FT LANES WITH A 12-FT CENTER TURN LANE

$$\text{LENGTH} = 3,650.00 \text{ FT} \times 2\text{-FT} = \underline{7300 \text{ FT}^2} \div 9 = 811.11 \text{ SY}$$

ASPH. & G.A. B REDUCED COST

$$811.11 \text{ SY} (\$59.50/\text{SY}) = \underline{\$48,261.11}$$

$$\text{CONSTRUCTION M/U} = \frac{4826.10}{53,087.21}$$

R.O.W REDUCTION - EASEMENTS

$$\begin{aligned} \text{LENGTH} &= 3,880 \text{ LF} \times 2\text{-FT} = 7760 \text{ FT}^2 / 43560 \text{ AC/FT}^2 \\ &= \underline{0.17 \text{ ACS}} \end{aligned}$$

$$\text{REDUCED COST} = 0.17 \text{ ACS} \times 225,000 (.50) = 19,125$$

MAKE-UP

$$\begin{aligned} &\times 9.33 \text{ MULTIPLIER} \\ &\underline{\$178,436.25} \end{aligned}$$

COST WORKSHEET



GH

PROJECT: SR 105/ US 441 WIDENING STP-2640(10)

ALTERNATIVE NO.:

Georgia Department of Transportation

TS-2

CORNELIA: STA. 190+00 - STA. 226+50

SHEET NO.:

5 of 5

PROVIDE 4, 11-FT LANES WITH A 12-FT CENTER TURN LANE

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
ASPH & GAB REDUCTION	SY	811.11	59.50 SY	48,261.			
MARK-UP	10% ^{of}			4826			
				48,261.11 + 4826.11 = \$53,087.22 ✓			
R.O.W COST REDUCTION	ACS	0.17 (50)	225,000	= 19,125.00			
				X 9.33 MULTIPLIER			
				= \$178,436.25			
TOTAL COST REDUCTION				= \$178,436.25			
Subtotal							
Markup (%) at							
TOTAL				231,523.			0

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-5**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **IN LIEU OF 8 IN. X 24 IN. CURB AND GUTTER ON SR 105,** SHEET NO.: **1 of 2**
USE A 6 IN. X 24 IN. CURB AND GUTTER

ORIGINAL DESIGN: (Sketch attached)

The original design typical section describes using 8 in. x 24 in., TP 2 curb and gutter. This is consistent with all typical section in this project.

ALTERNATIVE: (Sketch attached)

Use 6 in. x 24 in, TP 2 curb and gutter throughout the roadway project. The reduction of curb height should not adversely affect roadway storm water runoff. The grass strip can be increased from 2.5 ft. to 3 ft.

ADVANTAGES:

- Reduces typical section width
- Reduces construction and right of way costs
- Attains a uniform typical section

DISADVANTAGES:

- Unknown construction cost
- May impact gutter spread (depends on interval of drainage inlets)

DISCUSSION:

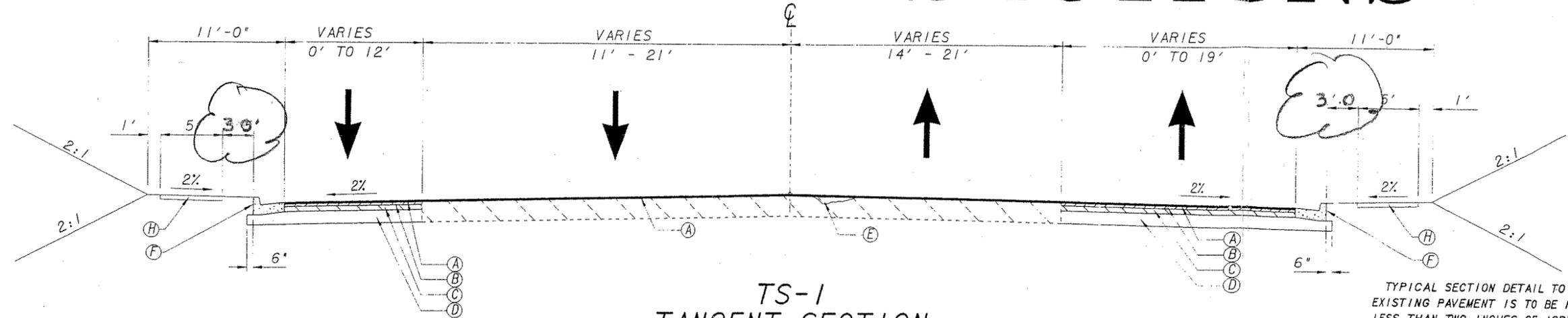
Using 6 in. x 24 in., TP 2 curb and gutter for construction should enable GDOT to maintain storm water runoff without overtopping the curb along the roadway corridor (verification needed by hydraulics).

Historically, GDOT has not reaped unit price savings in the reduced curb and gutter sizes, however as the curb and gutter are extruded, the cost savings should be related to the volume per linear foot of gutter.

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

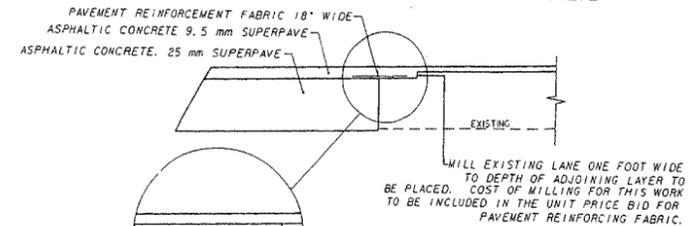
DESIGN SUGGESTION

TYPICAL SECTIONS



TS-1
TANGENT SECTION
S. R. 105 / U. S. 441

TYPICAL SECTION DETAIL TO BE USED WHEN EXISTING PAVEMENT IS TO BE RESURFACED WITH LESS THAN TWO INCHES OF ASPHALTIC CONCRETE



SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

* REQUIRES GUARDRAIL

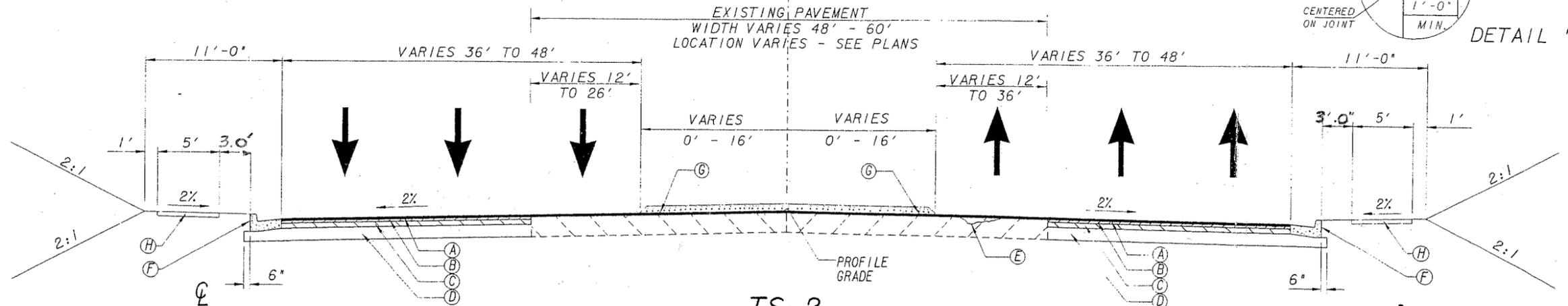
△ SLOPE 6% OR RATE OF S. E. WHICHEVER IS GREATER

- SLOPE AS FOLLOWS:
 S. E. RATE OF 2% OR LESS. USE 6%
 S. E. RATE OF 3%. USE 5%
 S. E. RATE OF 4%. USE 4%
 S. E. RATE OF 5%. USE 3%
 S. E. RATE OF 7%. USE 1%

NOTE:

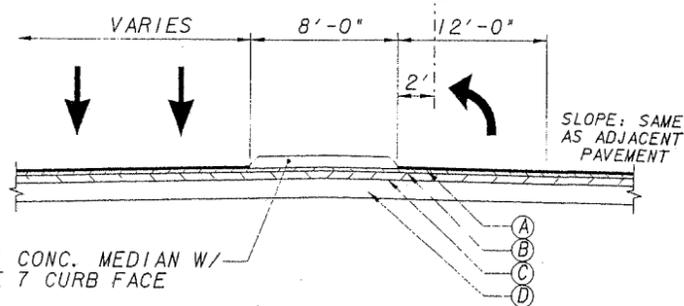
○ ALGEBRAIC DIFFERENCE IN PAVING AND SHOULDER SLOPES NOT TO EXCEED 8%

* REQUIRES GUARDRAIL



TS-2
TANGENT SECTION
S. R. 105 / U. S. 441

ALTERNATIVE DESIGN



7.5" CONC. MEDIAN W/
TYPE 7 CURB FACE

DETAIL FOR MEDIAN TURN LANE
SEE PLAN FOR LOCATION

REQUIRED PAVEMENT

- Ⓐ RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME (165 LB/SY)
- Ⓑ RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (220 LB/SY)
- Ⓒ RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (880 LB/SY)
- Ⓓ GR AGGR BASE CRS, 10' INCH, INCL MATL
- Ⓔ RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
- Ⓕ CONC CURB & GUTTER, 6 IN X 24 IN, TP 2, GA. STD. 9032 B
- Ⓖ 7.5 IN. CONCRETE MEDIAN (INTEGRAL) WITH TP 7 FACE, GA. STD. 9032B
- Ⓗ CONC SIDEWALK, 4 IN



GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE:
TYPICAL SECTIONS
S. R. 105/U. S. 441

SR 105/US 441
COUNTY: HABERSHAM

DRAWING NO.
5-0126

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-6**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **CHANGE SR 105 CURB AND GUTTER SIZE TO 8 IN. X 24 IN.** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The original design requires 8 in. x 30 in., TP 2 curb and gutter throughout the project.

ALTERNATIVE: (Sketch attached)

Use 8 in. x 24 in., TP 2 curb and gutter for SR 105. This will reduce the typical section width and should not adversely affect storm water runoff. The grass strip can be increased from 2.5 ft. to 3 ft.

ADVANTAGES:

- Reduces typical section width
- Reduces construction cost

DISADVANTAGES:

- Unknown construction cost
- May impact gutter spread (depends on interval of drainage inlets)

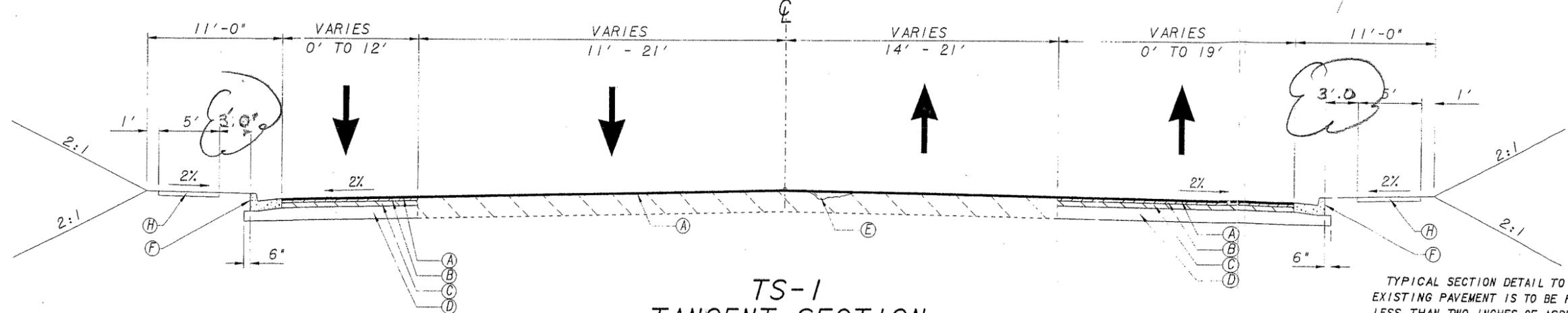
DISCUSSION:

Using 8 in. x 24 in., TP 2 curb and gutter for construction should maintain storm water runoff without overtopping curb along the roadway corridor (verification need by hydraulics).

Historically, GDOT has not reaped unit price savings in the reduced curb and gutter sizes, however as the curb and gutter are extruded, the cost savings should be related to the volume per linear foot of gutter.

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

TYPICAL SECTIONS



**TS-1
TANGENT SECTION
S. R. 105 / U. S. 441**

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

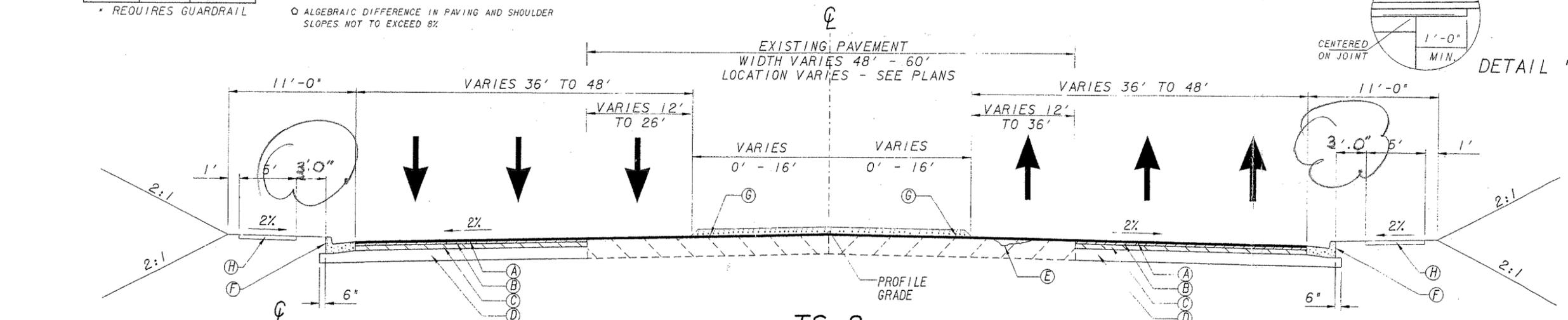
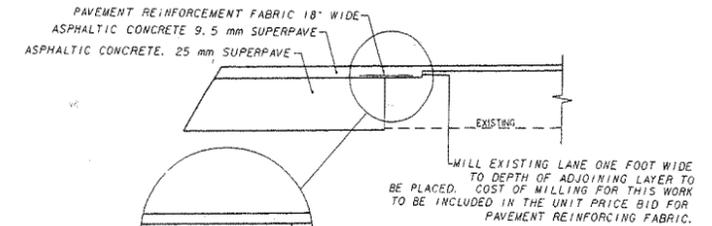
* REQUIRES GUARDRAIL

△ SLOPE 6% OR RATE OF S.E. WHICHEVER IS GREATER

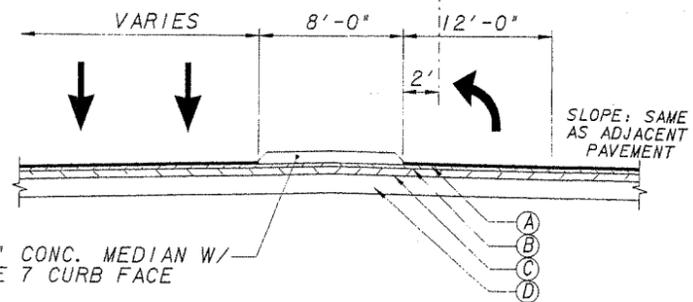
□ SLOPE AS FOLLOWS:
 S.E. RATE OF 2% OR LESS, USE 6%
 S.E. RATE OF 3%, USE 5%
 S.E. RATE OF 4%, USE 4%
 S.E. RATE OF 5%, USE 3%
 S.E. RATE OF 7%, USE 1%

NOTE:

○ ALGEBRAIC DIFFERENCE IN PAVING AND SHOULDER SLOPES NOT TO EXCEED 8%



**TS-2
TANGENT SECTION
S. R. 105 / U. S. 441**



7.5" CONC. MEDIAN W/
TYPE 7 CURB FACE

DETAIL FOR MEDIAN TURN LANE
SEE PLAN FOR LOCATION

REQUIRED PAVEMENT

- (A) RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME (165 LB/SY)
- (B) RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (220 LB/SY)
- (C) RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H LIME (880 LB/SY)
- (D) GR AGGR BASE CRS, 10 INCH, INCL MATL
- (E) RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
- (F) CONC CURB & GUTTER, 8 IN X 24 IN, TP 2, GA. STD. 9032 B
- (G) 7.5 IN. CONCRETE MEDIAN (INTEGRAL) WITH TP 7 FACE, GA STD. 9032B
- (H) CONC SIDEWALK, 4 IN

PB
100 YEARS
3340 PEACHTREE RD, NE
SUITE 2400, TOWER PLACE 100
ATLANTA, GA 30326-1001

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE:
**TYPICAL SECTIONS
S. R. 105/U. S. 441**

SR 105/US 441
COUNTY: HABERSHAM

DRAWING NO.
5-0128

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-7**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **TO ACCOMMODATE A 12-FT. URBAN SHOULDER FROM** SHEET NO.: **1 of 4**
STA 149+00 TO STA 192+00 SHIFT ALIGNMENT NORTH
1.5 FT.

ORIGINAL DESIGN: (Sketch attached)

The original design indicates the use of 10.5-ft. urban shoulders.

ALTERNATIVE: (Sketch attached)

Move the alignment north 1.5 ft. to avoid historic buildings on the east-end of the project and increase the urban shoulder to 12 ft.

ADVANTAGES:

- Provides greater space for utility relocation at the shoulder point (2.5 ft. in lieu of 1 ft.)
- Attains GDOT standards

DISADVANTAGES:

- Increases project cost

DISCUSSION:

A 1.5-ft. shift will make way for the utilities, but will increase the cost of the project. The shift to the north will require a very small amount of right of way acquisition (near STA 192+00), negligible from a cost standpoint. The bulk of the right of way requirements on the north side of the proposed roadbed is city-owned land.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 34,766	—	\$ 34,766
SAVINGS (Original minus Alternative)	\$ (34,766)	—	\$ (34,766)



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
 Georgia Department of Transportation

ALTERNATIVE NO.: 7S-7

SHEET NO.: 3 of 4

Additional Shoulder

$$\text{Sta. } 149+00 - \text{Sta. } 192+00 = 4,300'$$

$$\text{Additional shoulder width} = 1.5'$$

$$\text{Total Area} = 4,300' \times 1.5'$$

$$\text{" " " " } = 6,450 \text{ sf.}$$

$$\text{Additional shoulder depth} = 1.0' \text{ estimated}$$

$$\text{Total Quantity} = 6,450 \text{ sf} \times 1.0'$$

$$\text{Total Quantity} = 6,450 \text{ CY}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-9**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **USE A 10-FT. URBAN SHOULDER THROUGHOUT PROJECT** SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The original typical section indicates an 11-ft. shoulder on the north side that transitions to a 16-ft. shoulder on the north side of the mainline alignment. The south side alignment indicates an 11-ft. shoulder that transitions to a 10.5-ft. shoulder, per the typical sections in the plans.

ALTERNATIVE: (Sketch attached)

Use a 10-ft. shoulder throughout the mainline alignment, except for portions on the north side that have the 16-ft. urban shoulder with the multi-use path. For the 10-ft. urban shoulder, use a 2-ft. grass strip.

ADVANTAGES:

- Reduces earthwork quantities
- Reduces right of way impacts
- Consistent shoulder width

DISADVANTAGES:

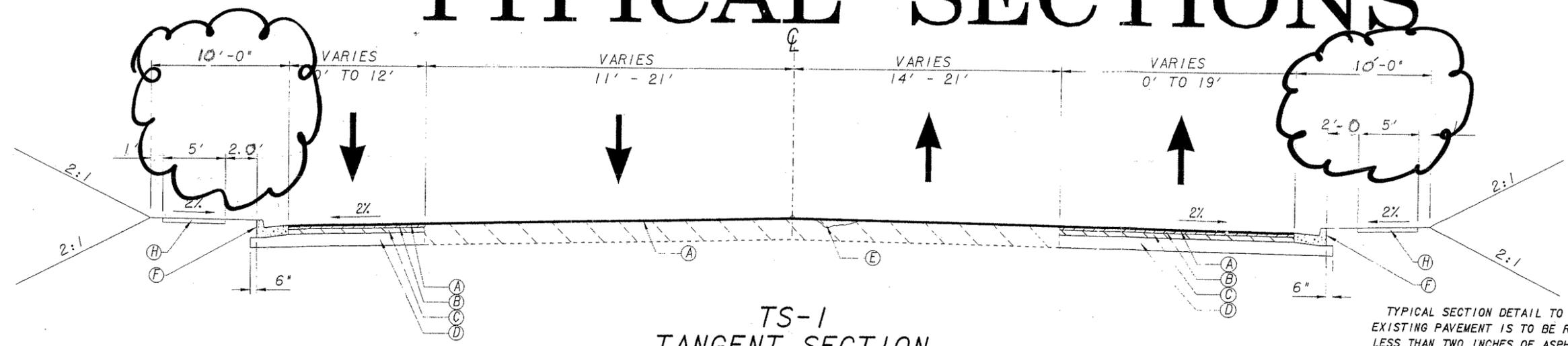
- Reduces standards
- Less room in shoulder to locate utilities

DISCUSSION:

The reduction of shoulder will provide fewer right of way impacts to both the mainline alignment and side streets. The reduction of 30-in. curb and gutter will make for an even 10-ft. shoulder on the south side of the mainline alignment.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 987,719	—	\$ 987,719
ALTERNATIVE	\$ 274,454	—	\$ 274,454
SAVINGS (Original minus Alternative)	\$ 713,265	—	\$ 713,265

TYPICAL SECTIONS

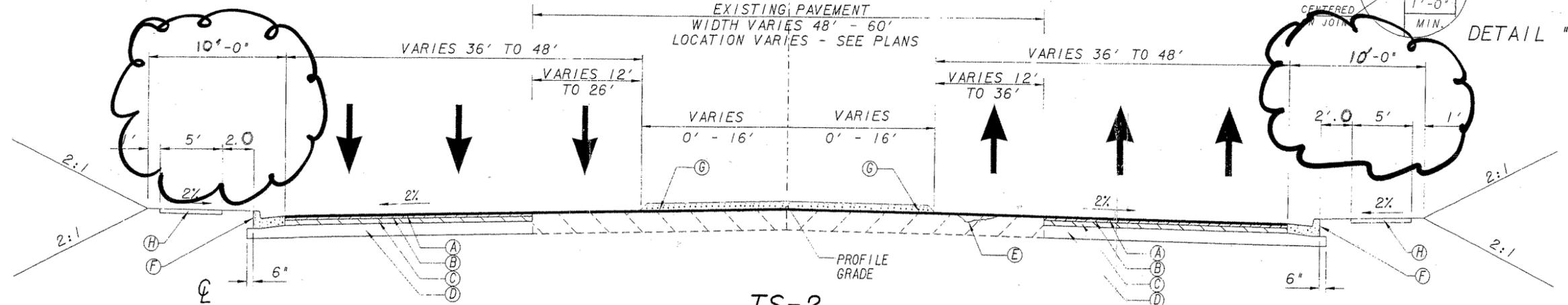


**TS-1
TANGENT SECTION
S. R. 105 / U. S. 441**

APPLIES TO STA. 99+50.00 TO STA. 106+57.31
NOTE: BEGIN CURB & GUTTER STA. 100+50.00 LT. & RT.
BEGIN TAPER STA. 102+25.29 TO STA. 107+65.29 (12' TO 38.96 LT.)

