West Winder Bypass

CSSTP-0006-00(327), P.I. No. 0006327

Barrow County

Value Engineering Study Report

April 2010

Designer

Moreland Altobelli Associates, Inc.

Value Engineering Consultant

Lewis & Zimmerman Associates

an ARCADIS company

Lewis & Zimmerman Associates
9861 Broken Land Parkway
Suite 254
Columbia, Maryland 21046
Tel: 301.984.9590
Fax: 410.381.0109
email: info@lza.com
www.lza.com

Mr. Matthew J. Sanders, AVS
Value Engineering Specialist
Georgia Department of Transportation - Engineering Services
One Georgia Center – 5th Floor
600 West Peachtree Street
Atlanta, Georgia 30308

Re: West Winder Bypass
CSSTP-0006-00(327), P.I. No. 0006327, Barrow County
Value Engineering Study Report

Date:
April 29, 2010

Contact:
Howard Greenfield

Phone:
301.984.9590 x 20

Email:
hgreenfield@lza.com

Our ref:
MY098001.0000

Dear Mr. Sanders:

Lewis & Zimmerman Associates, Inc. is pleased to submit two hard copies and one electronic copy of the referenced value engineering (VE) study report documenting the study that took place April 19-22, 2010. The objective of the VE effort was to identify opportunities to enhance the value of the project and save right-of-way costs.

The VE team developed 18 alternatives with identifiable cost saving potential. Many address the cost of the right-of-way showing how significant reductions can be achieved in a variety of ways. Another group of alternatives address how the costs for the two bridges could be reduced.

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

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company

Howard B. Greenfield, PE, CVS
Vice President

Attachment

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SECTION ONE – EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for Barrow County, Georgia and the Georgia Department of Transportation (GDOT). The subject of the study was the West Winder Bypass, CSSTP-0006-00(327), P.I. No. 0006327, Barrow County, being designed for Barrow County by Moreland Altobelli Associates, Inc. The project was at the conceptual stage of development when the study was conducted, April 19-22, 2010, at GDOT's Atlanta Headquarters.

Comprising the VE team were a highway engineer, a bridge engineer, a construction specialist and a Certified Value Specialist (CVS) team leader. The team followed the six-phase VE Job Plan to guide its deliberations:

- Information Gathering Phase
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment of Creative Ideas Phase
- Alternative Development Phase
- Presentation of Results Phase