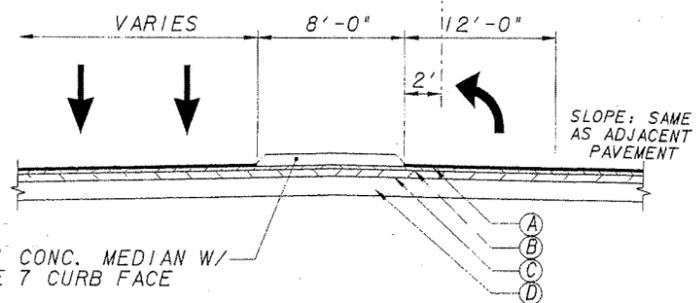
SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

- △ SLOPE 6% OR RATE OF S. E. WHICHEVER IS GREATER
- SLOPE AS FOLLOWS:
S. E. RATE OF 2% OR LESS, USE 6%
S. E. RATE OF 3%, USE 5%
S. E. RATE OF 4%, USE 4%
S. E. RATE OF 5%, USE 3%
S. E. RATE OF 7%, USE 1%
- ALGEBRAIC DIFFERENCE IN PAVING AND SHOULDER SLOPES NOT TO EXCEED 8%

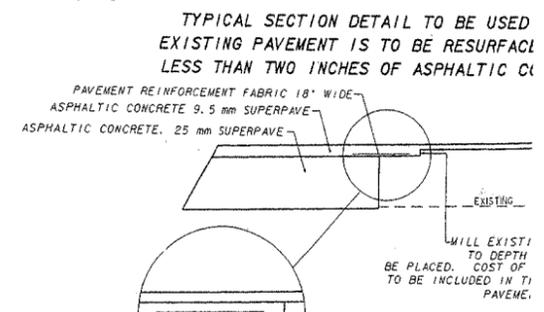


**TS-2
TANGENT SECTION
S. R. 105 / U. S. 441**

APPLIES TO STA. 116+89.11 TO STA. 131+00.00



DETAIL FOR MEDIAN TURN LANE
SEE PLAN FOR LOCATION



DETAIL "A"

- REQUIRED PAVEMENT**
- (A) RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME
 - (B) RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H L
 - (C) RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H L
 - (D) 6" AGGR BASE CRS, 1 1/2 INCH, INCL MATL
 - (E) RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
 - (F) CONC CURB & GUTTER, 8 IN X 24 IN, TP 2, GA. STD. 9032 B
 - (G) 7.5 IN. CONCRETE MEDIAN (INTEGRAL) WITH TP 7 FACE, GA STD. 9032B
 - (H) CONC SIDEWALK, 4 IN

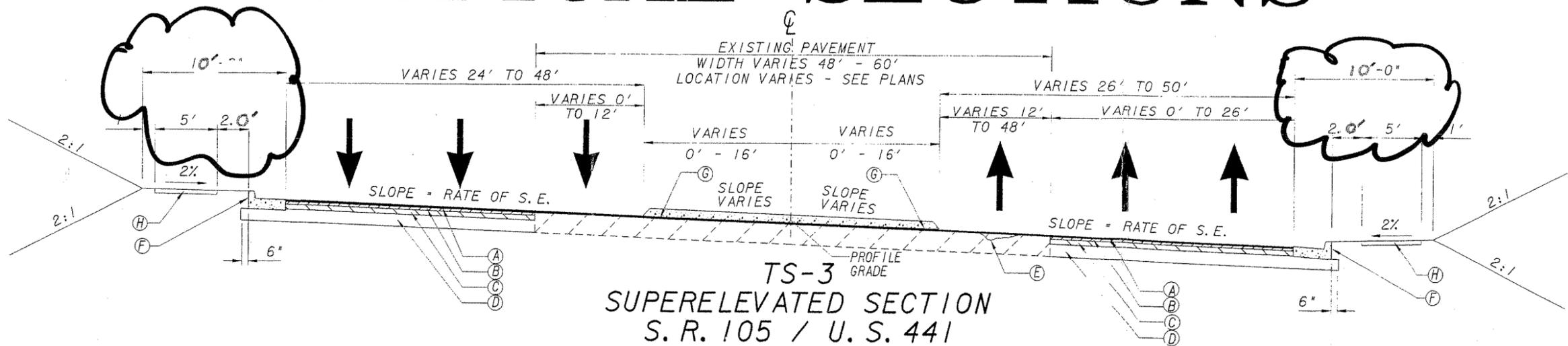
PB
100 YEARS
3340 PEACHTREE RD, NE
SUITE 2400, TOWER PLACE 100
ATLANTA, GA 30326-1001

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
TYPICAL SECTION
S. R. 105/U. S.
SR 105/US 441
COUNTY: HABERSHAM

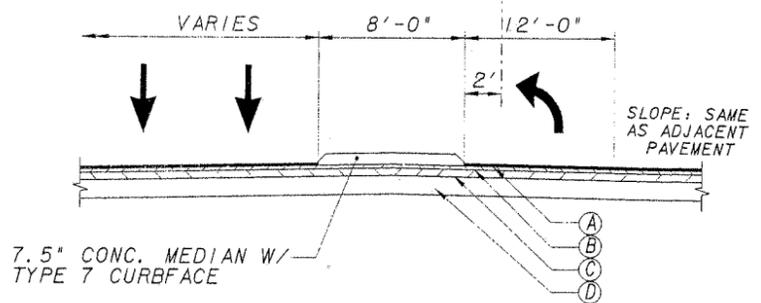
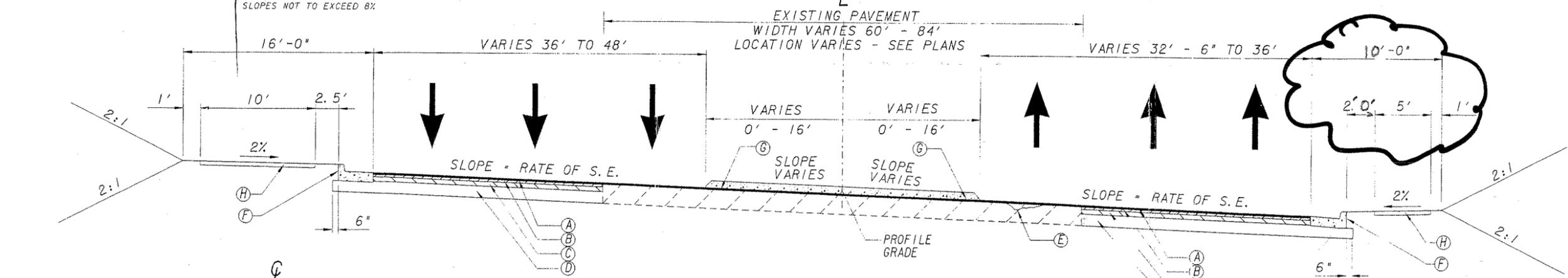
TYPICAL SECTIONS



SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	--	0-10'
3:1	--	--
2:1	ALL	OVER 10'

* REQUIRES GUARDRAIL

- △ SLOPE 6% OR RATE OF S. E. WHICHEVER IS GREATER
- SLOPE AS FOLLOWS:
S. E. RATE OF 2% OR LESS, USE 6%
S. E. RATE OF 3%, USE 5%
S. E. RATE OF 4%, USE 4%
S. E. RATE OF 5%, USE 3%
S. E. RATE OF 7%, USE 1%
- ALGEBRAIC DIFFERENCE IN PAVING AND SHOULDER SLOPES NOT TO EXCEED 8%



DETAIL FOR MEDIAN TURN LANE
SEE PLAN FOR LOCATION

- REQUIRED PAVEMENT
- (A) RECYCLED ASPH CONC 12.5 mm SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME
 - (B) RECYCLED ASPH CONC 19.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H L
 - (C) RECYCLED ASPH CONC 25.0 mm SUPERPAVE, GP 1 OR GP 2, INCL BITUM MATL & H L
 - (D) GR AGGR BASE CRS, 10 INCH, INCL MATL
 - (E) RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME
 - (F) CONC CURB & GUTTER, 8 IN X 24-IN, TP 2, GA. STD. 9032 B
 - (G) 7.5 IN. CONCRETE MEDIAN (INTEGRAL WITH TP 2 FACE, GA STD. 9032B
 - (H) CONC SIDEWALK, 4 IN

PR
100 YEARS

3340 PEACHTREE RD, NE
SUITE 2400, TOWER PLACE 100
ATLANTA, GA 30326-1001

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
TYPICAL SECTION
S. R. 105/U. S.
SR 105/US 441
COUNTY: HABERSHAM

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.:

TS-9

SHEET NO.:

5 of 6

USE 10' URBAN SHOULDER (2' GRASS STRIP, 5' S/W, 8" x 24" C&G)

SHOULDER REDUCTION

$$\begin{aligned} \text{Sta. } 99+50 - \text{Sta. } 135+00 \text{ LT. } \& \text{ RT.} &= 3,550 \text{ (11' SHOULDER LT. } \& \text{ RT.)} \\ \text{Sta. } 135+00 - \text{Sta. } 149+45.70 \text{ RT.} &= 1,445.70 \text{ (11' SHOULDER RT.)} \\ \text{Sta. } 149+45.70 - \text{Sta. } 192+00 \text{ RT.} &= 4,254.30 \text{ (10.50' SHOULDER)} \\ \text{Sta. } 192+00.00 - \text{Sta. } 198+50 \text{ RT.} &= 650.00 \text{ (10.50' SHOULDER RT.)} \\ \text{Sta. } 198+50 - \text{Sta. } 226+50 \text{ LT. } \& \text{ RT.} &= 2,800.00 \text{ (11' SHOULDER LT.; 10.50' SHOULDER RT.)} \\ &= 12,700.00 \text{ LF} \end{aligned}$$

10' SHOULDER RIGHT SIDE

$$\begin{aligned} 12,700 \text{ LF} \times 2\text{-FT} \times 15' &= 381,000 \text{ FT}^3/27 \\ &= 14,111.11 \text{ CY} \end{aligned}$$

0.05% MARK-UP

$$\begin{aligned} &= 705.55 + 14,111.11 \\ &= 14,816.66 \text{ CY } (\$4.90) = \underline{\underline{\$72,601.67}} \end{aligned}$$

8" x 24" TP 2 C&G

$$\begin{aligned} 12,700 \text{ LF } (.10\%) &= 1270.00 + 12,700.00 \\ &= 13,970 \times \$17.86 \\ &= \underline{\underline{\$249,504.20}} \end{aligned}$$

COMPARISON FOR 8" x 30"

$$13,970 \times \$19.26 = \$269,062.20$$

$$\begin{aligned} &269,062.20 \\ &- 249,504.20 \\ &= \underline{\underline{\$19,558.00}} \end{aligned}$$

RIGHT OF WAY (LEASEMENT) - RIGHT SIDE

$$\begin{aligned} 12,700 \text{ LF} \times 2 \text{ FT} &= 0.583 \text{ AC } @ \text{ \$112,500/AC} \\ &= \underline{\underline{43,560}} \end{aligned}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-10**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **DELAY THE CONSTRUCTION OF THE 5-FT. SIDEWALK** SHEET NO.: **1 of 4**
OPPOSITE THE 10-FT. MULTI-USE TRAIL LOCATION

ORIGINAL DESIGN: (Sketch attached)

Through the limits (STA 139+20 to STA 198+26) the current design proposes a 10-ft. multi-use trail on the left side and a 5-ft. sidewalk on the right side of SR 105 (approximately from east end of SR 365 to Camp Creek Road).

ALTERNATIVE: (Sketch attached)

Eliminate the 5-ft. sidewalk on the right side since the project provides a 10-ft. multi-use trail on the left side. The right shoulder would still be graded to the standard shoulder width.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- There would not be a paved facility for pedestrian traffic on both sides of the roadway

DISCUSSION:

This alternative proposes to save construction costs by using the 10-ft. multi-use trail and not provide for an additional sidewalk on the opposite shoulder. The right shoulder would still be graded to the proposed width so others (local government or developments) could build a sidewalk later if so desired.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 109,186	—	\$ 109,186
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 109,186	—	\$ 109,186



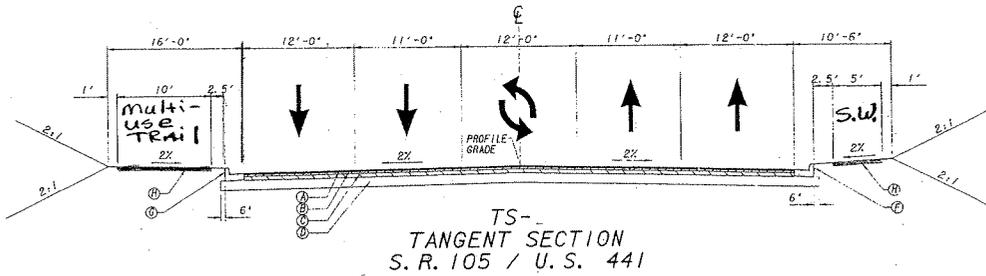
PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
Georgia Department of Transportation

ALTERNATIVE NO.: **TS-10**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

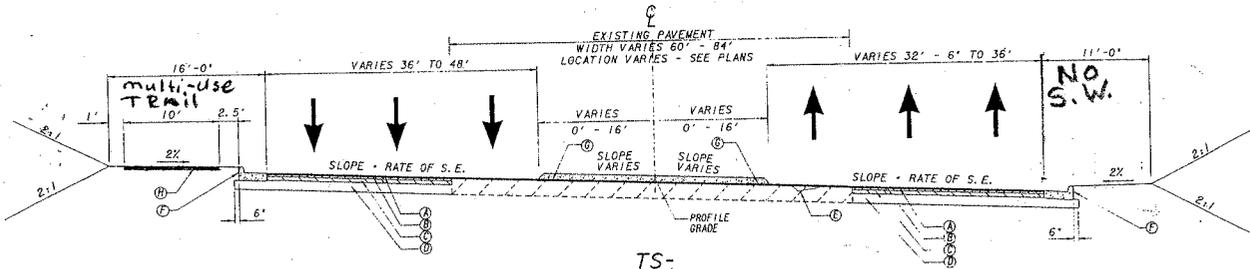
SHEET NO.: **2 of 4**

Original



TS-
TANGENT SECTION
S. R. 105 / U. S. 441

Alternative



TS-
SUPERELEVATED SECTION
S. R. 105 / U. S. 441

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-10

SHEET NO.: 3 of 4

Original cost for 5' sidewalk on
Rt. side of SR 105 from STA 139+20 to
STA 192+26.

$$\frac{5,306' \times 5'}{9 \text{ SF/SY}} = 2,948 \text{ s.y. (Sidewalk)}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-11**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **DELAY THE PAVING OF THE MULTI-USE TRAIL, GRADE** SHEET NO.: **1 of 4**
ONLY

ORIGINAL DESIGN: (Sketch attached)

The current design proposes a 10-ft. multi-use trail on the left side of SR 105 and a 5-ft. sidewalk on the right side of SR 105.

ALTERNATIVE: (Sketch attached)

Grade the left side to accommodate a 10-ft. multi-use trail, but do not build it now.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- No separate facility for bike traffic

DISCUSSION:

Pedestrian access would be maintained on the right side, and some recreational users (for example joggers) could still the side unpaved area on the left side.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 218,371	—	\$ 218,371
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 218,371	—	\$ 218,371



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.:

TS-11

ORIGINAL DESIGN

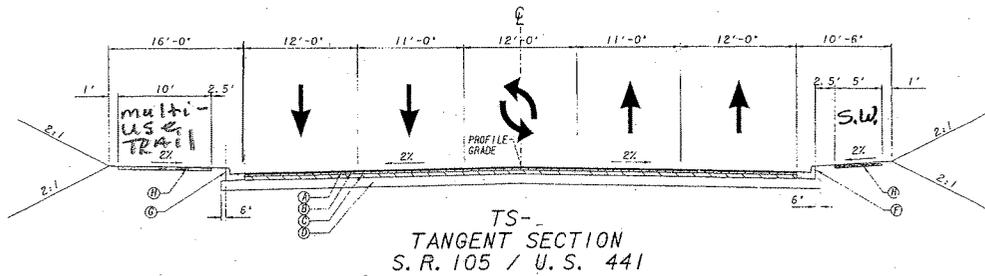
ALTERNATIVE DESIGN

BOTH

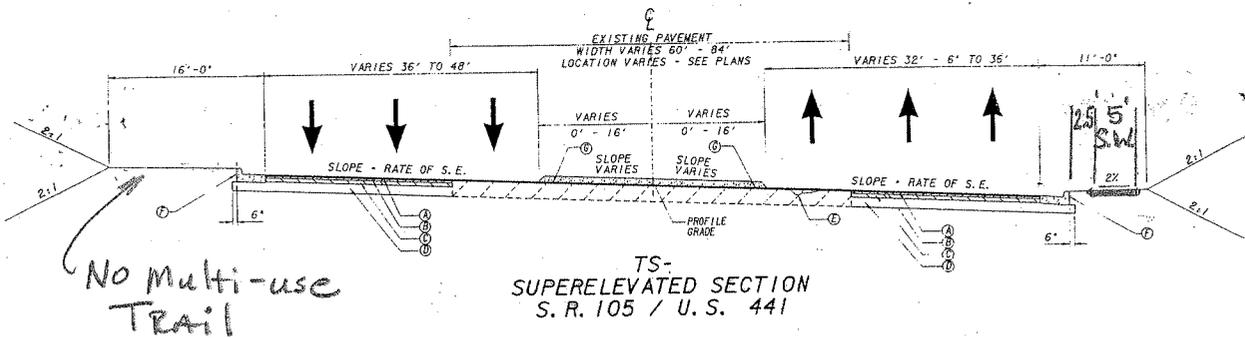
SHEET NO.:

2 of 4

Original



Alternative



No Multi-use Trail

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-11

SHEET NO.: 3 of 4

Original Cost for 10' concrete multi-use trail on Lt. side SR 105 from STA 139+20 to STA 192+26.

$$\frac{10' \times 5,306'}{95F/54} = 5,896 \text{ sy (10' multi-use trail)}$$

COST WORKSHEET



PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
Georgia Department of Transportation

ALTERNATIVE NO.: **TS-11**

SHEET NO.: **4** of **4**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
10' multiuse Textil	SY	5896	\$33.67	198,591			
				Subtotal			
				Markup (%) at 10%			
				TOTAL			

\$198,591
 \$19,859
\$218,450

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-12**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **PROVIDE A 5-FT. SIDEWALK IN LIEU OF THE 10-FT. MULTI-USE TRAIL AND KEEP OPPOSITE SIDEWALK** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The current design shows a 10-ft. multi-use trail on the left side and a 5-ft. sidewalk on the right side.

ALTERNATIVE: (Sketch attached)

Provide 5-ft. sidewalks on both sides. However, grade the left-side shoulder to provide for a future 10-ft. multi-use trail by adding 5 ft. to the shoulder.

ADVANTAGES:

- Reduces construction cost
- Provides for future expansion to a 10-ft. trail

DISADVANTAGES:

- Would not accommodate bike traffic now

DISCUSSION:

This alternative would save on construction costs by reducing the 10-ft. multi-use trail to a 5-ft. sidewalk. However, the shoulder would be graded to allow the 5-ft. sidewalk on the left side to be increased to 10-ft., so others (local government or developers) could widen the sidewalk into a trail in the future if so desired.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 109,186	—	\$ 109,186
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 109,186	—	\$ 109,186

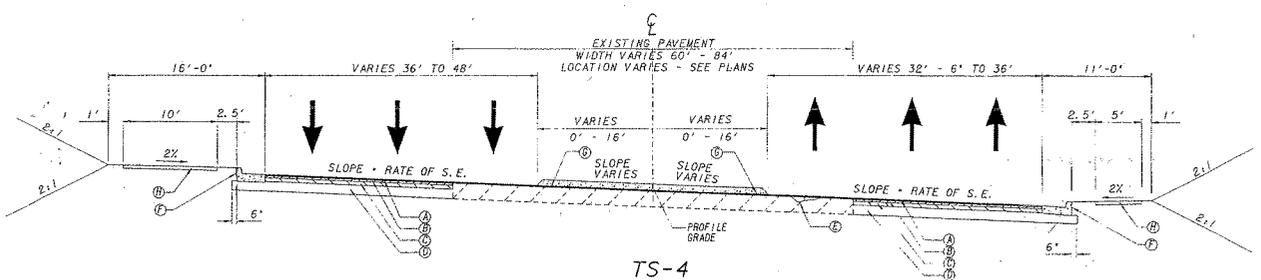
PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
 Georgia Department of Transportation

ALTERNATIVE NO.: TS-12

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

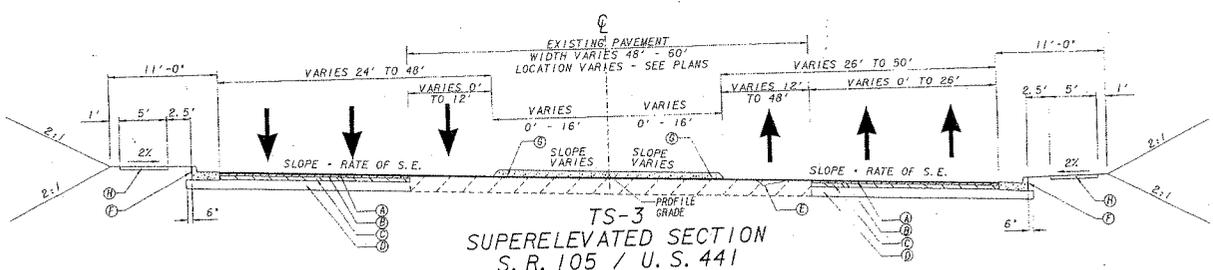
SHEET NO.: 2 of 4

Original
 (multi-use TRAIL & 5' sidewalk)



TS-4
 SUPERELEVATED SECTION
 S. R. 105 / U. S. 441

Alternate
 (5' sidewalks on both sides)



TS-3
 SUPERELEVATED SECTION
 S. R. 105 / U. S. 441

CALCULATIONS



PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
Georgia Department of Transportation

ALTERNATIVE NO.: **TS-12**

SHEET NO.: **3** of **4**

Cost to reduce 10' multi-use trail to
a 5' sidewalk from STA 139+20 to STA 192+26

$$\frac{5,306' \times 5'}{9 \text{ SF/SY}} = 2,948 \text{ S.Y.}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **TS-13**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **USE ASPHALT CONCRETE IN LIEU OF CONCRETE FOR** SHEET NO.: **1 of 3**
MULTI-USE TRAIL

ORIGINAL DESIGN:

The original design uses concrete for multi-use trail.