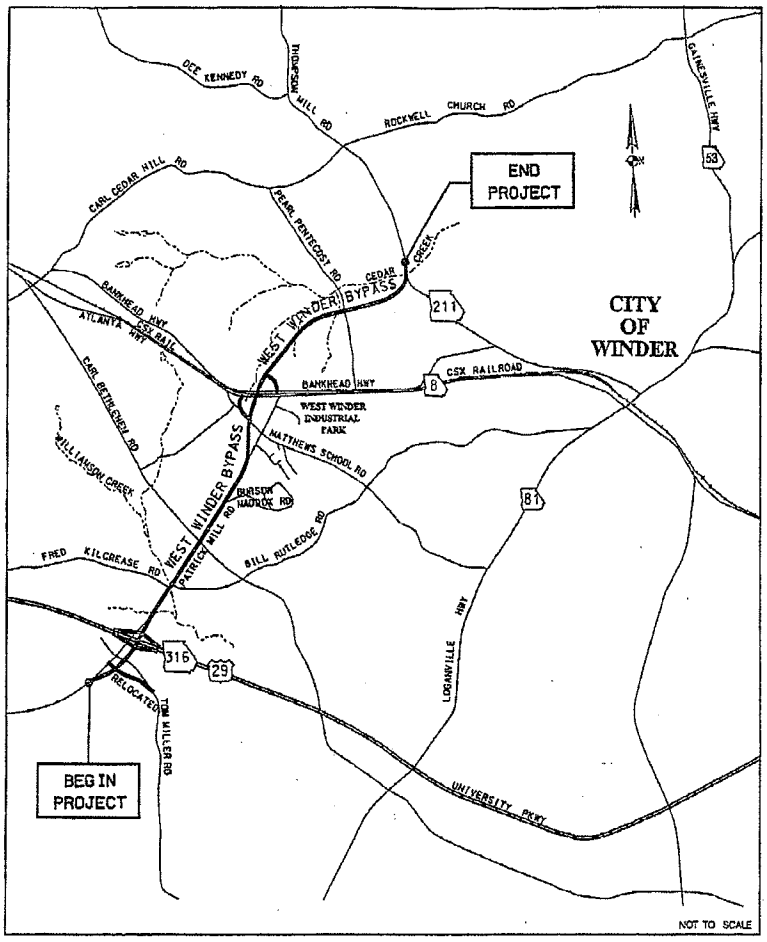
PROJECT DESCRIPTION

This project comprises the western bypass of the City of Winder from Patrick Mill Road/CR 93, 1,000+/- ft. south of SR 316 northward on new and existing location to SR 211 for a total of approximately 5.0 miles. The proposed construction will widen Patrick Mill Road/CR 93 from a two-lane to a four-lane divided highway with a 24-ft.-wide raised median from Barrow Industrial Parkway to approximately 300 ft. north of existing Burson Maddox Road.

Starting at Barrow Industrial Parkway, the new West Winder Bypass (Bypass) will turn to the east off of the current Patrick Mill Road alignment and then turn to the north to the bridge over SR 316 at 90 degrees. A diamond interchange will be created with SR 316 and include signalized intersections at the ramp terminals and the Bypass. Existing Tom Miller Road east of the Bypass will be relocated to the south to intersect with the Bypass midway between Barrow Industrial Parkway and the southern ramps to and from SR 316. The relocated Tom Miller Road/Bypass intersection will be signalized and the relocated road will continue west to intersect with the existing Patrick Mill Road at a T-intersection.

After crossing over SR 316, the Bypass will connect back to the existing Patrick Mill Road alignment and continue to a point north of Burson Maddox Road. Along this section of the Bypass, Fred Kilcrease Road and Bill Rutledge Road will be relocated north to meet at a signalized intersection with the Bypass. Another signalized intersection will be created at Carl Bethlehem Road. The intersection with Burson Maddox Road and the Bypass will be slightly shifted to the north.

The roadway will continue north on a new location west of existing Patrick Mill Road/CR 93. It will intersect with Mathews School Road that is partially relocated to the south before crossing the new West Winder Bypass and turning north to connect with Atlanta Highway/SR 8 at a new signalized intersection. The existing Mathews Road connection to SR 8 will now connect to the relocated Mathews School Road.



The West Winder Bypass continues north past relocated Mathews School Road and bridges over SR 8, the CSX Railroad, and Bankhead Highway before curving to the northeast. A signalized intersection will be created for the West Winder Bypass and a new Bankhead Connector Road that will connect to Bankhead Highway. The West Winder Bypass will continue on a northeast heading to a signalized intersection with Pearl Pentecost Road. It will continue on this heading before making a 90 degree turn to the northwest to connect directly into SR 11. The portion of SR 11 to the east of the new road will intersect the Bypass at a signalized T-intersection.

The typical section includes two, 12-ft.-wide travel lanes in each direction with a 24-ft.-wide raised median. There will be 10-ft.-wide shoulders on both sides (6.5-ft. paved with a 2-ft. rumble strip) and 12-ft.-wide right turn (auxiliary) lanes and 12-ft.-wide left turn lanes at all major intersections and major commercial drives.

The total project cost is estimated at $87.5 million including $42.1 million for construction, $2.6 million for utilities and $42.8 million for right-of-way.

CONCERNS AND OBJECTIVES

Currently, there is a significant amount of truck traffic that has to travel through the City of Winder to reach their intended destinations. This road will allow this traffic to bypass the City, thus relieving congestion and avoiding potential accidents. However, the cost to construct the Bypass is expensive and as a result the project is currently being broken into three phases. To assist Barrow County with development of a project that will meet its needs in a more cost-effective manner, the County in cooperation with GDOT convened this VE study. The objective of the study is to identify specific

changes to the current concept that will reduce costs without sacrificing the project's functionality or improve its functionality with little or no additional cost.

RESULTS OF THE STUDY

The VE team generated 18 cost saving alternatives and two design suggestions that will enhance the functionality of the project for consideration. All of these are summarized on the following Summary of Potential Cost Savings table and detailed in Section Two of the report. Note that each alternative has been developed independently so that some are interrelated or mutually exclusive and the total potential cost savings achievable will depend upon the combination of alternatives selected for implementation. The cost-saving alternatives with the greatest potential impact on the project are described below.

Creating space by acquiring right-of-way for the new road represents about 49% of the total project cost. A large percentage of the property is commercial/industrial property with a raw value of $4.00/square foot (sf) and a total marked up value of $9.92/sf. Thus many of the alternatives seek to reduce the amount of right-of-way required. One of the best means of accomplishing this is to change the West Winder Bypass/SR 316 interchange from a diamond interchange to a partial cloverleaf interchange. By changing the configuration, as shown in Alternative Number (Alt. No.) 24, the property on the west side will not have to be acquired, saving about $6 million. If a decision is made to retain the existing diamond interchange, then consideration should be given to shortening the ramps from about 1,700 ft. to 1,400 ft. to save approximately $2 million, mostly in right-of-way requirements (Alt. No. 12).

At present, a consistent 140-ft.-wide right of way is planned. There are several opportunities to reduce or narrow this significantly. Reducing the median width from 24 ft. to 20 ft. (Alt. No. 17), using 4:1 slopes in lieu of 6:1 slopes at the back of the shoulders (Alt. No. 33), and reducing the inside lane width from 12-ft. to 11-ft. (Alt. No. 13), will result in a narrower right-of-way. If a 10-ft. reduction could be achieved through the implementation of some combination of these alternatives, approximately $2 million in right-of-way requirements could be avoided.

The bridges also offer opportunities for cost avoidance. If the median width is reduced by 4 ft., then the bridge width can be reduced by 4 ft. (Alt. No. 17). An additional 4 ft. of width can be reduced by using 10-ft.-wide in lieu of 12-ft.-wide shoulders on the bridge to match the shoulder width beyond the bridges (Alt. No. 26). The bridges can also be shortened by 120 ft. with the use of full height abutments in lieu of slope pavement sections at the ends of the bridge (Alt. No. 19).

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	PRESENT WORTH OF COST SAVINGS: RECURRING COST SAVINGS	PRESENT WORTH OF COST SAVINGS: TOTAL PW LCC SAVINGS
1	Modify realignment of Fred Kilcrease Road to line up with a slight realignment of Bill Rutledge Road to the north	$1,354,000	$1,056,000	$298,000		$298,000
2	Realign West Winder Bypass bridge over Bankhead Highway, the CSX Railroad and SR 8 closer to a 90 degree skew	$438,000	$0	$438,000		$438,000
6	Remove cul-de-sac on existing Patrick Mill Road and create a right-in/right-out connection to the West Winder Bypass	DESIGN SUGGESTION				
7	Move cul-de-sac on Patrick Mill Road south to provide access to the historic property	DESIGN SUGGESTION				
9	Modify the alignment of Tom Miller Road and Fair Long Way	$646,000	$0	$646,000		$646,000
12	Shorten the ramps to and from SR 316 to the new West Winder Bypass	$2,188,000	$0	$2,188,000		$2,188,000
13	Use an 11-ft.-wide inside lane in lieu of a 12-ft.-wide lane	$509,000	$0	$509,000		$509,000
14	Move Burson Maddox Road 300 ft. south of as-designed intersection with the Bypass	$435,000	$91,000	$344,000		$344,000
15	Connect Mathews School Road directly to SR 8 close to the existing connection to SR 8	$223,000	$209,000	$14,000		$14,000
16	Narrow the paved concrete shoulders on the ramps to and from SR 316 and the new West Winder Bypass	$310,000	$0	$310,000		$310,000
17	Narrow the median from 24-ft.-wide to 20-ft.-wide	$935,000	$0	$935,000		$935,000
18	Use 4-ft.-wide paved outside shoulders in lieu of 6.5-ft.-wide paved outside shoulders	$418,000	$0	$418,000		$418,000
19	Use vertical bridge abutments in lieu of ends with sloped paving	$7,997,000	$6,778,000	$1,219,000		$1,219,000
24	Use a partial cloverleaf in lieu of a diamond interchange	$7,390,000	$1,210,000	$6,180,000		$6,180,000
25	Delete the center pier for the West Winder Bypass bridge over Bankhead Highway, CSX Railroad and SR 8	$160,000	$0	$160,000		$160,000
26	Use 10-ft.-wide shoulders on the bridge to match the roadway shoulders in lieu of 12-ft.-wide shoulders	$7,996,000	$7,674,000	$322,000		$322,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	PRESENT WORTH OF COST SAVINGS: RECURRING COST SAVINGS	PRESENT WORTH OF COST SAVINGS: TOTAL PW LCC SAVINGS
28	Shorten the West Winder Bridge over Bankhead Highway, CSX Railroad and SR 8 by 22 ft. 6 in.	$4,888,000	$4,647,000	$241,000		$241,000
33	Use 4:1 slopes in lieu of 6:1 slopes at the end of the shoulders and reduce the width of the right-of-way	$1,718,000	$0	$1,718,000		$1,718,000
34	Eliminate the traffic signal at the intersection of Bill Rutledge Road and Fred Kilcrease Road and the West Winder Bypass	$127,000	$0	$127,000		$127,000
35	Reduce turn lane storage lengths at the intersection of Carl Bethlehem Road and the West Winder Bypass	$171,000	$0	$171,000		$171,000