ALTERNATIVE:

Use asphalt concrete for multi-use trail.

ADVANTAGES:

- Reduces cost
- Easy on joggers
- Reduces construction schedule

DISADVANTAGES:

- Increases maintenance cost

DISCUSSION:

The use of asphalt concrete will reduce the initial cost. Joggers also prefer to run on asphalt, but asphalt has a tendency to crack and allows weeds to grow through the cracks. Using asphalt for multi-use trails is a common practice.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 218,370	—	\$ 218,370
ALTERNATIVE	\$ 111,812	—	\$ 111,812
SAVINGS (Original minus Alternative)	\$ 106,558	—	\$ 106,558

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-13

SHEET NO.: 2 of 3

The original cost for the 10' concrete multi-use trail on the left side of SR 105/US 441 from Sta. 139+20 to Sta. 192+26.

$$= \frac{10' * 5306'}{9 \text{ sf/sy}}$$

$$= 5896 \text{ sy.}$$

The alternative cost for the 10' asphalt concrete multi-use trail on the left side of SR 105/US 441 from Sta. 139+20 to Sta. 192+26

$$= 5896 \text{ sy.}$$

$$\text{A.C. Cost} = 220 \text{ LB/sy} * \frac{1}{2000 \text{ LB/ft}} * \$65.79 = \$7.24/\text{sy.}$$

$$4" \text{ GAB} = \$10.00/\text{sy.}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **EE-2**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **ONE-WAY SR 105 PAIRS BETWEEN CAMP STREET ROAD** SHEET NO.: **1 of 11**
AND CLARKESVILLE ROAD

ORIGINAL DESIGN: : (Sketch attached)

The portion of the current design through the city of Cornelia consists of widening the current US 105 roadway to four lanes separated by a 12-ft., two-way left turn lane. Urban shoulders, 10.5-ft. wide, are being provided in each direction.

ALTERNATIVE: (Sketch attached)

Create a one-way pair system from Station 196+00 to Station 224+00 (approximately) in the urbanized portion of SR 105 within the city of Cornelia.

The eastbound one-way pair would utilize the existing roadway (two 11-ft. lanes) with the addition of an urban shoulder on the south side (varies from 9 ft. to 11 ft.). The north side of the eastbound pair will retain the current roadside treatment to accommodate the current access to properties and minimize impacts. The existing roadway will be rehabilitated with a new pavement overlay.

The westbound side of the one-way pair would be placed within Stonecypher Street right of way utilizing a pavement section consisting of 12-ft. and 11-ft. lanes, as in the current design. The multi-use trail would be placed at the north side of the westbound pair. The roadway would drain towards the median. The south side would be graded out at 4:1 and retain a rural type section. A good portion of the abandoned railroad track bed would be retained as drainage and to preserve history. Note: the westbound pair alignment in the vicinity of Clarkesville Street can be modified to miss the historical property at the same location.

The two-lane section would taper to a one-lane section just west of Lee Street. Lee Street is proposed to be disconnected from SR 105 while access to Clarkesville Street is being provided from the westbound roadway via right-in, right-out movements. The connection to Lee Street could be retained if necessary, possibly with a one-way pair connection there in lieu of at Circle Drive. In this scenario, Clarkesville Street could be left with right-in, right-out movements or made into a cul-de-sac.

Connections between the pairs are provided at Circle Drive and Camp Creek Road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,121,215	—	\$ 4,121,215
ALTERNATIVE	\$ 307,490	—	\$ 307,490
SAVINGS (Original minus Alternative)	\$ 3,813,725	—	\$ 3,813,725

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **EE-2**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **ONE-WAY SR 105 PAIRS BETWEEN CAMP STREET ROAD** SHEET NO.: **2 of 11**
AND CLARKESVILLE ROAD

ADVANTAGES:

- Substantially reduces right of way impacts (urbanized section of Cornelia)
- Eliminates three commercial properties takes from the current design
- Provides additional length of multi-use trail
- Reduces frequency and severity of collisions (eliminates left turns out of driveways)
- Improves SR 105 traffic operations
- Reduces impacts to Timothy Webb parcel (historical property) when compared to current design
- Enhances future commercialization of additional properties within the limits of the one-way pairs
- Eases construction and staging

DISADVANTAGES:

- Requires coordination and public hearings
- Requires environmental document updating
- Encroaches on Benjamin Huff property (westbound curve could be revised as currently laid out to reduce impacts)
- Complicates operations of cross streets feeding the one-way
- Reduces quality of access along the current SR 105 within the vicinity of one-way pair.

DISCUSSION:

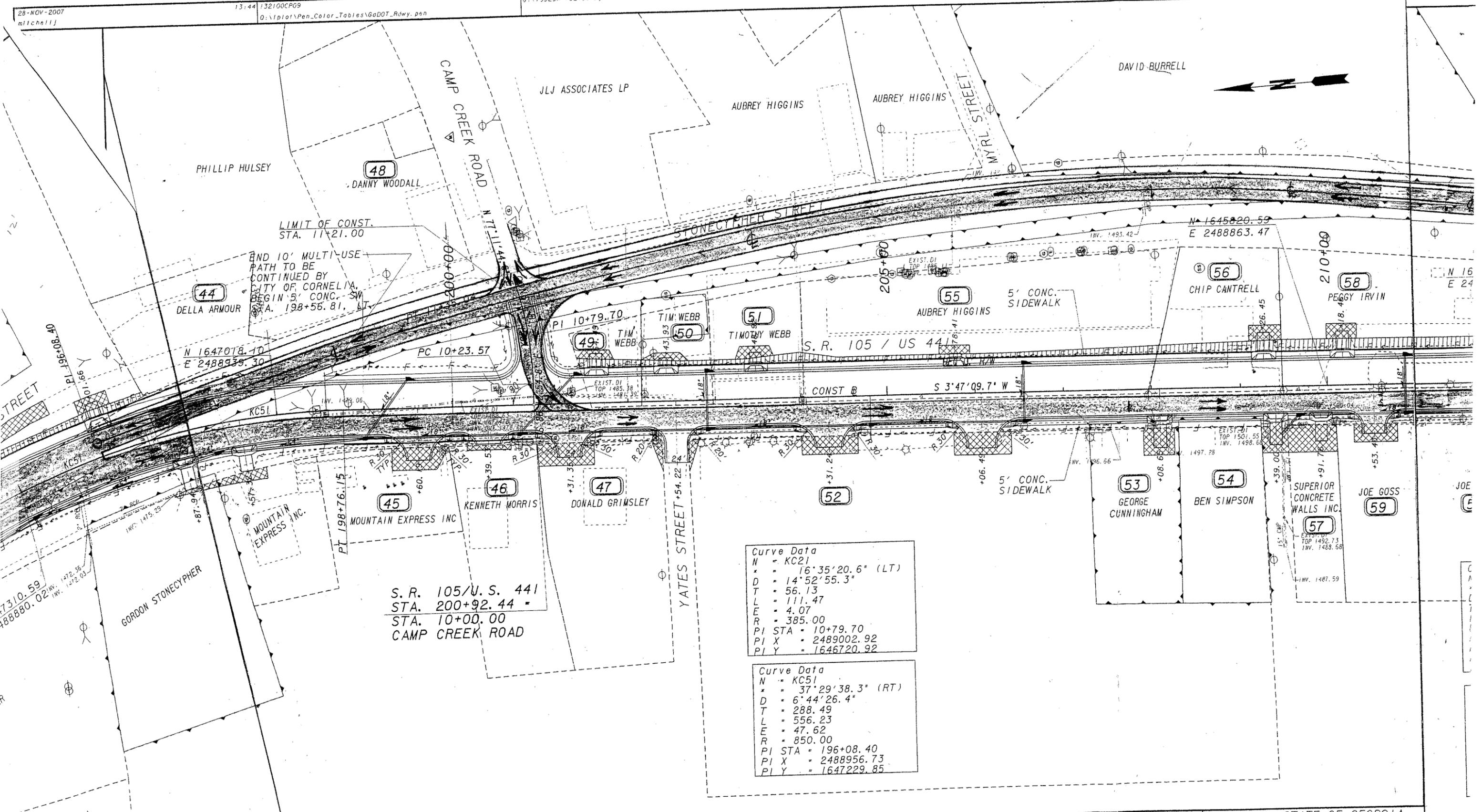
The key benefits of this alternative are improved operations of SR 105, reduced driveway/SR 105 mainline collision potential and reduction in right of way impacts (including the historical property). This alternative requires that an additional 2400 linear feet of multi-use trail not in the current design (a value of approximately \$50,000) be constructed in the state highway, which would be a benefit to the city of Cornelia. The key disadvantage, assuming the technical operations of the roadway system are resolved, is the change of access along the one-way pairs. This disadvantage could be sold to the city of Cornelia by suggesting that the one-way pair allows more properties along the one-way pair to be commercialized.

The operations of the one-way pair connections opposite Camp Creek Road and Circle Drive would need to be carefully analyzed. If the operations of these streets, as currently shown in the VE alternative drawings, are severely impacted, an alternative could be to create right-in and right-out movements at the cross street, leaving the connections for mainline U-turn operations only.

The right of way savings may be more than currently calculated due to the character of the right of way in this portion. It is primarily denser, smaller parcels.

Ultimately, the operational and right of way benefits of the one-way pair design needs to be weighed against the re-engineering and environmental document re-evaluation

STATE	PROJECT NUMBER	SHEET NO.
GA	STP-2640(10)	28



LIMIT OF CONST.
STA. 11+21.00

END 10' MULTI-USE
PATH TO BE
CONTINUED BY
CITY OF CORNELIA,
BEGIN 5' CONC. SW
STA. 198+56.81, LT

N 1647018.10
E 2488939.30

S. R. 105/U. S. 441
STA. 200+92.44 -
STA. 10+00.00
CAMP CREEK ROAD

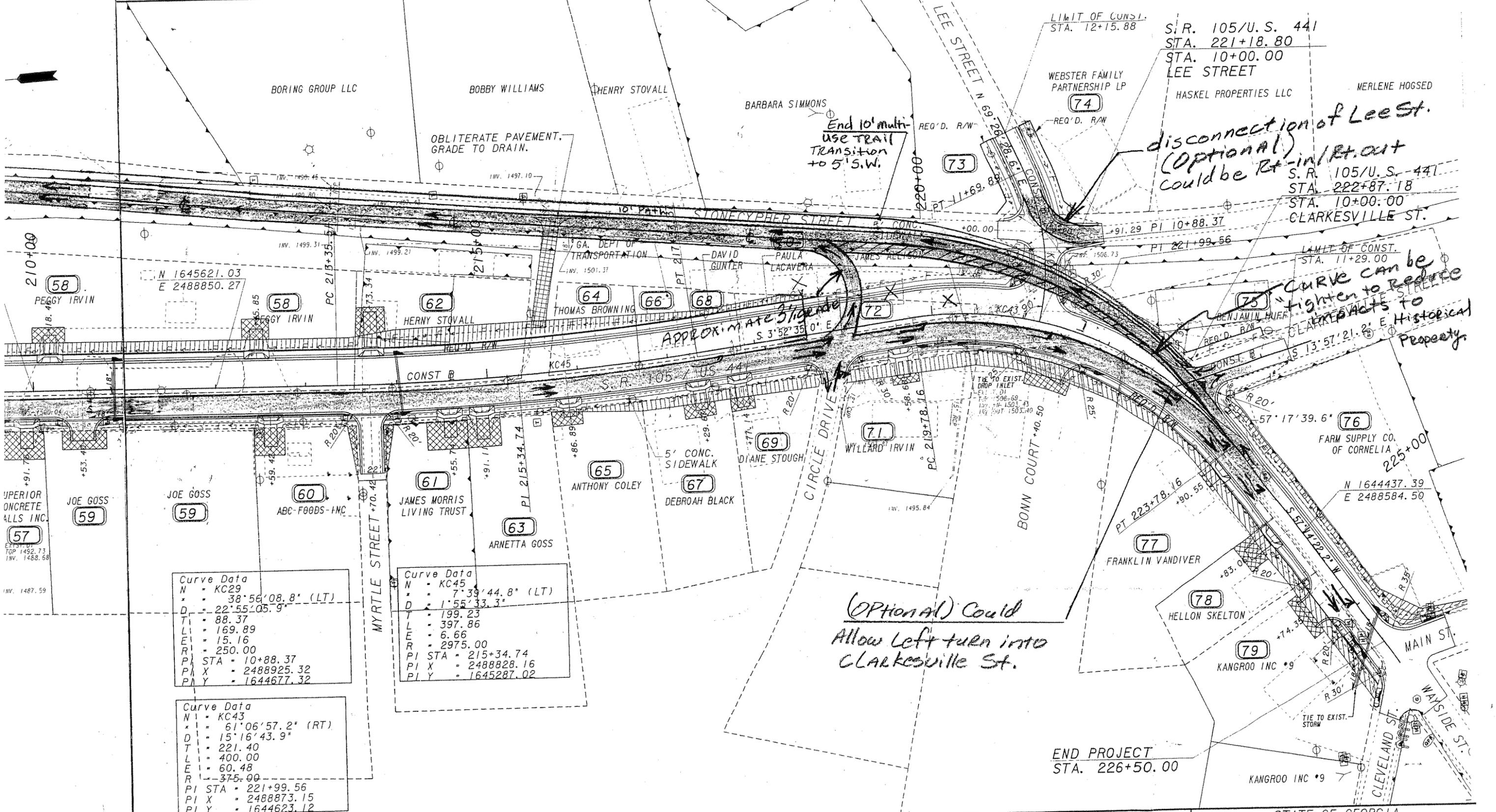
Curve Data

N	= KC21
Δ	= 16°35'20.6" (LT)
D	= 14°52'55.3"
T	= 56.13
L	= 111.47
E	= 4.07
R	= 385.00
PI STA	= 10+79.70
PI X	= 2489002.92
PI Y	= 1646720.92

Curve Data

N	= KC51
Δ	= 37°29'38.3" (RT)
D	= 6°44'26.4"
T	= 288.49
L	= 556.23
E	= 47.62
R	= 850.00
PI STA	= 196+08.40
PI X	= 2488956.73
PI Y	= 1647229.85

REVISION DATES



Curve Data

N	KC29
Δ	38°56'08.8" (LT)
D	22°55'05.9"
T	88.37
L	169.89
E	15.16
R	250.00
PI STA	10+88.37
PI X	2488925.32
PI Y	1644677.32

Curve Data

N	KC45
Δ	7°39'44.8" (LT)
D	1°55'33.3"
T	199.23
L	397.86
E	6.66
R	2975.00
PI STA	215+34.74
PI X	2488828.16
PI Y	1645287.02

Curve Data

N	KC43
Δ	61°06'57.2" (RT)
D	15°16'43.9"
T	221.40
L	400.00
E	60.48
R	375.00
PI STA	221+99.56
PI X	2488873.15
PI Y	1644623.12

End 10' multi-use trail transition to 5' S.W.

disconnection of Lee St. (OPTIONAL) could be Rt-in/Rt-out

CURVE can be tightened to reduce PREPARED TO Historical Property.

(OPTIONAL) Could Allow Left turn into Clarkesville St.

END PROJECT STA. 226+50.00

STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION
 MAINLINE PLAN
 AND EXISTING R/W LINE
 RED R/W LINE
 SECTION LIMITS
 LIMIT FOR CONSTR
 MAINTENANCE OF SLOPES

BEGIN LIMIT OF ACCESS.....BLA
 END LIMIT OF ACCESS.....ELA
 LIMIT OF ACCESS
 REQ'D R/W & LIMIT OF ACCESS

PB 3340 PEACHTREE RD, NE
 SUITE 2400, TOWER PLACE 100
 ATLANTA, GA 30328-1001

SCALE IN FEET

REVISION DATES	

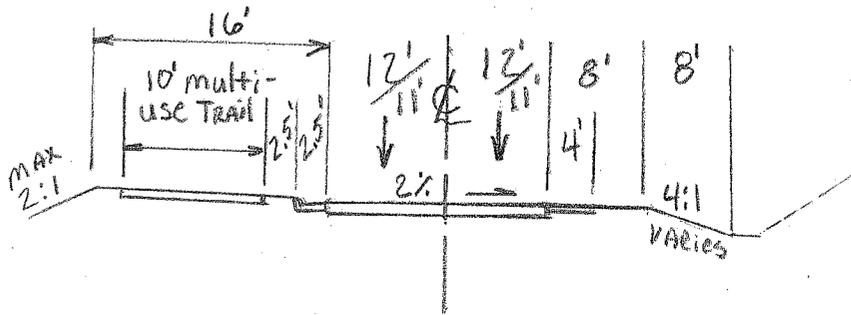
STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE: **MAINLINE PLAN**

PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
 Georgia Department of Transportation

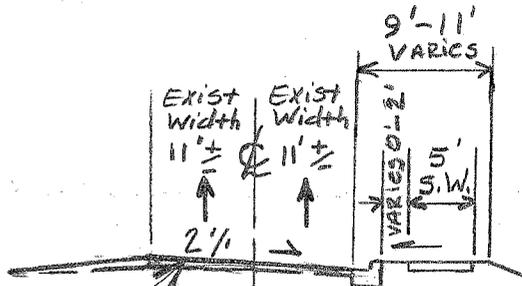
ALTERNATIVE NO.:
 EE-2

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 5 of 11



ALTERNATE TYPICALS (WESTBOUND)



Overlay exist roadway (Keep exist Lane widths)

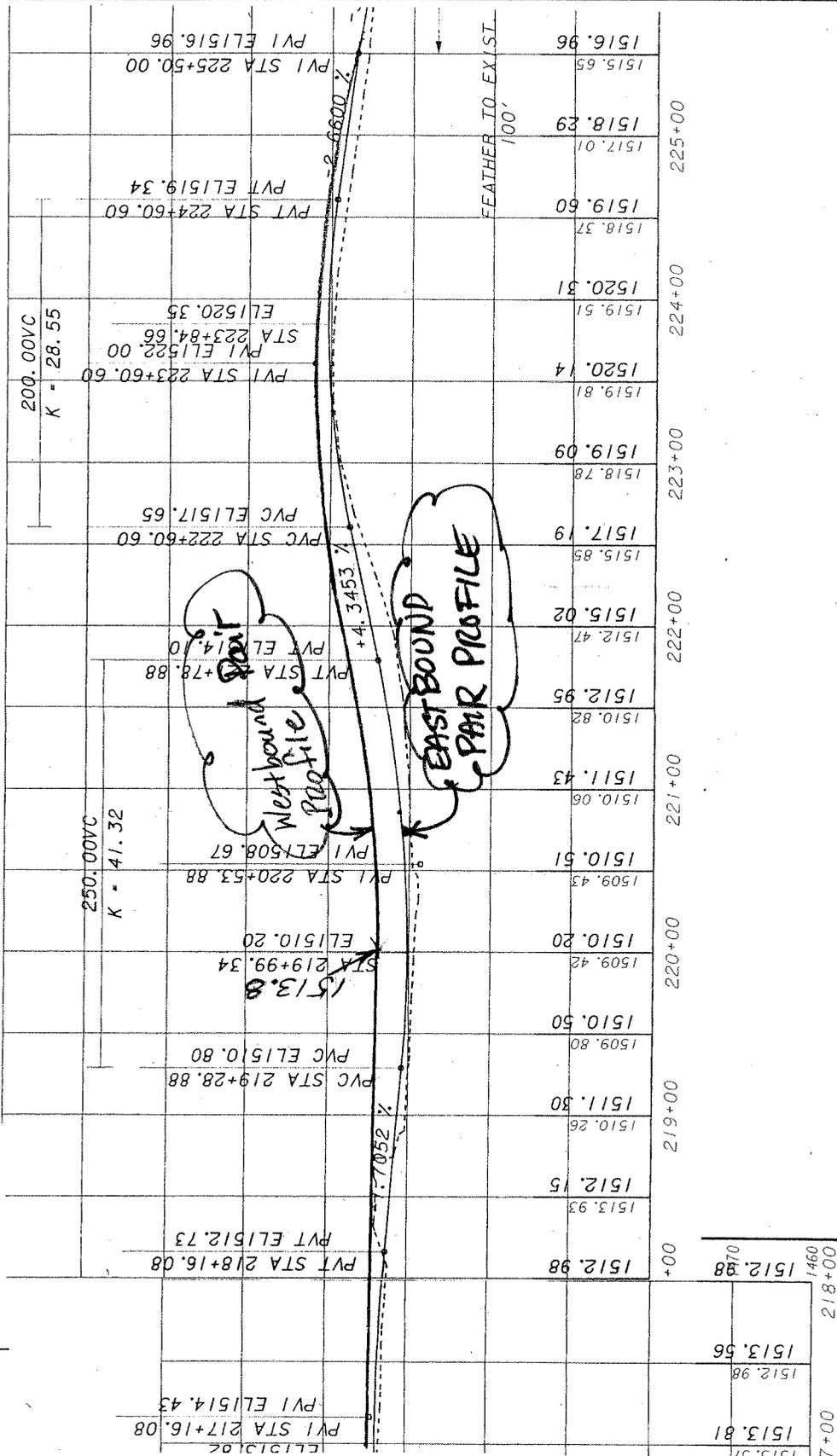
ALTERNATIVE TYPICAL (EAST BOUND)

PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **EE-2**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **6** of **11**