SECTION TWO – STUDY RESULTS

INTRODUCTION

The results of the West Winder Bypass, CSSTP-0006-00(327), P.I. No. 0006327, Barrow County project value engineering study portray the benefits that can be realized by Barrow County, GDOT, the design team from Moreland Altobelli Associates, Inc., and the ultimate users of the roadway. The results will directly affect the project's final design, and GDOT staff, with the aid of the design team and Barrow County representatives, will be tasked with determining 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 GDOT's project value objectives including:

- Save right-of-way
- Reduce crashes
- Improve functionality
- Improve cost-effectiveness

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 individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (without cost estimates). For each alternative developed, the following information 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),
- An evaluation of the advantages and disadvantages of 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 prices were not available, cost databases from GDOT and team members were consulted. Each design suggestion contains the same information as the VE alternatives, except that no cost information is included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons may be to improve traffic operations, reduce maintenance, improve constructability, reduce accidents, and reduce project risk.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value engineering process, thus facilitating referencing between the

Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings table.

KEY ISSUES

This project is being developed to reduce congestion and accidents in the City of Winder. Currently, the roads in the City are used by a large percentage of trucks to get to their intended destination. By constructing the Bypass, the trucks will be taken off the local streets. However, in order to construct the new Bypass, it will be necessary to acquire a significant amount of land that is zoned commercial/ industrial with a relatively high square foot cost. The project's total cost is so high that it is currently being divided into three construction phases spread out over a long period of time.

STUDY OBJECTIVES

Barrow County and GDOT desire to develop a project that is functionally sound, yet cost-effective to construct and maintain. To assist in achieving this goal, the VE team was tasked with identifying specific changes to the current design that would enhance functionality and/or improve cost-effectiveness.

RESULTS OF THE STUDY

The VE team generated 18 cost saving alternatives and two design suggestions that will enhance the functionality of the project for consideration that are detailed in this section of the report. The cost-saving alternatives with the greatest potential impact on the project are described below.

Creating space by acquiring right-of-way for the new road represents about 49% of the total project cost. A large percentage of the property is commercial/industrial property with a raw value of $4.00/square foot (sf) and a total marked up value of $9.92/sf. Thus many of the alternatives seek to reduce the amount of right-of-way required. One of the best means of accomplishing this is to change the West Winder Bypass/SR 316 interchange from a diamond interchange to a partial cloverleaf interchange. By changing the configuration, as shown in Alternative Number (Alt. No.) 24, the property on the west side will not have to be acquired, saving about $6 million.
If a decision is made to retain the existing diamond interchange, then consideration should be given to shortening the ramps from about 1,700 ft. to 1,400 ft. to save approximately $2 million, mostly in right-of-way requirements (Alt. No. 12).

At present, a consistent 140-ft.-wide right of way is planned. There are several opportunities to reduce or narrow this significantly. Reducing the median width from 24 ft. to 20 ft. (Alt. No. 17), using 4:1 slopes in lieu of 6:1 slopes at the back of the shoulders (Alt. No. 33), and reducing the inside lane width from 12-ft. to 11-ft. (Alt. No. 13), will result in a narrower right-of-way. If a 10-ft. reduction could be achieved through the implementation of some combination of these alternatives, approximately $2 million in right-of-way requirements could be avoided.