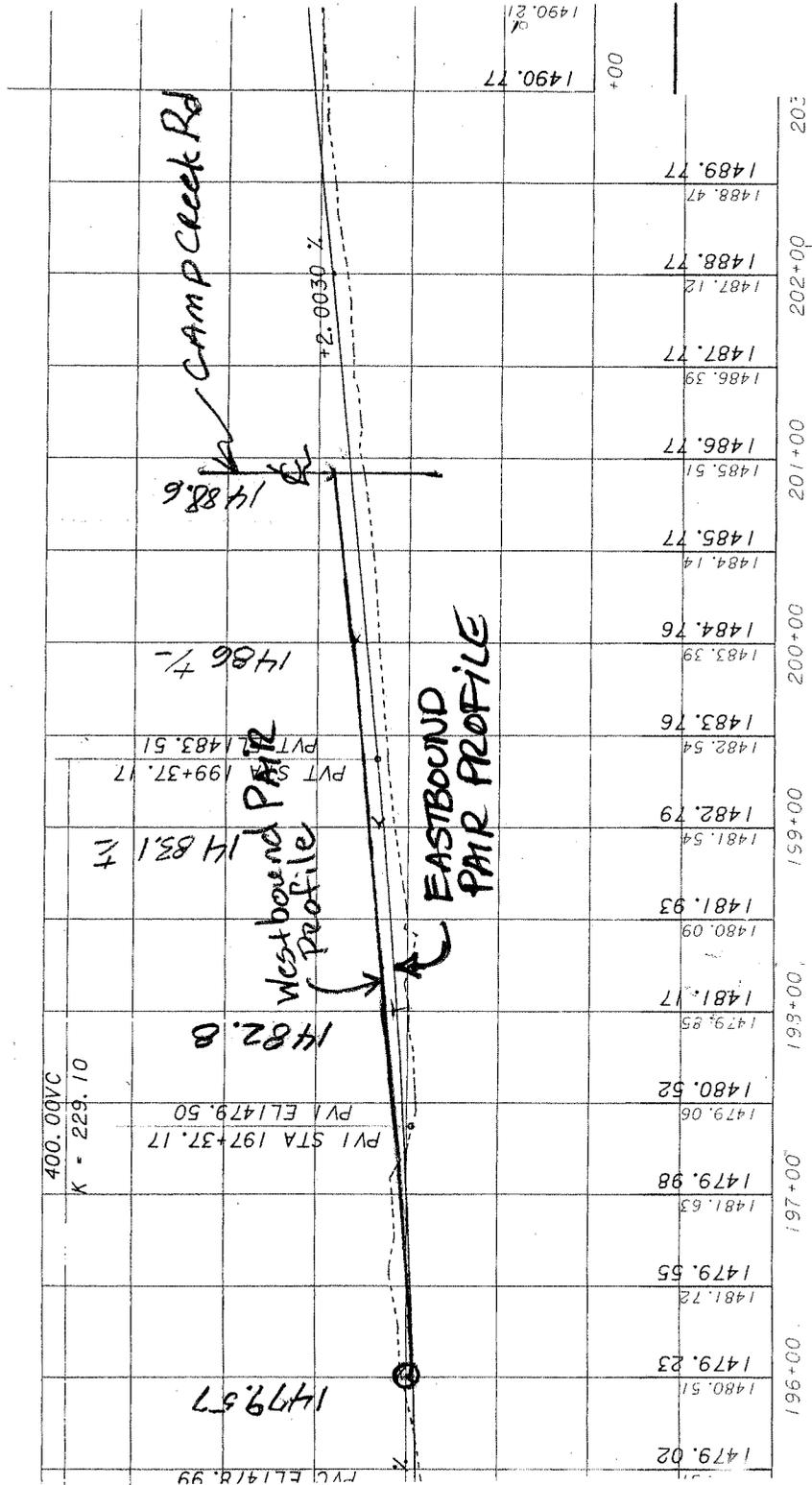


PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **EE-2**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **7** of **11**

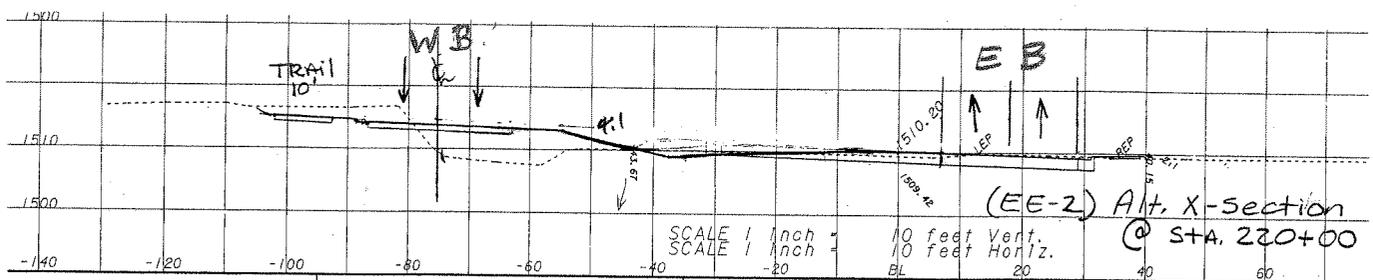


PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **EE-2**
 SHEET NO.: **8** of **11**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

Alt. Cross-Sections

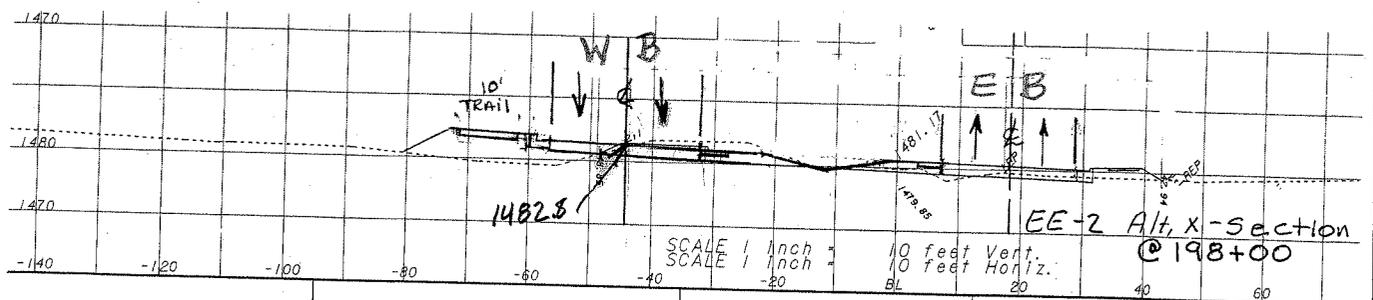


EE-2

PB 100 YEARS
 3340 PEACHTREE RD, NE
 SUITE 2400, TOWER PLACE 100
 ATLANTA, GA 30313-1001

GEORGIA
 DEPARTMENT
 OF
 TRANSPORTATION

REVISION



EE-2

PB 100 YEARS
 3340 PEACHTREE RD, NE
 SUITE 2400, TOWER PLACE 100
 ATLANTA, GA 30313-1001

GEORGIA
 DEPARTMENT
 OF
 TRANSPORTATION

REVISION

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.:

EE-2

SHEET NO.: 9 of 11

East bound (use exist lanes) (SAVE)

SAVE Full Depth pavement section:

$$\left[\frac{(11' + 12') \times (2,300')}{9 \frac{SF}{SY}} = 5,878 \text{ SY.}$$

(STA. 198+00± to STA 221+00±)

USE: \$59.50/SY. (see attachment)

SAVE R/W on East bound

$$\left[\frac{(23' + 16') \times 1,980'}{43,560 \frac{SF}{AC}} \approx 1.78 \text{ AC}$$

USE: \$225,000/AC (Commercial)

markup = 8.3295 (includes Improvements Reloc., Damages, Scheduling Conting., Adm/Court Cost, & Market Apprec.)

Add Overlay for existing East bound lanes

$$\left[\frac{(11' + 11') \times 2,300'}{9 \frac{SF}{SF}} = 5,623 \text{ SY.}$$

Exist. Lanes

USE: \$5.43/SY (see attachment) 1 1/2" Asphaltic Concrete

$$\left[\frac{(Aug. 4' Ht.) \times 2,900' \times (50' Aug. width)}{27 \frac{CF}{CY}} = 20,000 \text{ C.Y.}$$

USE \$4.90/CY (from Designers Cost Estimate)

$$\text{Add more DRAINAGE / use: } \$1,165,000 \text{ (project)} \left(\frac{2,35' m. \times 5,280'}{m.} \right) =$$

$$= \$93.89 \text{ /L.F. / use } \frac{1}{2} \text{ the length } 2,300' / 2 = 1,150'$$

Add 5' of multi-use trail (10' - 5') = 5'

The Present Design has 2 - 5' side walks along this section. The Alt. Design has a 10' multi-use TRAIL & AS 5.62

CALCULATIONS



PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.:

EE 2

SHEET NO.: 10 of 11

Main Line Pavement Section Cost:
(SR105)

AC

(12.5mm) : $165 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$65.79 = \$5.43/\text{sy}$

(19mm) : $220 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$63.21 = \$6.95/\text{sy}$

(25mm) : $880 \text{ LB/sy} \times \frac{1}{2000 \text{ lb/ft}} \times \$63.99 = \$28.16/\text{sy}$

10" GAB = $\$18.96/\text{sy}$

Total Cost: $\$59.50/\text{sy}$

Unit prices above are from the Designers cost estimate.

Add 1' multiuse TRIAL pavement (10 LSI) = 5'

$$\frac{5' \times 2300'}{95 \text{ /sy}} = 1,278 \text{ sy}$$

COST WORKSHEET



PROJECT: **SR 105/ US 441 WIDENING STP-2640(10)**
 Georgia Department of Transportation

ALTERNATIVE NO.:

EE-2

SHEET NO.: 11 of 11

PROJECT ITEM		Alt. ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Save (Pavement Section) (incl. GAB)	SY				5878	\$59.50	\$349,741
Save R/W	AC				1.78	\$225,000	\$400,500
Add (Original) Overlay	SY	5,623	\$5.43	\$30,533			
Add'l Earthwork	CY	20,000	\$4.90	\$98,000			
Add'l Drainage	L.F.	1,150	\$93.89	\$107,974			
Add'l 5' Multi-use Trail (10-5)	SY	1,278	\$33.67	\$43,030			
R/W Subt.							\$400,500
R/W Markup (8.3295)							\$3,336,000
Const. Subtotal				\$279,537			\$349,741
Const. Markup (%) at 10%				\$27,954			\$349,741
TOTAL				\$307,491			\$4,121,215

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **EE-3**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **ELIMINATE THE CLARKESVILLE STREET CONNECTION** SHEET NO.: **1 of 2**
WITH SR 105

ORIGINAL DESIGN: (Sketch attached)

The current design has a connection/intersection at Clarkesville Street and SR 105.

ALTERNATIVE: (Sketch attached)

Close the connection/intersection at Clarkesville Street with SR 105.

ADVANTAGES:

- Improves traffic operations on SR 105/US 441 by eliminating an intersection and directing traffic to a signalized intersection
- Reduces intersection collisions

DISADVANTAGES:

- Small increase in travel time for some traffic movements
- Reduces access

DISCUSSION:

The alternative design suggests to cul-de-sac Clarkesville Street so traffic will access SR 105/US 441 at Lee Street or Main Street signalized intersection. The Clarkesville intersection is too close to Lee Street and Main Street (SR 105/US 441) to allow all the turning movement at these intersections.

The construction cost for both designs is approximately the same, since the savings for eliminating the connection would be spent to cul-de-sac Clarkesville Street and for the additional curb and gutter along SR 105/US 441.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **EE-4**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **REVISE SPEED LIMIT OF EAST END OF PROJECT** SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The current design has the posted speed at 45 mph, according to the signing and marking plans from the western terminus until the last curve just prior to the eastern terminus. This curve will be signed at 30 mph.

ALTERNATIVE:

Change the posted speed limit to 35 mph where SR 105 changes to a more urban, high density setting, approximately at Magnolia Lane. Retain the 30 mph speed limit at the eastern terminus.

Manage the proposed 45 mph to 35 mph speed change with the following speed management measures:

At transition zone (beginning):

- Install “reduced speed ahead” (R2-5) signs in advance of the initial 35 mph sign speed limit.
- Increase the panel size for the “35 mph speed limit” (R2-1) sign
- Install flashing yellow warning lights on the “35 mph speed limit” (R2-1) sign
- Install radar detection with a VMS (variable message sign) board indicating vehicle speed

Within the transition zone:

- Increase the frequency of 35 mph signs
- Increase enforcement within zone with increased patrols. Supplement with signing indicating speed limit actively enforced, and post signs indicating fines for speeding.

If the above measures prove to be insufficient, the following measures could be installed:

At Transition Zone (Beginning)

- Provide screening along the sides of the road preceding the 35 mph speed limit location to produce a lateral confinement effect causing motorists to instinctively slow down.
- Install a series of rumble strips across the travel lanes. “Rumble Strip” signs to be installed prior to the where the rumble strips are installed.
- Install pavement marking in the travel lanes indicating 35 mph speed limit.
- Provide special edge line treatment such as change in color.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING
IMPROVEMENTS STP-2640(10)**
Habersham County, Georgia

ALTERNATIVE NO.: **EE-4**

DESCRIPTION: **REVISE SPEED LIMIT OF EAST END OF PROJECT**

SHEET NO.: **2 of 2**

ADVANTAGES:

- Increases safety in urban area
- Alerts motorist of reduced speed zone

DISADVANTAGES:

- Adds cost for signing and maintenance

DISCUSSION:

The current design proposes a posted speed limit of 45 mph almost the whole project, except for the last curve to be signed at 30 mph. The more urban, higher-density areas should have a 35 mph limit. While adding cost, the provisions outlined in this alternative will provide a safe transition from the 45 mph zone to the new 35 mph zone. It also provides a more gradual transition to the 30 mph zone at the last curve.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 105/US 441 INTERCHANGE WIDENING IMPROVEMENTS** ALTERNATIVE NO.: **EE-5**
STP-2640(10)
Habersham County, Georgia

DESCRIPTION: **IMPROVE LEE STREET, CLARKESVILLE STREET AND** SHEET NO.: **1 of 3**
MAIN STREET INTERSECTION SPACING

ORIGINAL DESIGN: (Sketch attached)

The original design allows right and left turns for Lee Street and Clarkesville Street along the mainline. The intersection distance between Lee Street and Main Street does not meet the required 660 ft. spacing that would allow left turns onto Clarkesville Street.

ALTERNATIVE: (Sketch attached)

Provide only right-in and right-out turns for Lee Street and Clarkesville Street.

Sign Lee Street southbound SR 105 movement to Stone Cypher Street.

ADVANTAGES:

- Provides safer turning movements
- Reduces intersection collisions
- Improves traffic operations along SR 105

DISADVANTAGES:

- Reduces SR 105/Clarkesville Street and Lee Street access

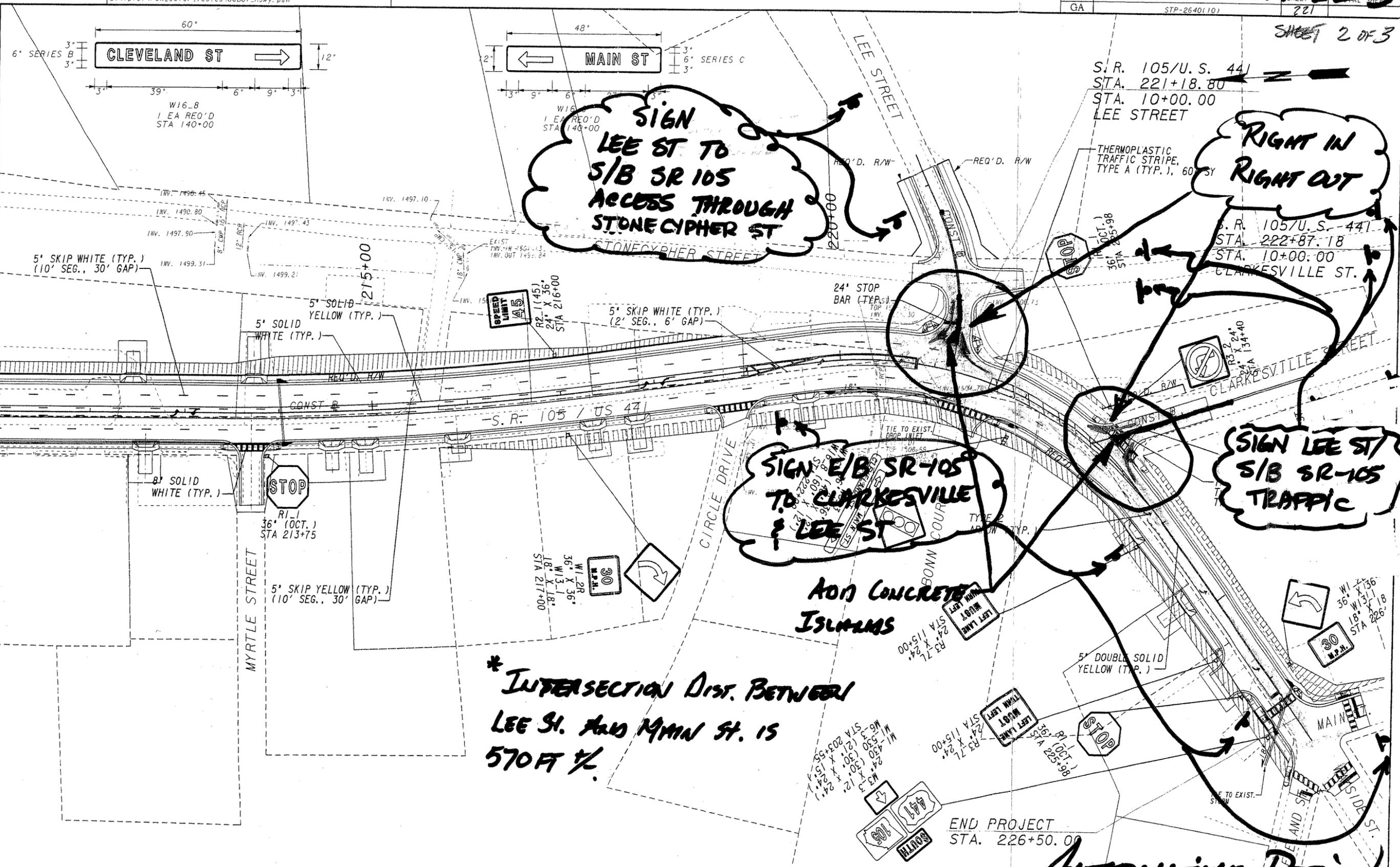
DISCUSSION:

Consider right-in and right-out turns for Lee Street and Clarkesville Street to improve SR 105 operations and to reduce city of Cornelia vehicle collisions. Consider using guide signs to direct motorists from Main Street (east of project terminus) to and from Lee Street/Clarkesville Street.

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

ALTERNATIVE DESIGN

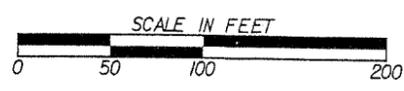
MATCHLINE STA 211+00 SEE SHT 26-08



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

BEGIN LIMIT OF ACCESS.....	BLA
END LIMIT OF ACCESS.....	ELA
LIMIT OF ACCESS	---
REQ'D R/W & LIMIT OF ACCESS	---

PR 100 YEARS
 3340 PEACHTREE RD, NE
 SUITE 2400, TOWER PLACE 100
 ATLANTA, GA 30326-1001



REVISION DATES

STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE:
SIGNING AND MARKING PLANS
 SR 105/US 441
 COUNTY: HABERSHAM
 DRAWING NO. 26-10

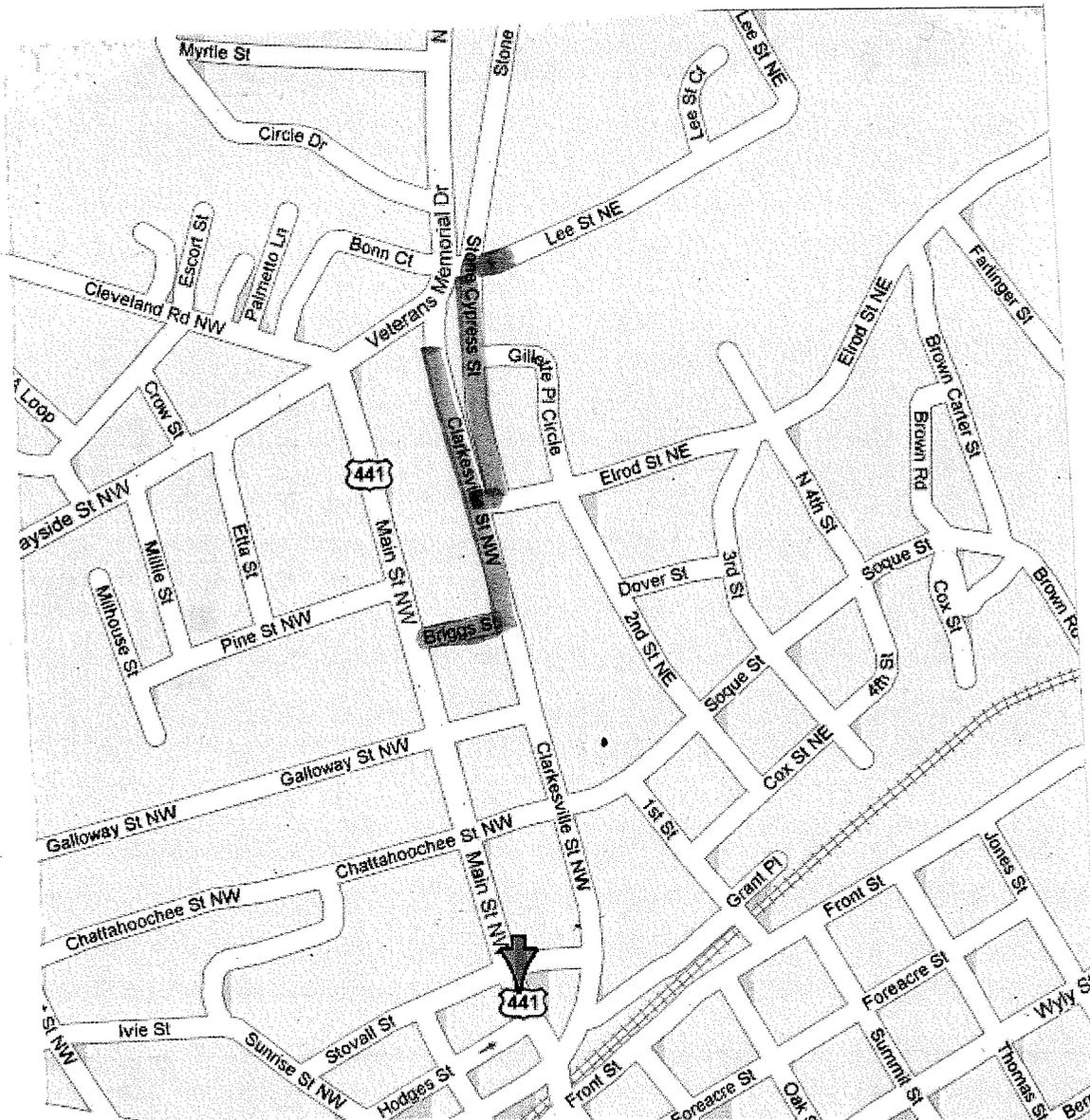


PROJECT: SR 105/ US 441 WIDENING STP-2640(10)
Georgia Department of Transportation

ALTERNATIVE NO.: EE-5

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 3 of 3



— GUIDE SIGNING FOR EASTBOUND SR 105 TO CLARKESVILLE / LEE ST. AND FOR CLARKESVILLE / LEE ST / EASTBOUND SR 105 TRAFFIC

PROJECT DESCRIPTION

Excerpted from Parsons Brinckerhoff's Environmental Assessment dated October 2007.

INTRODUCTION

This project involves the widening of 2.41 miles of SR 105/US 441 Business Route (referenced hereafter as SR 105) southeast from its intersection with Cannon Bridge Road to North Main Street in downtown Cornelia. The total project length includes the SR 105/SR 365 interchange. See Figure 1: Project Location Map. For consistency, the roadway segments are referenced herein as extending from “west” to “east” on SR 105 and from “north” to “south” on SR 365.

The purpose of this project is to improve the safety and operational capacity along SR 105 between Cannon Bridge Road in the north Cornelia commercial district and North Main Street/Cleveland Street in downtown Cornelia. The project will support regional and local economic development and recreational goals related to the development of a greenway and multi-use path along the former Tallulah Falls Railway line.

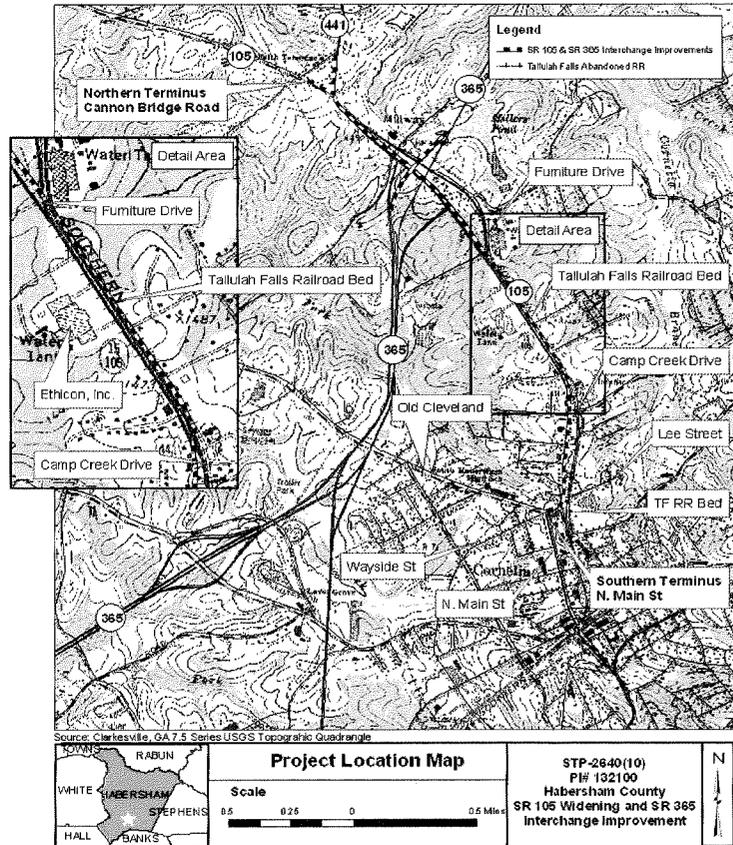


Figure 1: Project Location Map

From Cannon Bridge Road to SR 365, the existing five-lane SR 105 would be widened to a six-lane divided roadway with a 20-foot-wide raised concrete median, and with curb and gutter along the outside edges of pavement. The interchange at SR 365 would be reconfigured from a partial cloverleaf design to a partial diamond-type interchange. Diamond entrance and exit ramps to southbound SR 365 would be constructed on the southbound side of SR 365, replacing the existing southbound exit loop ramp and relocating the southbound entrance ramp to form a new ramp intersection with SR 105. The existing SR 365 northbound entrance loop ramp from SR 105 and the existing northbound SR 365 diamond exit ramp to SR 105 in the southeast quadrant of the interchange would remain unchanged.

From the SR 365 interchange eastward to a point just west of the intersection with Camp Creek Road, the existing SR 105 would be widened to a five-lane roadway, with a 12-foot-wide flush median, two-way left-turn lanes, and outside curb and gutter. This section of the roadway would be widened along the northern side of the existing alignment and would encroach on the abandoned bed of the former Tallulah Falls Railway.

Between the western side of the SR 365 interchange and Camp Creek Road, the proposed project would include a 10-foot-wide, 4,600-foot-long, two-way multi-use path along the northern shoulder area, offset by 12 feet from the westbound SR 105 travel lanes. From Camp Creek Road eastward to downtown Cornelia, a potential future segment of the multi-use path could roughly follow the current alignment of existing Stonecypher Street, using part of its right-of-way. The proposed SR 105 project would not include construction of the multi-use path beyond Camp Creek Road. The Tallulah Falls Railroad Greenway LLC, in coordination with the City of Cornelia and the Georgia Mountains Regional Development Center (GMRDC), would identify funding sources for the construction and maintenance of any future segments of the multi-use path. This document outlines the environmental impacts associated with the proposed roadway widening and interchange modification as well as the installation of a multi-use path as described above. The Environmental Assessment outlines the environmental impacts associated with the proposed roadway widening and interchange modification as well as the installation of a multi-use path as described above.

Planning Basis for the Action

The proposed project is needed in order to reduce the existing traffic congestion and accident rates along the SR 105 corridor in the city of Cornelia. The purpose of the project is to improve the safety and operational capacity along SR 105, originating at Cannon Bridge Road and ending near North Main Street in downtown Cornelia. The installation of a raised median between Cannon Bridge Road and SR 365 will limit access and create turn bays to allow safer operating conditions for through traffic. The project would provide local and through traffic with a roadway facility that would meet current and future traffic demands, and it would provide the public with a safer environment for automobile drivers and pedestrians.

The multi-use path as described above is included in the proposed project as a cultural resources mitigation commitment; it is not be required in order to meet the project purpose and need, but it is consistent with the project purpose and need and with the Downtown Master Plan (City of Cornelia 2001). The multi-use path would be the initial segment of an alternative transportation route linking the northern Cornelia commercial district with the city of Cornelia's downtown park, which would provide a recreational amenity for residents and visitors to Habersham County and serve as an economic vehicle for the city of Cornelia.

Population growth, commercial development, and employment centers located in the corridor make the improvements to SR 105 important for continued growth and safe mobility in the area. The population grew from 27,622 to 35,902 between 1990 and 2000 for Habersham County, an increase of 30 percent. The population of the city of Cornelia increased from 3,219 to 3,674 between 1990 and 2000, a growth rate of 8.4 percent. The SR 365/SR 105 interchange provides access to a variety of commercial properties that are important destinations for the delivery of goods and services, and which provide employment opportunities for the community. Ethicon, Inc., one of Habersham County's largest employers, occupies an industrial site on SR 105 within the limits of this project (GMRDC 2005). The widening of SR 105 and the improvements to the SR 365 interchange would enhance safety, operations, and mobility through the corridor.

From Cannon Bridge Road southeast to SR 365, the proposed project would widen SR 105 to a six-lane divided roadway with a 20-foot raised median and outside curb and gutter. Turn lanes at specific locations would create a safer environment for local and through traffic. East of SR 365, the proposed five-lane section of SR 105 would reduce access issues for local business and provide a protective storage area for left-turning traffic in the downtown area of Cornelia.

The SR 365 interchange would be reconfigured from the existing partial cloverleaf design to a partial diamond-type interchange design. Diamond entrance and exit ramps for southbound SR 365 would be constructed, replacing the existing southbound exit loop ramp and relocating the southbound entrance ramp to form a new ramp intersection with SR 105. The existing SR 365 northbound entrance loop ramp from SR 105 and the existing northbound SR 365 diamond exit ramp to SR 105 in the southeast quadrant of the interchange would remain unchanged. Moving the SR 365 southbound ramps eastward (away from the J. Warren/Mize Road intersection) would improve both the storage capacity between signals and the weaving conditions at the SR 365 southbound on-ramp. Leaving the northbound ramps in their existing condition would provide greater intersection efficiency and reduce construction time and cost, and would not impact existing properties. The reconfiguration and proposed design of the interchange, with regard to modifying the southbound ramps and retaining the existing northbound ramps, meets the justifications and criteria required to satisfy the federal guidelines for approval of an interchange modification report (IMR). The new proposed design would provide acceptable levels of service (LOS) for the mainline, crossroads, and ramps, and would provide for adequate distances between other existing interchanges along the SR 365 corridor.

Coordination with the City of Cornelia, the Georgia Mountains RDC, and the Tallulah Falls Railroad Greenway LLC has occurred during project development. The 2001 Cornelia Master Plan includes a greenway that would connect the eastern terminus of the multi-use path proposed for the SR 105 project with a downtown park located near a recently renovated rail depot that serves as a public gathering place. See Figure 2: Cornelia Master Plan.

The goals and objectives of a planning process conducted in 2001 by the City of Cornelia states the following: "... Make downtown a desirable place to live, work and visit. By developing a new public plaza and trail system that attracts users from all over, the downtown can become a unique destination" (City of Cornelia, "A Plan and Process for Community Design" Downtown Master Plan, September 2001). Additionally, the Master Plan calls out that: There is a need for a pedestrian and bicycle trail system that will accommodate bicyclists and walkers to connect several of the newer neighborhoods with schools, parks, shopping and employment centers ...[and] as regional and mountain bicycling have become increasingly popular, bicycle trail links should be developed to tie Cornelia to nearby communities and to the national forest. One way of doing this is to take advantage of existing abandoned rail corridors that already link Cornelia to Mt. Airy and Tallulah Falls.

Information from the GMRDC supports the suitability of installing a greenway trail along the Tallulah Falls Railroad right-of-way, as a means of providing a catalyst to recreation and economic development in the region. To the north of Cornelia, the city of Demorest and Piedmont College will have a pedestrian bridge across US 441, funded by federal transportation dollars, and they plan to develop a portion of the Greenway trail that connects to the college's campus. Further north, a completed section of Greenway trail through Tallulah Falls State Park is well used by recreational bicyclists and pedestrians

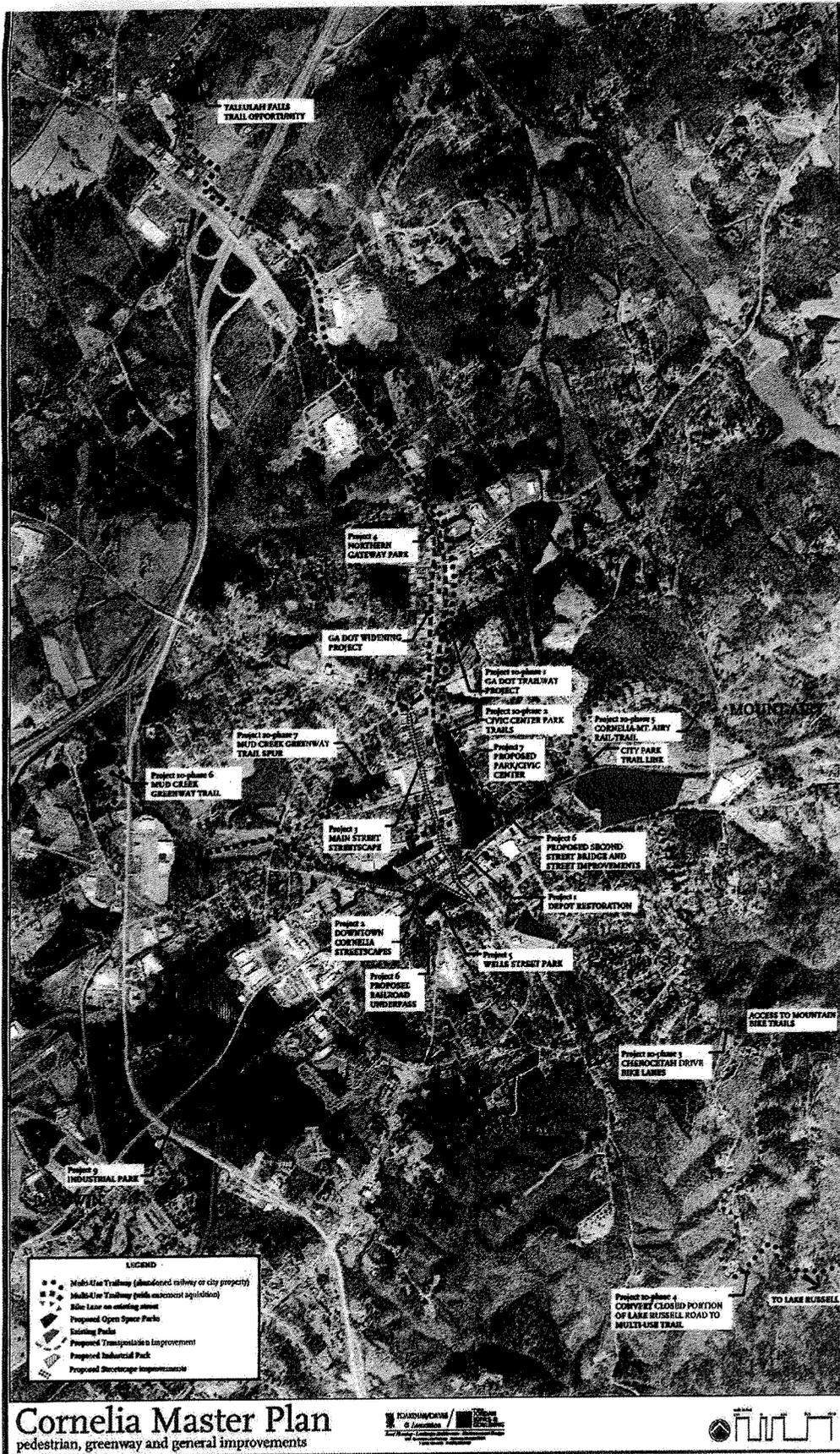


Figure 2: Cornelia Master Plan

The proposed multi-use path would be consistent with the bicycle and pedestrian plan developed by the GMRDC that garnered public support during public involvement activities (Figure 3: Habersham County Existing and Proposed Bicycle Routes). Identified as a top project by the GMRDC, "... the Tallulah Falls Rails to Trails Project from the Cornelia Depot to the North Carolina border, for its potential to increase tourism, serve multiple travel destinations, and improve safety," has been identified as a priority project for the region (Georgia Mountains Regional Bike and Pedestrian Plan, August 25, 2005).

Construction of the multi-use path also would be expected to trigger the development of additional sections of the historic Tallulah Falls Railroad corridor. The Tallulah Falls Railroad Greenway LLC has plans to install a multi-use path that would connect the city of Cornelia to a regional multi-use path network (Figure 4: Tallulah Falls Rails to Trails Corridor, Mile 0-5). The Tallulah Falls Railroad Greenway, as a Rails-to-Trails concept, would transform the abandoned Tallulah Falls Railroad bed into a multi-use trail, connecting parks and institutions in Habersham County through Rabun County to Franklin, North Carolina. Originating in downtown Cornelia at the city park abutting the newly renovated railroad depot, the trail would pass through the project corridor, connect to the city of Demorest, proceed north to Piedmont College and the Ruby Fulbright Center and Aquatic Center, adjoin the Demorest Mountain Area, the city of Clarkesville, the city of Clayton, and eventually, terminate at Franklin, North Carolina.

The city of Clarkesville north of Cornelia has been selected to receive \$100,000 in Recreational Trails Program funds to develop the early phases of a citywide greenway plan that will intersect the Tallulah Falls Greenway when completed. Mt. Airy, Cornelia’s neighbor to the east, also plans to develop a pedestrian connection to Cornelia’s trail system.

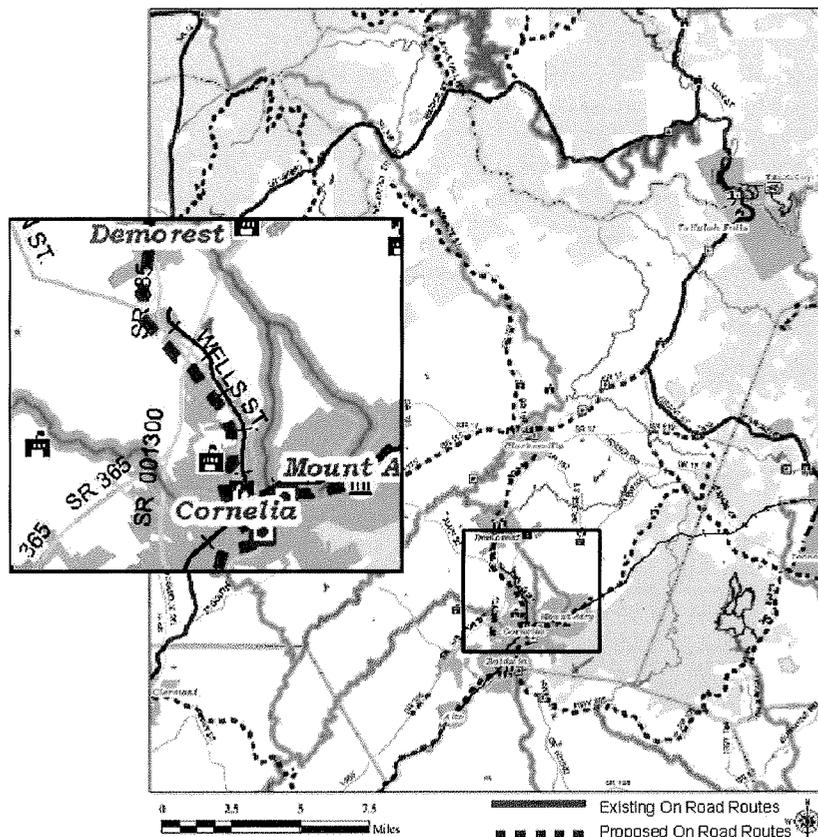


Figure 3: Habersham County Existing and Proposed Bicycle Routes

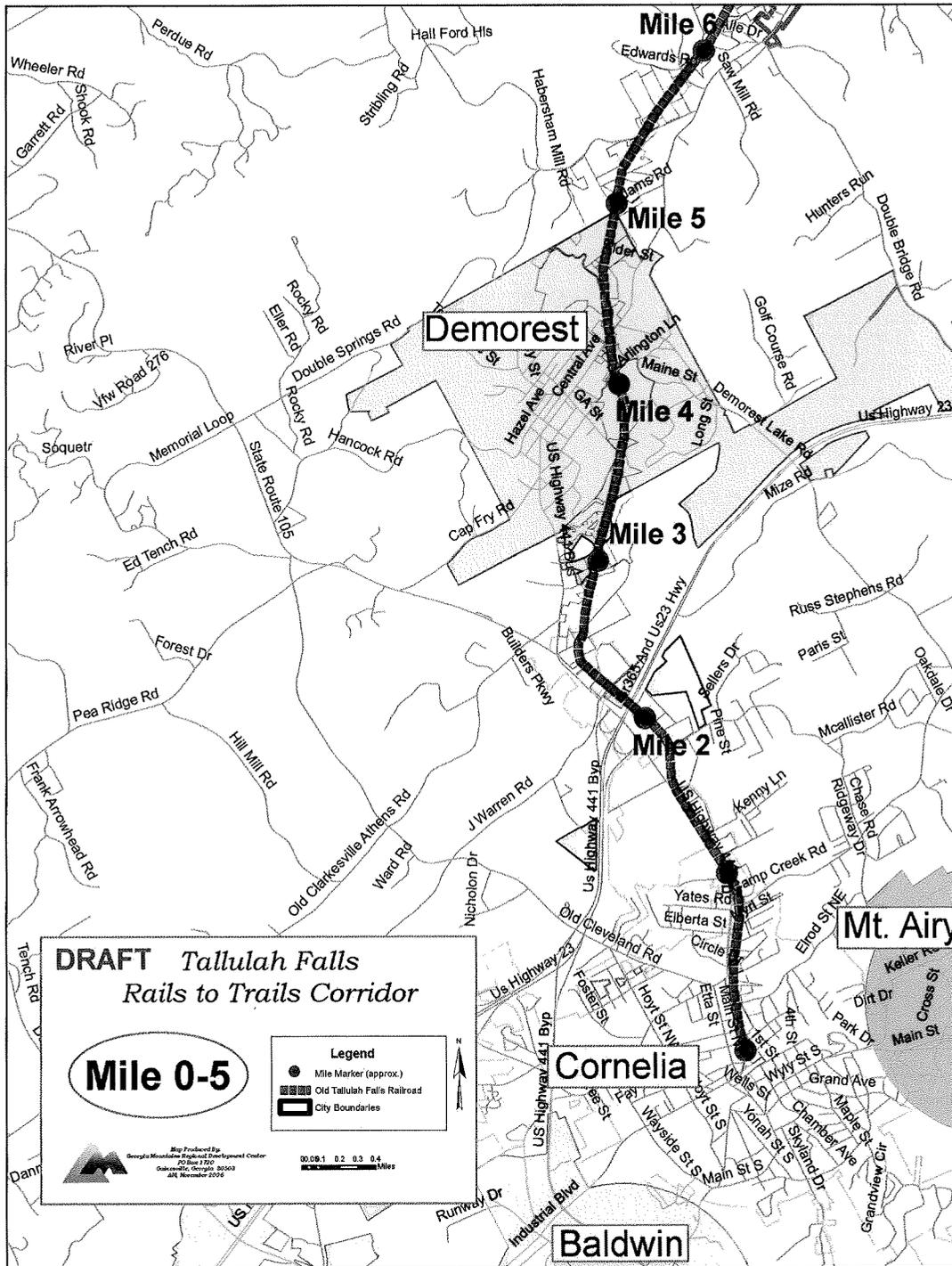


Figure 4: Mile 0 to 5 Segment of Tallulah Falls Rails to Trails Corridor (not to scale)

Deficiencies in the System

The current deficiencies in the system are traffic congestion and above average accident rates. Along this section of SR 105, from the Cannon Bridge Road intersection to downtown Cornelia at Main Street, the Annual Average Daily Traffic (AADT) volumes (i.e., 7-days-per-week traffic averaged over a one-year period) ranged from 11,895 vehicles per day (vpd) to 19,948 vpd in 1999. As shown in Table 1: Current Base Year Traffic Data (AADT), the base year (2005) AADT traffic

volumes along this 2.41-mile section of SR 105 varied from 15,430 to 28,270 vpd. The 2005 minimum and maximum AADT volumes represent increases of 30 and 42 percent higher, respectively, than the corresponding volumes for 1999. By 2025, future AADT traffic volumes along the same section of roadway are expected to range from 27,900 to 50,900 vpd (increases of 80 and 81 percent higher, respectively, than the corresponding values for 2005).