The bridges also offer opportunities for cost avoidance. If the median width is reduced by 4 ft., then the bridge width can be reduced by 4 ft. (Alt. No. 17). An additional 4 ft. of width can be reduced by using 10-ft.-wide in lieu of 12-ft.-wide shoulders on the bridge to match the shoulder width beyond

the bridges (Alt. No. 26). The bridges can also be shortened by 120 ft. with the use of full height abutments in lieu of slope pavement sections at the ends of the bridge (Alt. No. 19).

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, each part of an alternative or design suggestion should be considered 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 design team and GDOT 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 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.

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

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **1**

DESCRIPTION: **MODIFY REALIGNMENT OF FRED KILCREASE ROAD TO LINE UP WITH A SLIGHT REALIGNMENT OF BILL RUTLEDGE ROAD TO THE NORTH**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

The original design calls for the creation of a new common intersection of Fred Kilcrease Road and Bill Rutledge Road with the West Winder Bypass about 250 feet north of the existing Bill Rutledge Road's intersection with Patrick Mill Road.

ALTERNATIVE: (sketch attached)

Extend Bill Rutledge Road to create a 70 degree intersection with the West Winder Bypass and at the same time slightly realign Fred Kilcrease Road north so that it sits opposite relocated Bill Rutledge Road.

ADVANTAGES:

- Saves construction time and money
- Quicker and easier access to Bill Rutledge Road for existing homeowners
- Eliminates S-curve on Fred Kilcrease Road
- Eliminates the requirement of deeding permanent easement to the homeowners for their access to Bill Rutledge Road
- Creates one longer box culvert in lieu of two shorter box culverts

DISADVANTAGES:

- To keep access open for existing homeowners, construction staging would be comparatively more difficult as Bill Rutledge Road is widened at its intersection with the West Winder Bypass. While the construction is going on at the intersection, traffic on Bill Rutledge Road can be routed through Carl Bethlehem Road.

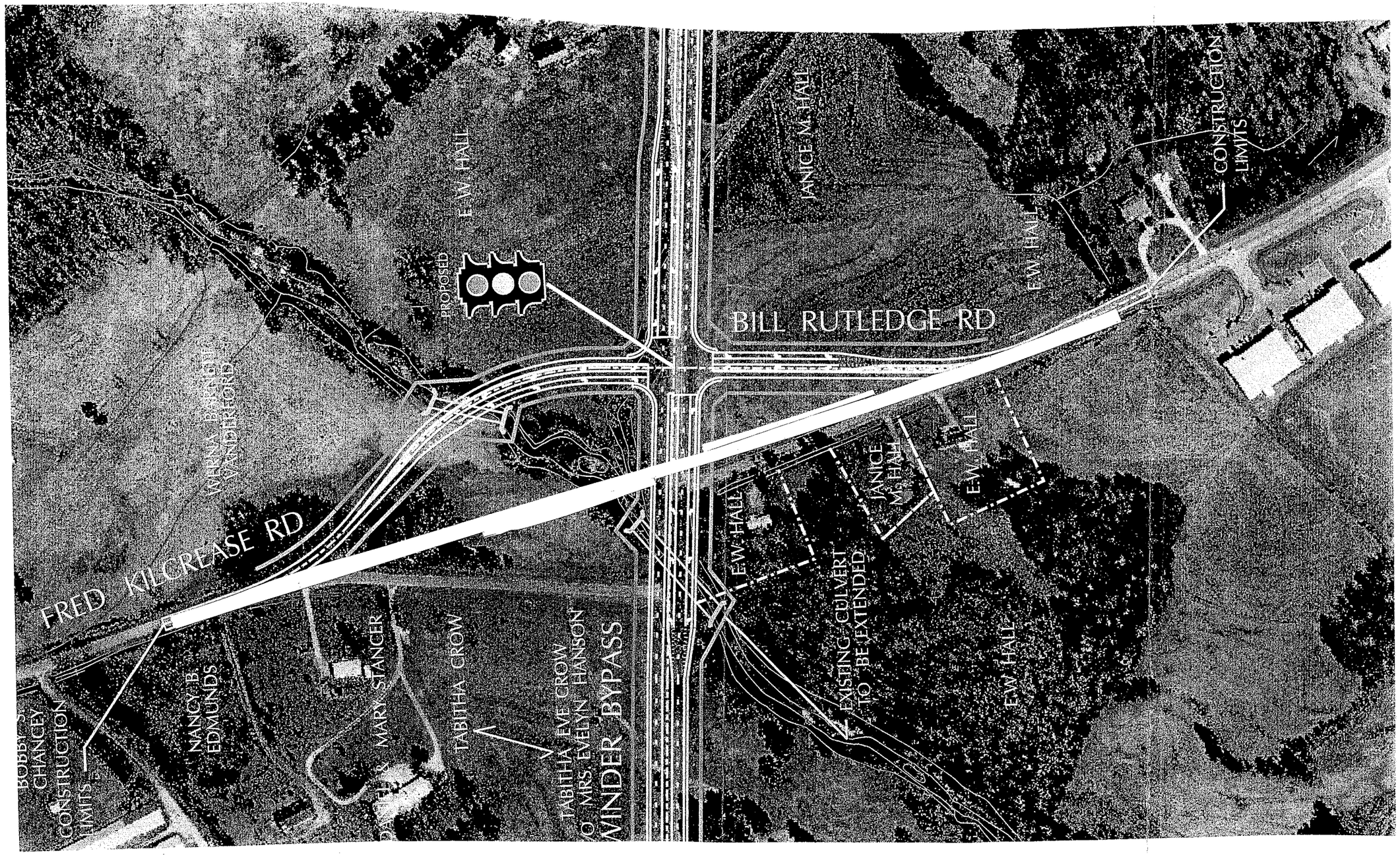
DISCUSSION:

The original design alignment of Bill Rutledge Road will necessitate three permanent easements for current homeowners so that their driveways can be extended from their house to the road. In fact, the house closest to the Winder Bypass will need a 200-ft.-long easement to construct driveway. The other alternative is to sell the land to the homeowners at a price acceptable to them.

However, if Bill Rutledge Road is realigned as proposed in this alternative, the property lines for the houses will remain on the existing right-of-way line and just a short distance from the edge of the new roadway. On the west side of the West Winder Bypass, much less of the Werna Barnett Vanderford property is impacted to construct the relocated Free Kilcrease Road and expanded box culvert.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,354,000	—	$ 1,354,000
ALTERNATIVE	$ 1,056,000	—	$ 1,056,000
SAVINGS (Original minus Alternative)	$ 298,000	—	$ 298,000

ALT. NO. 1
Sht. 2 of 3



COST WORKSHEET

PROJECT: **WEST WINDER BYPASS** ALTERNATIVE NO.:

CSSTP-0006-00(327); P.I. No. 0006327 **1**

Barrow County, GA SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Pavement							
Fred Kilcrease Road (28' x 900')	SY	2,800	60.56	169,568			
Fred Kilcrease Road (28' x 750')	SY				2,333	60.56	141,286
Bill Rutledge Road (28' x 550')	SY	1,711	60.56	103,618			
Bill Rutledge Road (28' x 600')	SY				1,867	60.56	113,066
Subtotal Construction				273,186			254,352
Markup at 8%				21,855			20,348
Total Construction				295,041			274,700
Right-of-Way							
Fred Kilcrease Road (90' x 900')	SF	81,000	4.00	324,000			
Fred Kilcrease Road (90' x 750')	SF				67,500	4.00	270,000
Bill Rutledge Road (1/2 x 250' x 550'	SF	68,750	1.50	103,125			
Bill Rutledge Road (60' x 500')	SF				30,000	1.50	45,000
Subtotal Right-of-Way				427,125			315,000
Markup at 148%				632,145			466,200
Total Right-of-Way				1,059,270			781,200
Subtotal				1,354,311			1,055,900
Markup (%) at				Inclueded			Inclueded
TOTAL				1,354,311			1,055,900
TOTAL (ROUNDED)				1,354,000			1,056,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **2**

DESCRIPTION: **REALIGN THE BRIDGE OVER BANKHEAD HIGHWAY, THE CSX RAILROAD, AND SR 8 CLOSER TO A 90° SKEW**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design skew angle for the West Winder Bypass bridge over Bankhead Highway, the CSX Railroad, and SR 8 is approximately 73°.

ALTERNATIVE: (sketch attached)

Realign the bridge to approximately a 90° skew.