Roadways are rated for operational effectiveness using level-of-service (LOS) classifications associated with traffic volume levels and traffic flow conditions. There are six LOS categories at which a roadway can be said to operate, represented by the letters “A” through “F.” Each level is numerically determined by a maximum value for the ratio of traffic volume to facility capacity. Functionally defined, LOS “A” is attained when volume is well below capacity and traffic is flowing freely, and LOS “B” is attained when traffic flow is steady but the presence of other vehicles begins to be noticeable. LOS “C” allows for steady traffic flow, but speeds and maneuverability are more closely controlled by the higher volumes. LOS “D” approaches conditions of unsteady traffic flow, in which speed and maneuverability are severely restricted. LOS “E” is reached when traffic flow is reduced to a slow but relatively uniform speed, and traffic volume is equal to or nearly equal to capacity and maneuverability is extremely difficult. The lowest LOS of “F” is reached when the volume greatly exceeds the capacity and lengthy delays occur.

The existing LOS values along the existing facility between Cannon Bridge Road and Main Street vary from “B” to “E.” Widening SR 105 would improve safety along this route and improve the operational effectiveness to LOS “C” or better.

Table 1: Existing Base Year Annual Daily Traffic (AADT) and Levels of Service (LOS)

Roadway Section	AADT (*)	LOS
	(Existing Year 2005)	(Existing Year 2005)
Cannon Bridge Road to SR 365	28,270 vpd	“C”
SR 365 to Camp Creek Road	15,430 vpd	“A”
Camp Creek Road to Lee Street	17,730 vpd	“C”

(*) vpd = vehicles per day

Source: Georgia Department of Transportation, Office of Environment and Location (January 2006).

The project design is based upon the highest projected AADT volumes for the corridor. In 2012, the highest projected AADT volumes would be 33,100 vpd, and in 2032 the AADT volumes are expected to reach 49,200 vpd (an increase of 49 percent over the projected 2012 AADT volumes).

There are existing signalized intersections at the following:

- SR 105/Historic US 441 at SR 105 (Cannon Bridge Road), Historic US 441 and Habersham Hill Court (Existing Year 2005 LOS “C”)
- SR 105/Historic US 441 at Carpenters Cove Land And J Warren Road (Existing Year 2005 LOS “B”)

- SR 105/Historic US 441 at I-985/SR 365/US 441/US 23 northbound ramps (Existing Year 2005 LOS “B”)
- SR 105 at Camp Creek Road (Existing Year 2005 LOS “A”)
- SR 105 at North Main Street and Cleveland Road (Existing Year 2005 LOS “C”)

Traffic signals are warranted at the intersection of SR 105/US 441 Business with the VFW Post Road and the proposed Wal-Mart entrance that aligns with VFW Post Road (Figure 5: Proposed Commercial Development - Wal-Mart Relocation; and Figure 6: Proposed Commercial Development - Wal-Mart Layout).

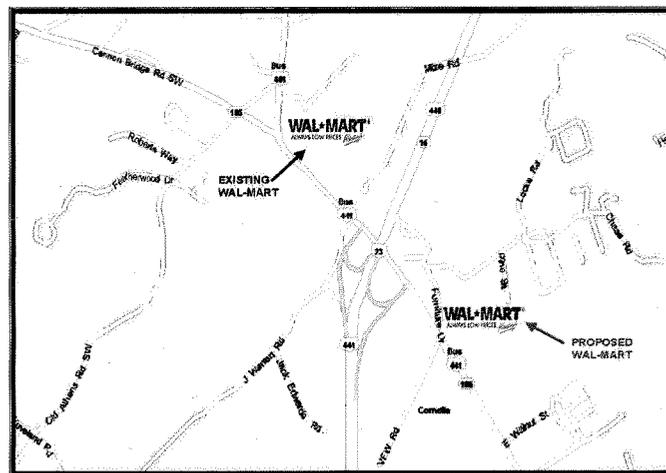


Figure 5: Proposed Commercial Development - Wal-Mart Relocation

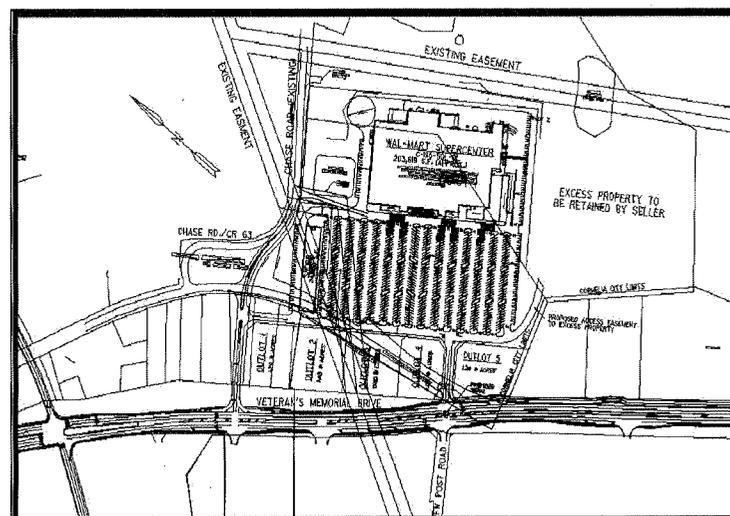


Figure 6: Proposed Commercial Development - Wal-Mart Layout

The accident rate along this section of roadway was less than the state average for 2003, but it was similar to or exceeded the statewide averages for similar roadway facilities in 2004 and 2005 (Table 2: Accident Rates per 100 Million Vehicle Miles (MVM)). There were no fatalities recorded for the SR 105 project corridor between 2003 and 2005, and the statewide average fatality rate showed a decrease during that period, with no fatalities in 2005. However, the City of Cornelia noted one fatality along the corridor subsequent to that period (Hon. D. Higgins, pers. comm., April 18, 2007). The injury rate showed a decrease with time over the same three-year period, with a rate along the project corridor that was more than twice the state average in 2003, similar to the state average in 2004, and slightly more than half of the state average in 2005. Many of the accidents were rear-end and angle intersection type accidents, which may be attributed to limited passing opportunities and left-turn lane storage lengths along this route.

Based on an analysis of the No-Build alternative, it is evident that the two most critical deficiencies are (1) the left turn movement from the southbound SR 365 loop ramp to westbound SR 105, and (2) the intersection of SR 105 and J. Warren Road/Mize Road.

Table 2: Accident Rates per 100 Million Vehicle Miles (MVM) *

Year	Accident Rate		Injury Rate		Fatalities	
	SR 105 Corridor	Statewide Average	SR 105 Corridor	Statewide Average	SR 105 Corridor	Statewide Average
2003	99	166	85	41	0	0.70
2004	68	69	14	17	0	0.57
2005	104	66	13	21	0	0

* SR 105 corridor and statewide averages for the Minor Arterial Roadway facility type.

The signalized intersection of SR 105 at Cannon Bridge Road/Wal-Mart Drive is expected to operate at LOS “E” in the 2032 PM peak periods under the No-Build scenario. With the exception of the westbound approach, all other approaches would fail LOS expectations by 2032. Upon examining the movement delays, it is evident that one eastbound through lane would not provide enough capacity for SR 105 eastbound; substantial left-turn queuing occurs on SR105 westbound, and the left-turning vehicles exiting from the proposed Wal-Mart site would block the through- and right-turn traffic on that single-lane driveway.

The signalized intersection of SR 105 at J. Warren Road/Mize Road is projected to operate at LOS “E” and LOS “F” in the 2032 AM and PM peak periods, respectively. During the PM peak, the eastbound approach traffic would exceed the roadway capacity, and the eastbound left-turning traffic would incur significant queuing. The westbound queues would extend over the bridge through the SR 365 interchange, to the intersection of SR 105 at the SR 365 northbound ramps.

As a result of the queuing at the intersection of SR 105 at J. Warren Road/Mize Road, the westbound approach traffic at the adjacent un-signalized intersection of SR 105 at the southbound SR 365 ramps would operate at LOS “F” during PM peak hour conditions. The westbound spillback would impact

the left-turning traffic from the SR 365 southbound loop off ramp, with queuing extending to the SR 365 southbound mainline.

Logical Termini

The termini are logical for the proposed project based on the capacity, operation, and safety needs in the corridor. Cannon Bridge Road is a logical western terminus for SR 105 because it is at this intersection that westbound traffic volumes on SR 105/US 441 Business are split by approximately 50 percent, and the traffic diverges to either SR 105 or US 441 Business. The eastern terminus of the project is located at the point where SR 105 intersects with North Main Street and Cleveland Street. This is a logical eastern terminus because the vehicular traffic, at this point, turns either north toward downtown Cornelia or south on Cleveland Street, or it continues east on Wayside Street. From SR 105 to Cleveland Street, the projected Average Daily Traffic (ADT) volumes would decrease by 10 percent (Table 3: Traffic Volumes at Eastern Terminus of SR 105 Project Corridor).

Table 3: Traffic Volumes at Eastern Terminus of SR 105 Project Corridor

	Opening Year and Design Year ADT *		Traffic Decrease	
	2012 (vpd)	2032 (vpd)	Traffic Volume (vpd)	Percent Drop
Cleveland Street	2000	2650	1000/9650	10%
N. Main Street	3200	5400	5450/9650	57%
Wayside Street	2275	3200	3200/9650	32%

* ADT = Average Daily Traffic (for this analysis, total one-way vehicular traffic in each 24-hour period, 5 days per week, Monday – Friday, averaged over a one-year period), expressed as vehicles per day (vpd).

From SR 105 to North Main Street, the ADT volumes would decrease by 57 percent. From SR 105 to Wayside Street, the ADT volumes would decrease by 32 percent.

One other project is included in GDOT’s future long-range program for the area, which would involve adding a new interchange on SR 365 at Mt. Airy Road, approximately three miles north of SR 105 (GDOT Project PI 0008377).

DESCRIPTION OF ALTERNATIVES

A. Introduction

The proposed project alignments were developed by the GDOT District 1 office. Basic data on the corridor were gathered and studied, including aerial photography, topographic maps, traffic (existing and projected), previous studies, wetland inventory maps, soil maps, floodplain maps, and Georgia Department of Natural Resources (GDNR) historic resource survey maps.

Parks and recreational facilities, known or suspected historical and archaeological sites, existing rights-of-way, possible underground storage tank (UST)/landfill/hazardous waste sites, wetland and hydric soil boundaries, floodplains, and areas of possible endangered species habitat were delineated on the aerial photography prior to layout of an alignment. The locations of churches, cemeteries, schools, hospitals, and any other noise sensitive areas were identified on the aerial photography and were taken into consideration during project development. Through a coordinated effort between the engineering design and the environmental resources identification processes, an alignment was developed that satisfies the need and purpose of the project and avoids or minimizes impacts to the social, cultural, natural, and physical environments.

Six alternatives were considered for the proposed roadway and interchange project: a no-build alternative; two build alternatives for a portion of SR 105 – a one-way pair roadway and a five-lane roadway; and three build alternatives for improvements to the existing SR 365 interchange – a full diamond interchange, a modified southbound ramp interchange, and a southbound partial diamond interchange. The five-lane roadway segment and the southbound partial diamond interchange are the preferred roadway and interchange alternatives for meeting the need and purpose of the project, as well as for minimizing the overall environmental impacts.

Modifications have been made to the original approved concept report. As a part of the original approved concept, SR 105 would transition to a one-way pair roadway section beginning just west of Camp Creek Road and extending to Lee Street. The one-way pair would use the Stonecypher Street alignment for the westbound lanes and the existing SR 105 roadway alignment for the eastbound lanes. The one-way pair alternative would require the acquisition of additional right-of-way, with significant associated historical impacts. In order to minimize the environmental impacts and property damage, the current concept report proposes the five-lane segment of SR 105 (including the 12-foot wide flush median left turn lane) to extend from the SR 365 interchange eastward to Lee Street, tapering to the project terminus at Cleveland Street/North Main Street. As proposed, the five-lane section of SR 105 also would minimize access issues, and it would provide a protective storage lane area for left-turning traffic entering into the local businesses in the downtown area of Cornelia.

B. Preferred Roadway and Interchange Alternatives

The proposed project is located on the northern side of the city of Cornelia, in Habersham County (see Figure 1: Project Location Map). The project would widen and reconstruct SR 105 eastward from its intersection with Cannon Bridge Road through the SR 365 interchange, extending to the edge of downtown Cornelia at the intersection of SR 105 with North Main Street and Cleveland Street, and it would reconfigure the SR 105/SR 365 interchange.

Existing Typical Section of SR 105

West of SR 365 (toward Demorest), SR 105 currently provides four 12-foot lanes, with a central left turn lane and curb and gutter. East of SR 365 (toward downtown Cornelia), SR 105 provides two 12-foot lanes, with graded outside shoulders of variable widths.

Proposed Typical Section of SR 105

With the preferred roadway alternative, SR 105 would be widened to six lanes between Cannon Bridge Road eastward to the SR 365 interchange, including a 20-foot wide raised concrete median with curb and gutter and with sidewalks along the outside edges of pavement (Figure 7: Typical Sections, SR 105/US 441 from Cannon Bridge Road to SR 365). From the SR 365 interchange to the intersection with Camp Creek Road, SR 105 would be widened to five lanes, including a 12-foot wide flush median with two-way left turn lanes and outside curb and gutter (Figure 8: Typical Sections, SR 105/US 441 from SR 365 to North Main Street).

The SR 105 roadway would be widened on the northern side of the existing alignment, and it would encroach on the abandoned bed of the former Tallulah Falls Railway. The proposed project would include construction of a 10-foot wide, two-way multi-use path, offset by 12 feet from the roadway along the shoulder area of the SR 105 westbound travel lanes (Figure 9: Typical Sections, Overview). The multi-use path would parallel SR 105 from its western terminus, located just west of SR 365, to its eastern terminus at Camp Creek Road.

Existing SR 105/SR 365 Interchange

The existing configuration of the SR 105/SR 365 interchange is a partial cloverleaf, including combined loop and diamond ramps in the southwest quadrant, for traffic exiting southbound SR 365 to SR 105 and traffic entering southbound SR 365 from SR 105, respectively, and with double loop ramps in the southeast quadrant, for northbound SR 365 traffic exiting to SR 105 and traffic entering SR northbound SR 365 from SR 105.

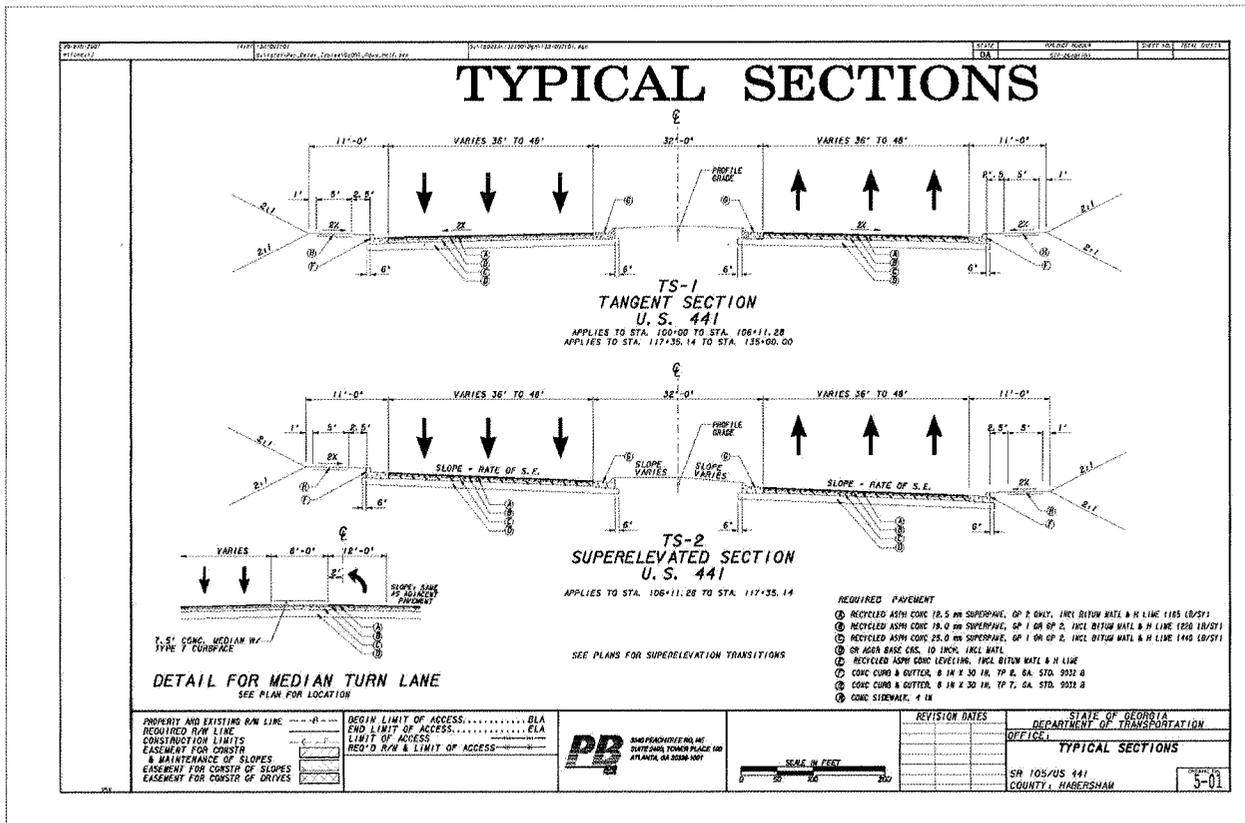


Figure 7: Typical Sections, SR 105/US 441 from Cannon Bridge Road to SR 365

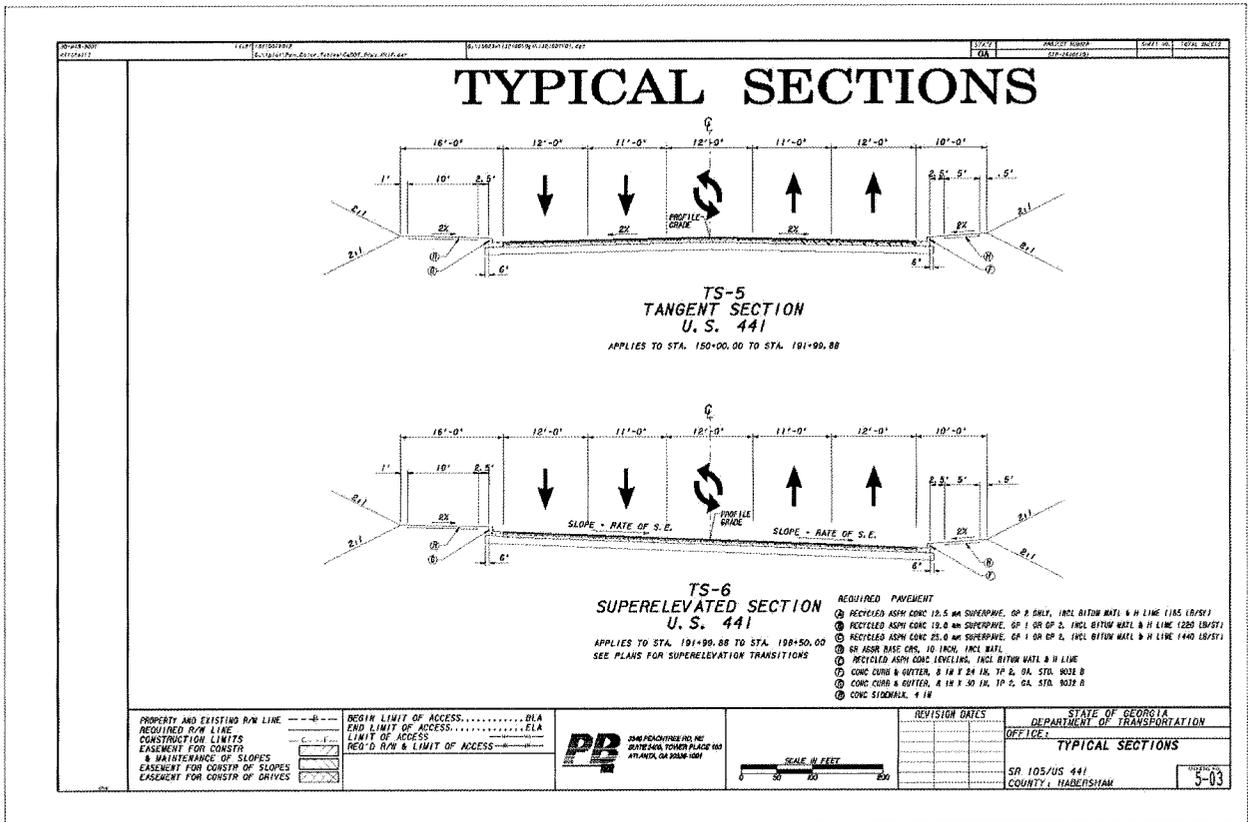


Figure 8: Typical Sections, SR 105/US 441 from SR 365 to North Main Street

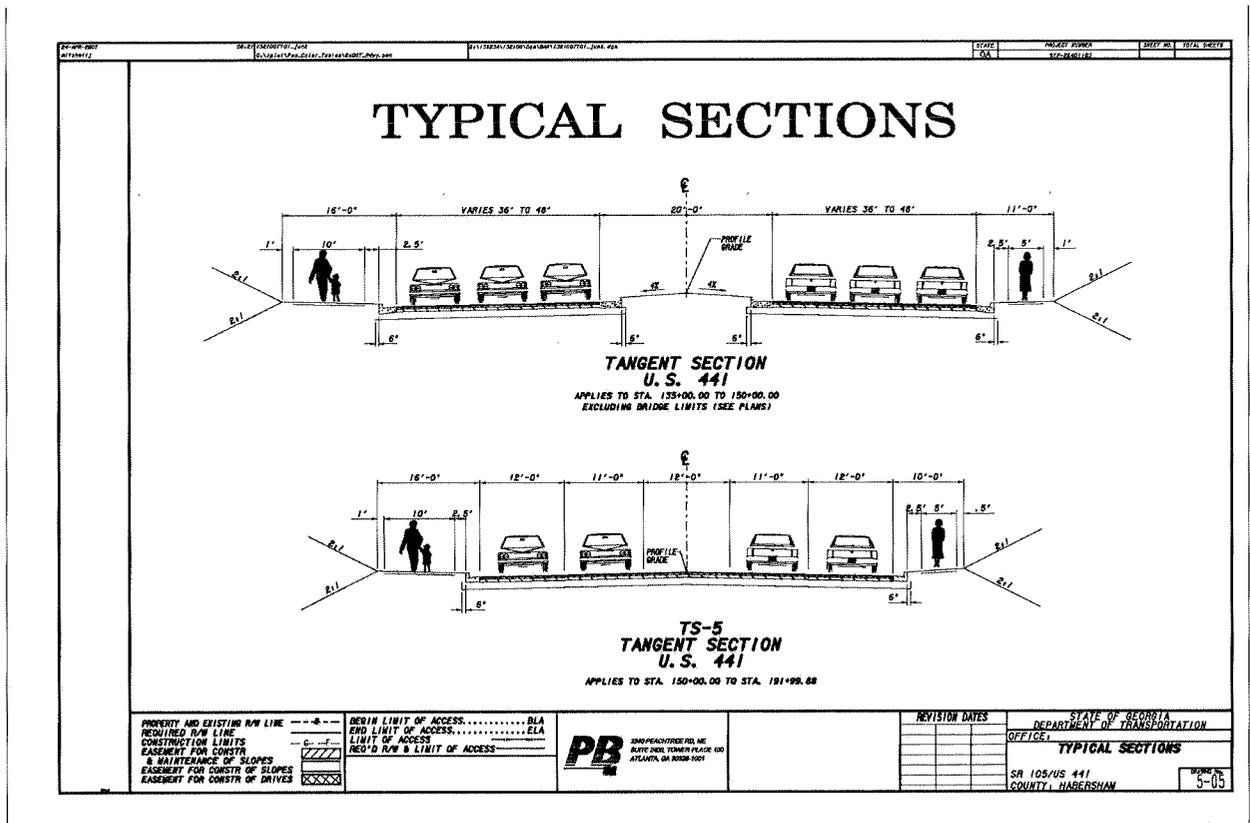


Figure 9: Typical Sections, Overview

Proposed SR 105/SR 365 Interchange

The preferred alternative for the SR 105/SR 365 interchange improvements is the southbound partial diamond configuration. This configuration is preferred over the other alternatives because it alleviates the stacking issues associated with the modified southbound ramp configuration (Figure 10: Typical Sections, SR 365 at Exit/Entrance Ramps; and Figure 11: Interchange Reconfiguration).