ADVANTAGES:

- Shortens bridge
- Reduces construction material requirements
- Reduces bridge construction time
- Less right-of-way impact to lumber business
- Realignment would provide a better skew angle at the new intersection with Matthews School Road

DISADVANTAGES:

- Adds horizontal curve to the alignment

DISCUSSION:

The original design skew angle for the bridge over Bankhead Hwy, the CSX Railroad and SR 8 is 73°. The alternate alignment would save 20 ft. of bridge length by using a 90° skew angle. This realignment would also save a residential displacement and reduce the right-of-way impacts to the lumber yard property.

A combined savings of over $1,000,000 could be realized if Alt. No. 2 is incorporated with Alt. No. 19 (vertical wall abutments) to shorten the bridge even more.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 438,000	—	$ 438,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 438,000	—	$ 438,000

SKETCHES

ALTERNATIVE NO.: 2

Original Sketch

SHEET NO.: 2 of 5

WILLIAMS RD

RUSSELL T. & KIMBERLY SHARP GARMON

LUDGER W. LANTHIER JR.

JOHN F. DONOGHUE

CINDY WITHERS

CLARA MAE MASON

JOHN C. & DOMINICA ROBERTS

DORRIS MONTGOMERY

DORRIS PIERCE MONTGOMERY & JMOGENE WILKINS

JOHNS MANVILLE INTERNATIONAL, INC.

J.B. WILKINS

A.L. & EMMER MAE HAYES

JOHN WILLIE HILL

ESSIE LOU WILKINS

LYNARD L. & DALIA W. McNIGHT

ST. MATTHEWS CATHOLIC CHURCH

MR. & MRS. BILLY R. PERKINS

DONNA PRAGHMAN

J.B. WILKINS

PIERCE HARDWOOD LIMITED PARTNERSHIP C/O 84 LUMBER

MAYNARD BARTLETT & BUTLER REALTY GROUP

JERRY E. WISE JR.

HELEN JUANITA WILKINS MILLER

CONSTRUCTION LIMITS

ATLANTA AVE

COX AVE

BANKHEAD HWY

BANKHEAD CONNECTOR RD

UNITED WASTE SERVICE, INC.

MARIAN JEANETTE SEABOLT

EUGENE H. ENGLAND

PROPOSED

WHISTLEVILLE CHRISTIAN CHURCH

SCHOOL RD

PAMELA ROYSTER

CONSTRUCTION LIMITS

SKETCHES

ALTERNATIVE NO.: 2

Alternate Sketch

SHEET NO.: 3 of 5

WILLIAMS RD

RUSSELL T. & KIMBERLY SHARP GARMON

LUDGER W. LANTHIER JR.

JOHN F. DONOGHUE

CINDY WITHERS

CLARA MAE MASON

JOHN C. & DOMINICA M. ROBERTS

DORRIS MONTGOMERY

DORRIS PIERCE MONTGOMERY & IMOGENE WILKINS

R/W

JOHNS MANVILLE INTERNATIONAL INC

SAVES 2 PARCELS

A.L. & EMMER MAE HAYES

JOHN WILLIE HILL

ESSIE LOU WILK

J.B. WILKINS

R=955'

R/W

SKEW=87°

EYNARD L. & DALIA W. McNIGHT

ST. MATTHEWS CATHOLIC CHURCH

MR. & MRS. BILLY R. PERKINS

J.B. WILKINS

R/W

R=1,150'

DONNA PRACHMAN

R=6,550'

R/W

VYNARD BARTLETT & BUTLER REALTY GROUP

PIERCE HARD LIMITED PA CO 84 LUMBER

JOHNS MANVILLE INTERNATIONAL INC

JERRY L. WISE JR.

HELEN JUANITA WILKINS MILLER

CONSTRUCTION LIMITS

BANKHEAD HWY

BANKHEAD CONNECTOR RD

MARIAN JEANETTE

PAMELA ROYSTER

TML

CONSTRUCTION LIMITS

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **2**

SHEET NO.: **4 of 5**

The "Original Design" bridge length is 450' at a 73° skew. The "Alternate Design" bridge length is 430' at a 90°.

Bridge area saved: (450'- 430') x 99.25' = 1,985 sf

R/W impacts saved:

Save one residential displacement (Elsie Lou Wilkins). However approximately half the parcel will still be taken (land only). Value saved = $50,000

Save relocation fee of $30,000

Other R/W impacts are considered a "wash" or equal when compared to the "Original Design" alignment, since the alternate alignment has less impact on some properties (e.g. Lumberyard) and more impact on Other properties (e.g. United waste Services).