Relocation of the SR 365 southbound diamond ramp would provide an additional 200 feet of spacing between the intersection of J. Warren Road/Mize Road and the proposed SR 365 southbound on ramp. This change would allow the eastbound SR 105 right-turning traffic more time and distance to merge into the right turn lane. The additional distance between signals at these intersections also would help to improve progression through the corridor. At the intersection of SR 105 and the SR 365 northbound entrance and exit loop ramp, the existing ramp geometry and location would be maintained. The existing design does not introduce signal timing issues that would affect LOS, such as those that would occur with delays to the SR 105 eastbound left-turning traffic; also, retention of the existing SR 365 northbound ramp taper would not impact the Iron Ore Road intersection to the north of the SR 105/SR 365 interchange.

Due to the proposed widening of SR 105, along with the need to install new turn lanes and revise intersection alignments, the proposed project would require the acquisition of additional rights-of-way. Traffic flow would be maintained during the construction of the project.

Justification for the Preferred Five-lane Roadway and Partial Diamond Interchange Alternatives

In the original approved concept, SR 105 would transition to a one-way pair roadway section between Camp Creek Road and Lee Street, using the Stonecypher Street alignment for the westbound lanes and the existing SR 105 roadway alignment for the eastbound lanes. Traffic analyses indicated that this alternative would not meet the project purpose and need, and the required right-of-way acquisitions would result in significant impacts to historic resources.

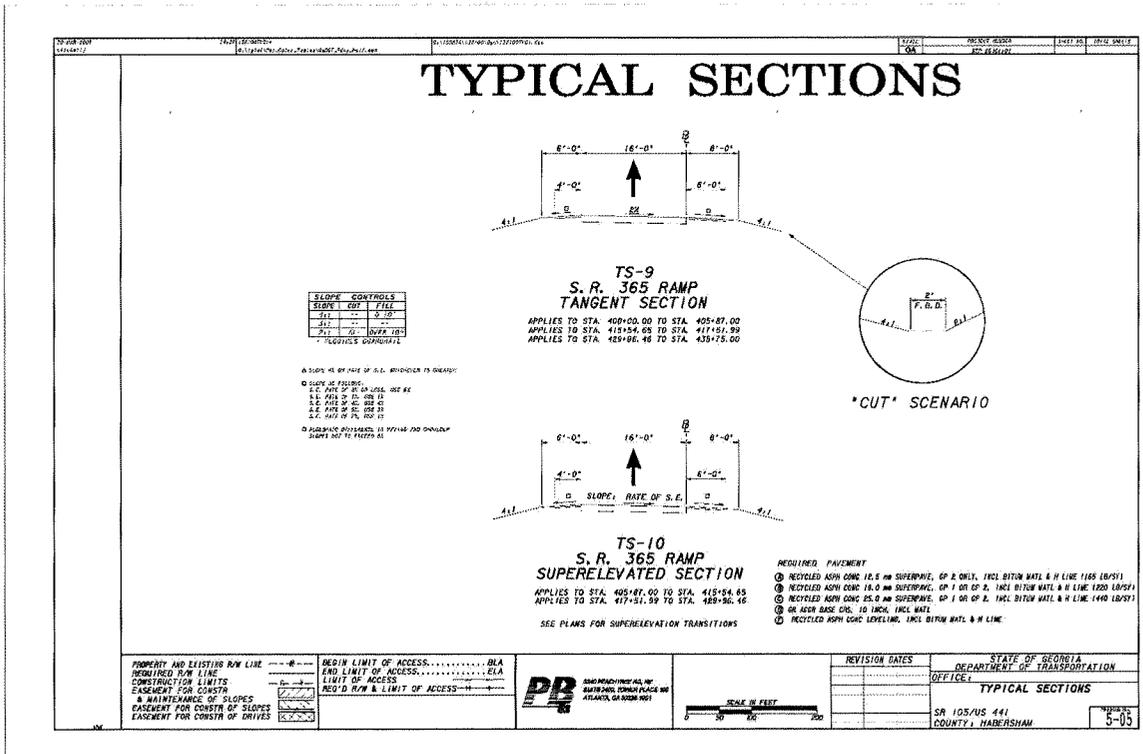


Figure 10: Typical Sections, SR 365 at Exit/Entrance Ramps

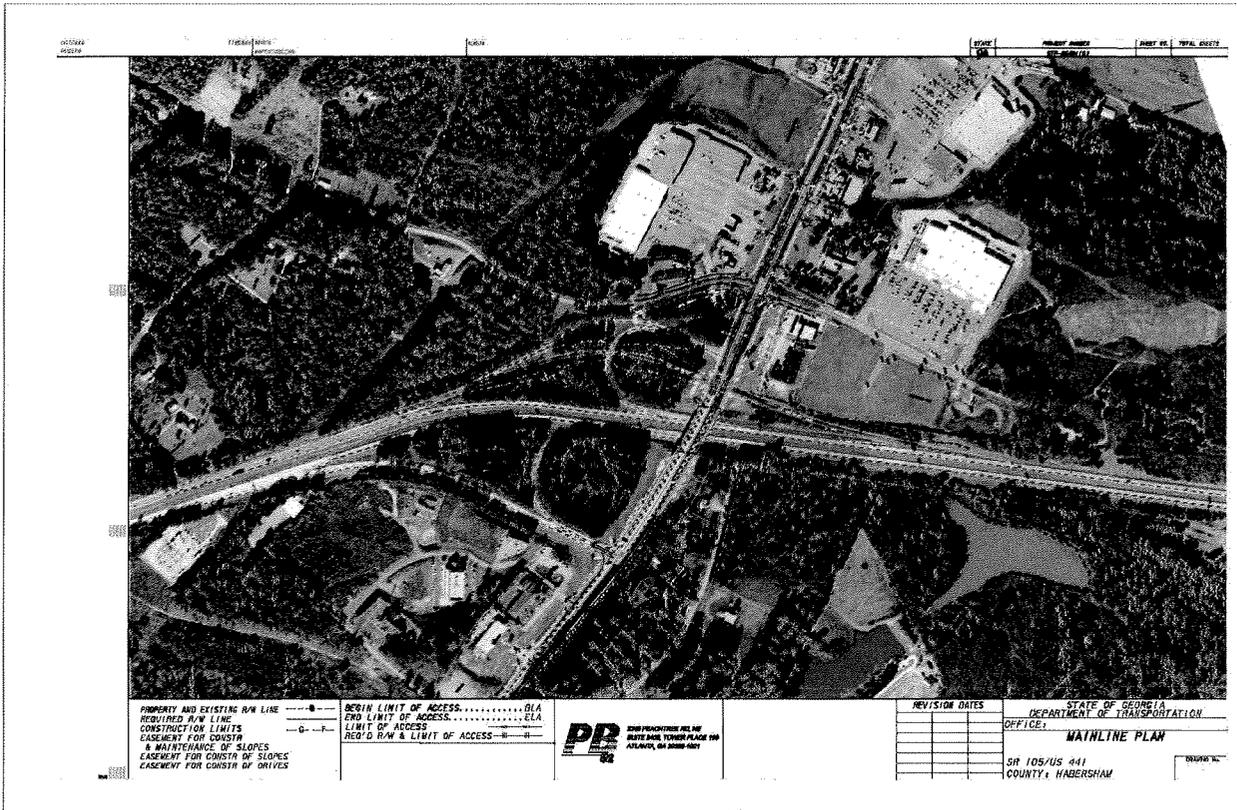


Figure 11: Interchange Reconfiguration

The one-way pair alternative would reconstruct the existing SR 105 (North Main Street) alignment for use as the eastbound one-way travel lanes between Walnut Street and downtown Cornelia. The most intact and visible (i.e., historically significant) portion of the abandoned Tallulah Falls Railroad bed and the right-of-way of Stonecypher Street would be used for construction of the westbound one-way travel lanes. Construction of the project with the one-way pair alternative would destroy 6,200 feet of that historic railway bed between SR 365 and downtown Cornelia. Reconstruction of the existing intersections of North Main Street with Clarksville, Wayside, and Cleveland Streets to accommodate the eastbound travel lanes of the one-way pair also would have caused the destruction of (or severe impacts to) several other historic properties.

Therefore, a five-lane roadway with a 12-foot flush median turn lane was proposed for the section of SR 105 between Camp Creek Road and Lee Street, in order to minimize the environmental impacts and property damage. As the preferred roadway alternative, widening SR 105 to five lanes between Camp Creek Road and Lee Street also would reduce access issues, and it would provide a protective storage area for left-turning traffic into the local businesses in the downtown area of Cornelia. Consideration of the one-way pair alternative was not carried forward for this environmental assessment, based on the need to minimize adverse effects to and displacements of historic properties, including the Tallulah Falls Railway bed.

Based on the traffic analysis, the southbound partial diamond configuration is the preferred alternative for improvements to the SR 365 interchange. Moving the SR 365 southbound ramps away from the J. Warren/Mize Road intersection would improve storage capacity between signals and would improve the weaving conditions at the SR 365 southbound on-ramp. Leaving the SR 365 northbound loop ramps in their existing condition would provide greater intersection efficiency and reduced project costs, and it would not impact any adjacent properties.

A coordinated signal system would be installed to interconnect the traffic signals along SR 105 between the SR 365 northbound ramps and Cannon Bridge Road. Without such coordination, much of the efficiency gained by the proposed roadway and interchange improvements would be lost in potential queuing and congestion. Additional guide signs are recommended as part of the proposed project as a means of alerting drivers to the non-standard intersection configuration. Also recommended as part of the project are overhead lane signs at the dual left turn lanes on Mize Road, in order to inform drivers to be in the outside lane for movements to the SR 365 southbound ramp. The preferred interchange alternative also would require that the existing SR 365 northbound and southbound loop ramps be signalized at SR 105, and that they be coordinated with the signals at the adjacent intersections. The average intersection and approach LOS for the AM and PM peak hours for the preferred interchange alternative in the design year 2032 are shown in Table 4: 2032 SB Partial Diamond Alternative – AM and PM Levels of Service (LOS).

Table 4: 2032 SB Partial Diamond Alternative – AM and PM Levels of Service (LOS).		
Intersections and Approach	2032	
	AM Peak LOS	PM Peak LOS
US 441 Business @ Cannon Bridge Road/Wal-Mart Drive	B	C
EB - US 441 Business East	C	C
WB - SR 105/US 441 Business West	C	C
SB - Wal-Mart Drive	C	D
NB - Cannon Bridge Road/SR 105 North	A	A
US 441 Business/SR 105 @ J. Warren Road/Mize Road	C	C
EB - SR 105/US 441 Business East	C	C
WB - SR 105/US 441 Business West	C	C
SB – Mize Road South	C	C
NB - J. Warren Road North	C	C
US 441 Business/SR 105 @ SB Ramps	A	A
EB - SR 105/US 441 Business East	A	A
WB - SR 105/US 441 Business West	A	A
SB - SR 365 SB Off Ramp	B	B
US 441 Business/SR 105 @ NB Ramps	B	B
EB - SR 105/US 441 Business East	B	A
WB - SR 105/US 441 Business West	A	B
NB - SR 365 NB Off Ramp	C	C

C. Other Alternatives Considered

Other alternatives considered for the widening SR 105 and the re-construction of the SR 365 interchange include a no-build alternative, a one-way pair roadway typical section design, a full diamond interchange, and a modified southbound ramp interchange.

No-Build Alternative

The LOS results show that the geometric modifications to the intersections of SR 105 at Cannon Bridge Road/Wal-Mart Drive and at J. Warren Road/Mize Road show significant operational improvements as compared to the no-build scenario. With these improvements, all approaches at these two intersections would operate at LOS “C” or better in 2032. As an exception, the intersection at the northbound SR 365 off-ramp approach to SR 105 would be expected to operate at LOS “D” in the AM and PM peak hour, under the full diamond interchange alternative. However, this same intersection would operate at LOS “C” for both the modified southbound ramp interchange alternative and the (preferred) southbound partial diamond alternative.

With the interchange ramp modifications and geometric improvements to the intersections of SR 105 at Cannon Bridge Road/Wal-Mart Drive and at J. Warren Road/Mize Road in place, each of the interchange types would provide an acceptable ramp intersection LOS. However, there are slight variations among the interchange alternatives, as described below.

The no-build alternative was not considered further in this Environmental Assessment because it does not address the need or purpose of the proposed project, which is to improve the safety and operational capacity along SR 105. The no-build alternative would not address the higher than average accident rate along the current alignment, nor would it address the capacity issues associated with the projected rise in future traffic volumes. Without improvements to the current alignment of SR 105, the combination of the roadway’s above-average accident rate and the expected increase in traffic volumes along it would lead to an increasingly hazardous condition for motorists.

One-way Pair Roadway Alternative

For the one-way pair roadway alternative, SR 105 would be widened to five lanes between SR 365 and Walnut Street, including a 14-foot flush median with outside curb and gutter. A one-way pair roadway segment would be constructed between Walnut Street and Lee Street, with eastbound traffic utilizing existing SR 105 and westbound traffic utilizing a widened roadway along the alignment of Stonecypher Street and part of the abandoned Tallulah Falls railway.

Construction of a 10-foot wide multi-use path would be included in this roadway alternative. From its western terminus at the western side of the SR 365 interchange extending eastward to Walnut Street, the multi-use path would be offset by 12 feet from the northern edge of pavement of existing westbound SR 105. From Walnut Street to its eastern terminus at Lee Street, the path would be offset by 12 feet from northern edge of pavement of the westbound segment of the one-way pair.

A one-way pair roadway alternative would not meet the need and purpose of this project based on the results of the traffic analysis, which determined that traffic queuing would spill out on either side of the one-way pair from vehicles attempting to access local businesses in the area. The cross streets in the area of the one-way pair are not long enough to handle the projected traffic volumes in the project corridor. Right-of-way needs would require the acquisition of businesses and residences in the area

of the one-way pair, and construction of the one-way pair would have substantial and severe impacts to the cultural environment along the project corridor.

As discussed below in the Section 4(f) evaluation, construction of the westbound SR 105 travel lanes as part of a one-way pair would destroy 6,200 linear feet of the Tallulah Falls Railway bed, between the SR 365 interchange eastward to downtown Cornelia (see Section IV of this Environmental Assessment). The one-way pair also would have caused impacts to either the setting within the resource boundary or to the viewshed within Area of Potential Effect (APE) for five historic resources (the Smith-Simmons House; the Bowden House; the Stovall Tractor Company; the Galloway Mill; and the Habersham Broom Company); it also would endanger the continuance of the historic residential uses of the Smith-Simmons House and the Bowden House.

The one-way pair roadway alternative was not considered further in this Environmental Assessment because it did not meet the need and purpose of the project based on the results of the traffic analysis, and because of the substantial impacts on historic resources through the one-way pair section.

Full Diamond Interchange Alternative

In the full diamond interchange alternative, relocation of the SR 365 southbound off ramp would allow the heavy left-turning traffic volume that currently uses the existing westbound SR 105 loop ramp to travel directly up the ramp and turn right. The existing right-turning traffic volumes using the same existing loop ramp would become left-turning traffic volumes and would require a new traffic signal at the ramp intersection. The existing SR 365 northbound loop ramp from SR 105 would be replaced with a diamond on-ramp, which would introduce a new left-turn movement (and signal phase) to serve eastbound SR 105 traffic turning onto northbound SR 365. Some signal efficiency would be compromised to serve the additional movement, but adequate LOS could still be achieved. The northbound on-ramp taper to the mainline of SR 365 also would potentially impact the existing Iron Ore Road intersection at SR 365.

The full diamond interchange alternative would not meet the need and purpose of the proposed project because the spacing of intersections in the interchange area with this design alternative would not meet the optimal LOS.

Modified Southbound Ramp Interchange

The modified southbound ramp alternative for the interchange would allow for only right-turn movements at the two SR 365 southbound ramp terminals. This design would provide for efficient traffic operations and would allow for an un-signalized intersection at the ramp terminals.

Due to significant queuing projected for the right turn from eastbound SR 105 to the SR 365 southbound on-ramp, a separate right-turn bay was analyzed for this movement. Based on a traffic simulation of the alternatives and on an examination of several measures of effectiveness (i.e., maximum queues; percent stops in each lane; delay time to each movement), the separate right-turn bay was determined to provide only a minimal improvement in through-flow vehicular traffic. However, the right-turn traffic under this scenario was determined to still require queuing in the right-turn bay itself. The most critical reason for this “stacking” issue is largely attributed to the short spacing between the intersection of eastbound SR 105 with J. Warren Road and the right turn to the SR 365 southbound on-ramp. This condition may be improved by introducing a wider on-ramp turn radius, so that vehicles would not have to slow as much to make the right turn. At the SR 365

northbound off ramp terminal location (on the eastern side of the interchange, on SR 105), the existing ramp layout adequately services the volume demand.

The modified southbound ramp interchange alternative would not meet the need and purpose of this project because the spacing of intersections in the interchange area with this design alternative does not meet optimal LOS.

VALUE ANALYSIS AND CONCLUSION

INTRODUCTION

This section describes the value analysis (VA) procedure used during the value engineering (VE) study on the SR 105/US 441 Widening project, STP-2640(10) conducted by Lewis & Zimmerman Associates, Inc for the Georgia Department of Transportation. The workshop was performed January 22-25, 2006 in the Georgia Department of Transportation offices in Atlanta, Georgia. The design firm, Parsons Brinckerhoff, was selected by the owner to assist with the development of the project and have provided information for the VE Team to use as the basis of the study.

A systematic approach was used in the VE study. The key steps taken were organized into three distinct parts: 1) pre-study preparation; 2) VE orientation/kickoff meeting and workshop; and 3) post-study reporting and implementation. A Task Flow Diagram, which outlines each of the procedures included in the VE study, is attached for reference.

In the sections following the VA procedure, separate narratives and supporting documentation identify the following:

- Value Engineering Workshop Participants
- Economic Data used in the workshop
- Cost Model developed for use in the workshop
- Function Analysis performed by the team
- Creative Ideas and Evaluation of the ideas performed by the team

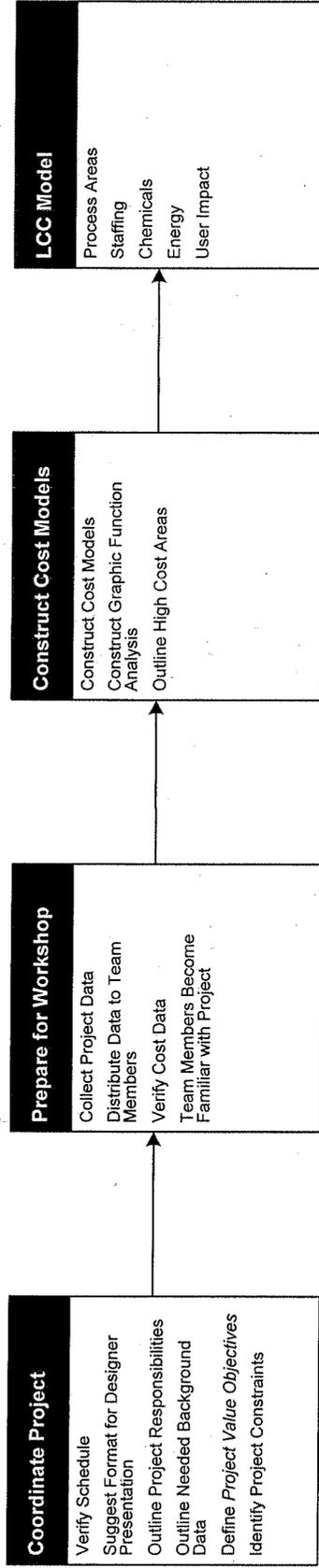
PREPARATION EFFORT

A workshop format was used to conduct the study. Pre-study preparation for the workshop consisted of scheduling study participants and tasks and gathering necessary project documents to distribute to team members for review prior to attending the workshop. Throughout the study the following documents were used as the basis for generating alternative approaches for achieving project functions and for determining the cost implications of the alternatives that have potential for enhancing the value of the project.

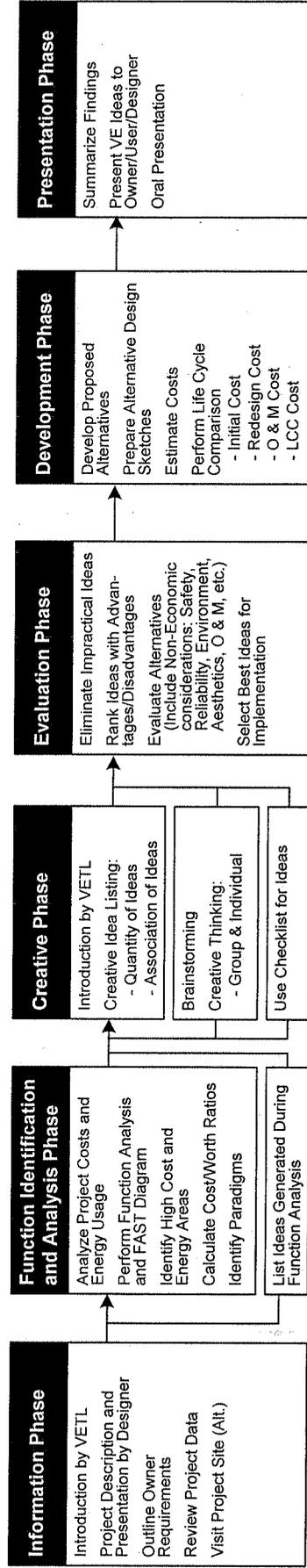
- Project plans at the preliminary plan stage of development-not dated, prepared by the Parsons Brinckerhoff.
- Earthwork Calculations, dated October 2007, prepared by the Parsons Brinckerhoff.
- Environmental Assessment and appendices, not dated, prepared by the Parsons Brinckerhoff.
- Construction Cost Estimate, dated 10/30/2007, prepared by Parsons Brinckerhoff.
- Preliminary Right of Way Cost Estimate, dated December 19, 2007, prepared by Parsons Brinckerhoff
- Project Concept Report, dated July 27, 2001 prepared the Georgia Department of Transportation

Value Engineering Study Task Flow Diagram

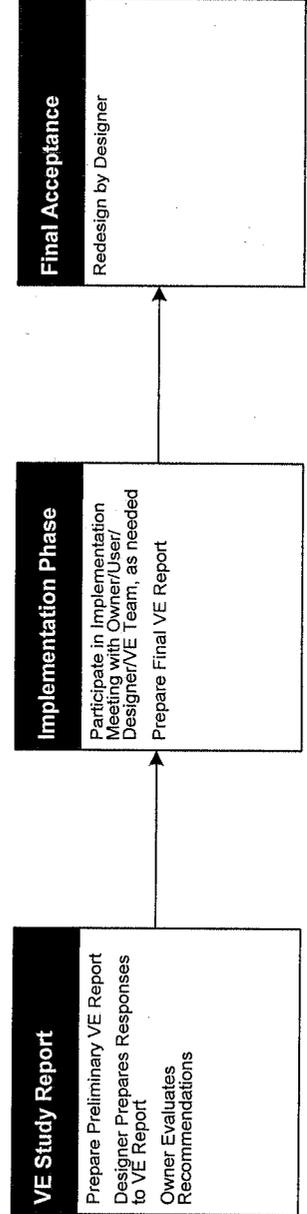
Preparation Effort



Workshop Effort



Post-Workshop Effort



- Revised Project Concept Report, dated January 29, 2007 prepared the Georgia Department of Transportation
- Traffic Study for Proposed Retail Development, dated March 30, 2006, prepared by Wolverton & Associates.
- Pavement section memorandum, dated November 7, 2007, prepared by the Georgia Department of Transportation.

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs are very important as they provide the VE team with insight as to how the project has progressed to its current state.

Project cost data provided by the designers was used by the VE team as the basis for a comparative analysis with other similar projects. To prepare for this exercise, the VE Team Leader used the cost estimate prepared by the designers to develop cost models for the project. The models (described in the Cost Model section) were used to distribute the total project cost among the various elements or functions comprising the project. The VE Team used this data to identify the high cost elements or functions that drive the project and the elements or functions providing little or no value so that the team could effectively use its time and focus on reducing or eliminating the impact of those elements.

VALUE ENGINEERING WORKSHOP EFFORT

The 4-day VE workshop began with an orientation/kickoff meeting on January 22, 2008 and concluding with the final VE Presentation on January 25, 2008. During the workshop, the VE Job Plan was followed in compliance with FHWA and SAVE International guidelines for the conduct of a VE study. The job plan guided the search for alternatives to mitigate or eliminate high cost drivers, support functions providing little or no value, and potential project risk elements. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructibility, and providing missing or less than optimum functionality were also entertained. The Job Plan includes six phases:

- Information Gathering Phase (without site visit)
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Gathering Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods had to be reviewed and understood. For this reason the Georgia Department of Transportation and the design teams sent information (described above) to the VE team prior to the study and, following a short orientation session, the workshop was kicked off with a presentation of the project to the team. The presentation highlighted the information provided in the written

documentation and expanded on that information to include a history of the project's development and any underlying influences that caused the design to develop to its current state. During this presentation, VE team members were given the opportunity to ask questions and obtain clarifications of the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to further enhance its project knowledge by defining the functions provided, identifying the costs to provide these functions, and determining whether the value provided by the functions has been optimized. Function analysis is a means of evaluating a project to determine if the expenditures actually perform the requirements of the project, or if there are disproportionate amounts of money spent on support functions. The elements performing support functions add cost to the final product, but have a relatively low worth to the basic function.

Function is defined as the "intended use" of a project element. In the VA process, the team attempted to identify functions in the simplest manner using active verb/measurable noun word combinations. Sometimes modifying adjectives were used with the noun to clarify the definition. To accomplish this, the team first looked at the project in its entirety and randomly listed its functions which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) were identified for the major components of the project depicted on the cost model(s).

After identifying the functions, the team classified the functions according to the following:

Abbreviation	Type of Function	Definition
HO	Higher Order	The primary reason the project is being considered or project goal
B	Basic	A function the must occur for the project to meet its higher order functions
S	Secondary	A function that occurs because of the concept or process selected and may or may not be necessary
R/S	Required Secondary	A secondary function that may not be necessary to perform the basic function but must be included to satisfy other requirements or the project cannot proceed
G	Goal	Secondary goal of the project
O	Objective	Criteria to be meet
LO	Lower Order	A function that serves as a project input

Higher order and basic functions provide value while secondary functions tend to reduce value. Thus the team works in future phases to reduce the impact of secondary functions and thus enhance project value.

The team also used the cost model(s) to seek out the areas where most of the project funds are being applied. Because of the absolute magnitude of these high cost elements or functions, they too

became initial targets for value enhancement. Overall, these exercises stimulated the VE team members to focus on apparently low value areas and initially channel their creative idea development in these places.

Creative Idea Generation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements that have a high absolute cost compared to other elements in the project and the secondary functions providing little or no value, the VE team generated as many ideas as possible to provide the necessary functions at a lower total life cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructibility were also encouraged. At this stage of the process the VE Team was looking for a large quantity of ideas and free association of ideas. Creative Idea Listing worksheets were generated and organized by the function or project element being addressed.

The Georgia Department of Transportation and the design team may wish to review these creative lists since they may contain ideas that were not pursued by the VE but can be further evaluated for potential use in the design.

Evaluation/Judgment Phase

Since the goal of the Creative Idea Generation phase was to conceive as many creative ideas as possible without regard for technical merit or applicability to respond to the project goals, this phase of the workshop focused on identifying those ideas that respond to the project value objectives and are worthy of additional research and development before being presented to the owner. The selection process consisted of evaluating the ideas originated during the Creative Idea Generation phase based on the project value objectives identified through conversations at the Designer's Briefing.

Based on the team's understanding of the owner's value objectives, each idea was compared with the present design concept and the advantages and disadvantages of each idea were discussed (and recorded on the Creative Idea Listings). How well an idea met the design criteria was also reviewed. Based on the results of these reviews, the VE team rated the idea by consensus using a scale of 1 to 3, with 3 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 2 indicating an idea that provides moderate value improvement and 1 indicating an idea with a major technical flaw that does not respond to project requirements. Generally, ideas rated 2 and 3 are continued in the next phase and presented during the presentation phase.

The team also used the designation "DS" to indicate a Design Suggestion, which is an idea that may not have specific quantifiable cost savings, but may reduce project risk, improve constructibility, help to minimize claims, enhance operability, ease maintenance, reduce schedule time or enhance project value in other ways. Design suggestions could also increase a project's cost but provide value in areas not currently addressed. These are also developed in the next phase of the VA process.

Development Phase

In this phase, each highly-rated idea was expanded into a workable solution designated as a Value Engineering Alternative. The development consists of describing the current design and the alternative solution, preparing a life cycle cost comparison where applicable, describing the advantages and disadvantages of the proposed alternative solution, and a writing a brief narrative to compare the original design to the proposed change and provide a rationale for implementing the idea into the design. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The Value Engineering Alternatives are included in the Study Results section of the report. Design suggestions include the same information as the alternatives except that no cost analysis is performed. These are included in the Study Results section of the report.

Presentation Phase

The last phase of the workshop was to summarize the results of the study and prepare Draft Summary of Potential Cost Saving worksheets to handout at the presentation and to present the key Value Engineering Alternatives and design suggestions to the Georgia Department of Transportation and the design teams. The purpose of the presentation meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study, and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed and arrangements were made for the reviewers of the VE report to contact the VE Team in order to obtain further clarifications, if necessary. Draft copies of the Summary of Potential Cost Savings worksheets were given the owner and design team to facilitate a timely review and speedy implementation of the selected ideas.

POST-STUDY PROCEDURES

The post-study portion of the VE study consisted of the preparation of this Value Engineering Study Report. Personnel from Georgia Department of Transportation and the design team will analyze each alternative and prepare a short response, recommending incorporation of the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. LZA is available at your convenience as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

Upon completing their reviews, the owner and designer will meet and, by consensus, select those Value Engineering Alternatives and Design Suggestions that provide good value to incorporate into the project.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the project elements involved with the SR 105 widening project. Team members consisted of a multidisciplinary group with professional highway design, structures and construction experience and a working knowledge of VE procedures. The VE Team included the following:

Participant	Specialization	Affiliation
Joe Leoni, PE	Highway Design	ARCADIS G&M, Inc.
Molapo Kgabo, PE	Structural Design	HNTB Corporation
Harley Griffin, PE	Constructability	Delon Hampton & Associates
George Hunter, PE, PMP, CVS	VE Team Leader	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on January 22, 2008 by representatives from the owner and the design teams. 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 specifics. Additionally, the meeting afforded the owner and design staff the opportunity to highlight in greater detail, those areas of the project requiring additional or special attention. An attendance list for the meeting entitled Designer's Presentation Meeting Participants is attached.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted on January 25, 2008 at the Georgia Department of Transportation Headquarters offices in Atlanta, Georgia to review VE alternatives with the owner and representatives from the design team. Copies of the Draft Summary of Potential Cost Savings were provided to the attendees. An attendance list for the meeting entitled VE Team Presentation Meeting Participants is attached.

VE STUDY SIGN-IN SHEET

Project No.: STP-264(10)

County: Habersham

PI No.: 132100

Date: 1/22-25/08

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
Lisa L. Myers	00244168	Engineering Services	404-651-7468	lmyers@dot.ga.gov
George Hunter		LEWIS & ZWILGERMAN	916-224-9812	ghunter@lze.com
JAKE MITCHELL		PB	404-364-2427	mitchellj@pbworld.com
BENITA RIVERS		PB	4-364-2673	rivers@pbworld.com
Douglas Fadoo	00928931	GDOT District One	770-718-5007	dfadoo@dot.ga.gov
MOLAPO KGABO		HNTB	(404) 946-5740	mkgabo@HNTB.com
Joe Leoni		ARCADIS	(770-431-8166)	Joe.Leoni@ARCADIS-US.com
Jim Graybeal		PB Americas, Inc.	404-364-8190	graybeal@pbworld.com
Neil Kantner	00340852	GDOT Dist 1	770-532-5522	neil.kantner@dot.ga.gov
Kim Coley	00289567	GDOT, DI, ENV.	770-532-5582	kcoley@dot.ga.gov
STENLEY MACK	00354596	GDOT TRAFFIC OPS	404 635 8152	smack@dot.ga.gov
Jeff Woodward	00244213	GDOT Construction	404-656-5603	jeff.woodward@dot.state.ga.us
Lyn Clements	00313424	GDOT BURE	404-656-5289	lynclements@dot.ga.gov
Adrienne Scott	00695861	GDOT R/W	770-787-0635	Adscott@dot.ga.gov
HARLEY GRIFFIN		DHA	404-524-8030	HGRIFFIN@DEWILHAMPTON.COM

COST MODEL

The VE team leader prepared a Pareto Chart, or cost histogram, for the project that follows this page. This cost histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project and provides the VE team with a focus for its work during the study. For this project, approximately 20% of the construction items represent about 83% of the project costs:

- Right of Way \$15,187,800
- Roadway Pavement \$7,541,796
(Asphalt, leveling course, tack coat, base materials)
- Drainage \$1,281,491
- Bridge \$1,059,557

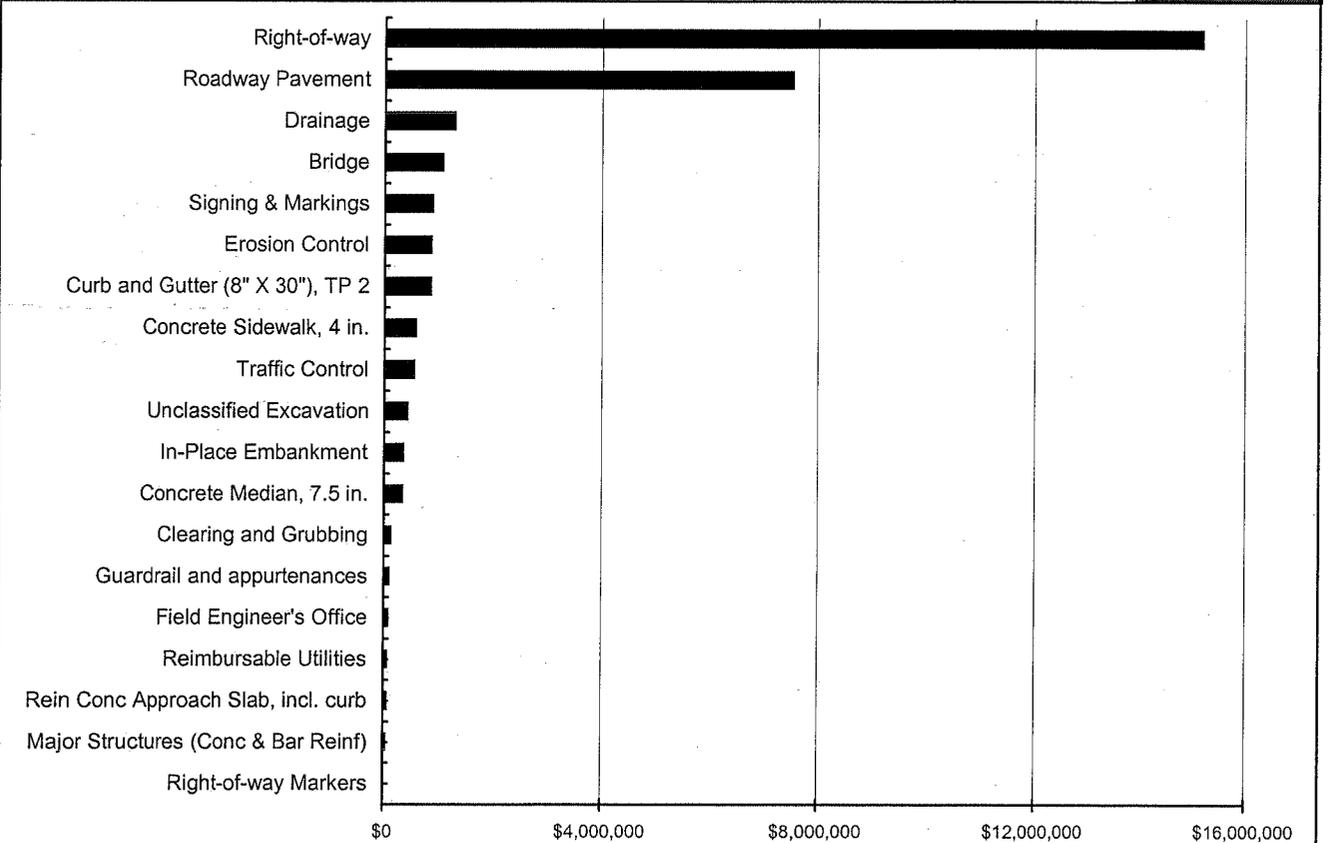
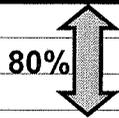
The construction costs include an E&C mark-up of 10%. The combined construction and right of way are \$30,369,852.

COST HISTOGRAM



PROJECT: SR 105/US 441 WIDENING, STP-2640(10) P.I. 132100

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Right-of-way	\$15,187,800	50.01%	50.01%
Roadway Pavement	\$7,541,796	24.83%	74.84%
Drainage	\$1,281,491	4.22%	79.06%
Bridge	\$1,059,557	3.49%	82.55%
Signing & Markings	\$875,992	2.88%	85.44%
Erosion Control	\$853,552	2.81%	88.25%
Curb and Gutter (8" X 30"), TP 2	\$850,326	2.80%	91.05%
Concrete Sidewalk, 4 in.	\$580,851	1.91%	92.96%
Traffic Control	\$550,000	1.81%	94.77%
Unclassified Excavation	\$427,447	1.41%	96.18%
In-Place Embankment	\$349,692	1.15%	97.33%
Concrete Median, 7.5 in.	\$338,253	1.11%	98.44%
Clearing and Grubbing	\$123,750	0.41%	98.85%
Guardrail and appurtenances	\$95,053	0.31%	99.16%
Field Engineer's Office	\$84,513	0.28%	99.44%
Reimbursable Utilities	\$67,500	0.22%	99.66%
Rein Conc Approach Slab, incl. curb	\$57,100	0.19%	99.85%
Major Structures (Conc & Bar Reinf)	\$40,798	0.13%	99.99%
Right-of-way Markers	\$4,379	0.01%	100.00%
TOTAL	\$ 30,369,852	100.00%	



Costs in graph include appropriate mark-ups

FUNCTION ANALYSIS

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

The result of the function analysis exercise identified that the basic functions of the project are to increase the reduce congestion and reduce congestion in the corridor in support of the higher order function to revitalize Cornelia. The reconfiguration of the SR 15/SR 365 interchange the addition of lanes, the raised and flush medians and the turning lanes all support these basic functions. It should be noted that the environmental document also investigated other ways to deliver the basic functions, notably by construction a bypass to the south of the existing SR 105.

RANDOM FUNCTION ANALYSIS



PROJECT: **SR 105/US 441 WIDENING INTERCHANGE IMPROVEMENTS** SHEET NO.: 1 of 2
STP-2640(10)
Habersham County, Georgia

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Global Project	Revitalize	Cornelia	HO
	Reduce	Accidents	B
	Reduce	Congestion	B
SR 105/SR 365 Interchange Reconfiguration	Redistribute	Volumes	S
	Increase	Intersection Volumes	RS
Raised Median	Control	Left Turns	RS
	Divide	Opposing Lanes	RS
	Protect	Turning Vehicles	RS
Two-way left turn lane	Reduce	Right of Way Impacts	S
	Divide	Opposing Lanes	RS
	Remove	Turning Vehicles	RS
	Store	Turning Vehicles	S
Add Through (Mainline) Lanes	Reduce	Congestion	B
	Decrease	Accidents	B
	Improve	Mainline Capacity	S
	Improve	Corridor LOS	RS

Function defined as:	Action Verb	Kind:	B = Basic	HO = Higher Order
	Measurable Noun		S = Secondary	LO = Lower Order
	? VE Team opinion- not sure		RS = Required Secondary	U = Unwanted

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the creative phase, numerous ideas were generated for this project using conventional brainstorming techniques as recorded on the following pages. For the convenience of tracking an idea through the VE process, the ideas were grouped into the following design categories and numbered according to the order in which they were conceived. The following letter prefixes were used to identify the design categories.

DESIGN CATEGORY	PREFIX	NUMBER OF IDEAS
Typical Sections	TS	13
Bridge	BR	4
Interchange	I/C	0
West End Section	WE	2
East End Section	EE	5
Typical Section	TS	2
Contract Packaging & Staging	CP	4
	Total:	24

Creative Idea Evaluation

The ideas were then ranked on a qualitative scale of one to three on how well the VE team believed the idea met the project purpose and need criteria. To assist the team in evaluating the creative ideas, the advantages and disadvantages of each new idea compared to the existing design solution were discussed based on the responses of owner during the project briefings identified the following as below:

- Capital Costs
- Level of Service
- Quality of Access
- Highway User Safety
- Cornelia Revitalization
- Historical Impacts

After discussing each idea, the team then evaluated the ideas by consensus. This produced 10 ideas evaluated as 2s and 3s to carry forward and research and develop into formal Value Engineering Alternatives and 2 ideas to develop as Design Suggestions to be included in the Study Results section of the report. When this is not the case, an idea may have been combined with another related idea or discarded, as a result of the additional research that indicated the concept as not being cost-effective or technically feasible. The reader is 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: **SR 105/US 441 WIDENING INTERCHANGE IMPROVEMENTS**
STP-2640(10)
Habersham County, Georgia

SHEET NO.: **1 of 2**

NO.	IDEA DESCRIPTION	RATING
TYPICAL SECTIONS (TS)		
TS-1	11 ft. through lanes throughout project	3
TS-2	Cornelia – 4 11ft lanes plus 2 turn lanes at 12 ft.	3
TS-3	Reduce raised median to 18 ft.	1
TS-4	Reduce raised median to 12 ft.	2
TS-5	Reduce curb and gutters to 6 in. x 24 in.	2
TS-6	Reduces SR 105 curbs and gutters to 18 in. x 24 in.	2
TS-7	STA 149+00 to STA 192-00 – Shift alignment north 1.5 ft. for standard 12 ft. urban shoulder	2
TS-8	STA 149+00 to STA 192-00 – Shift alignment north 1.5 ft. for standard 12 ft. urban shoulder, hold south right-of-way line and shift roadbed north	1
TS-9	Use 10 ft. urban shoulder (2 ft. grassing strip, 5 ft. should width, 24 in. curb and gutter	2
TS-10	Where 10 ft. multi-use trail is eliminate 5 ft. shoulder width on opposite side of roadway	3
TS-11	Grade-out area for north side 10 ft. multi-use trail – build 5 ft. shoulder width on south side	3
TS-12	5 ft. shoulder width on both sides of roadway throughout project. Does not preclude multi-use trail.	2
TS-13	Use asphalt concrete in lieu of concrete for multi-use path	3
BRIDGE (B)		
B-1	11 ft. through lanes throughout project	3
B-2	Grade-out area for north side 10 ft. multi-use trail – build 5 ft. shoulder width on south side	3
B-3	5 ft. shoulder width on both sides of roadway throughout project. Does not preclude multi-use trail.	2
B-4		
WEST END (WE) (6-Lane Section)		
WE-1	Changes to the lane arrangements between western terminus and SR 365 Retain US 441 Walm—eliminate roadwork. Cannon enters eastbound SR105	1
WE-2	Changes to the lane arrangements between western terminus and SR 365 Retain US 441 Walm—eliminate roadwork. Cannon enters eastbound SR105	1

Rating:	1 = Not to be developed DS = Design suggestion	2 = Possible development potential ABD = Already being done	3 = Most likely to be developed
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