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **2**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved:							
Bridge area saved	sf	1,985.00	100.00	198,500			
Engineering & Construction Mkup	%	8%	198,500.00	15,880			
R/W house saved	ea	1	50,000.00	50,000			
Relocation Fee saved	lump	1	40,000.00	40,000			
Engineering & Construction Mkup	%	148%	90,000.00	133,200			
Subtotal				437,580			
Markup (%) at included							
TOTAL				437,580			
TOTAL (ROUNDED)				438,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **6**

DESCRIPTION: **REMOVE THE CUL-DE-SAC ON PATRICK MILL ROAD AND CREATE A RIGHT-IN, RIGHT-OUT INTERSECTION WITH THE WEST WINDER BYPASS**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (sketch attached)

The original design includes construction of a cul-de-sac on Patrick Mill Road and removal of the remaining 800 ft. of existing pavement south of the cul-de-sac.

ALTERNATIVE: (sketch attached)

Provide a right-in, right-out intersection for existing Patrick Mill Road with the West Winder Bypass while retaining most of the existing pavement.

ADVANTAGES:

- Provides easy access to the Bypass for existing property owners on Patrick Mill Road

DISADVANTAGES:

- Traffic might slow down on Bypass as vehicles access and egress Patrick Mill Road

DISCUSSION:

A right-in, right-out intersection will provide much easier access to the Bypass for local property owners needing to travel north. The cost savings from not demolishing the existing pavement and not constructing the cul-de-sac will be offset by the cost of constructing a right-in, right-out intersection. Additionally, the alternative design eliminates the need for property owners wanting to access the West Winder Bypass to travel 1,700 feet north to Matthews School Road and then another 700 feet west in order to access the Bypass to travel north as would be the case with the original design. They will still have to travel the same route if they want to travel south on the Bypass.

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

SKETCHES

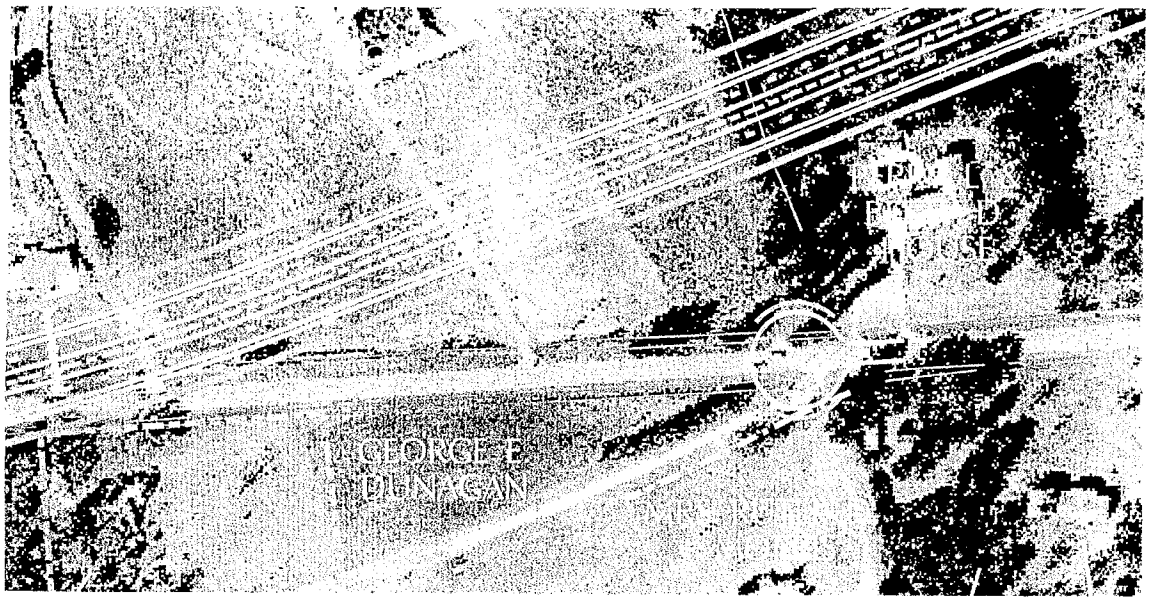
PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

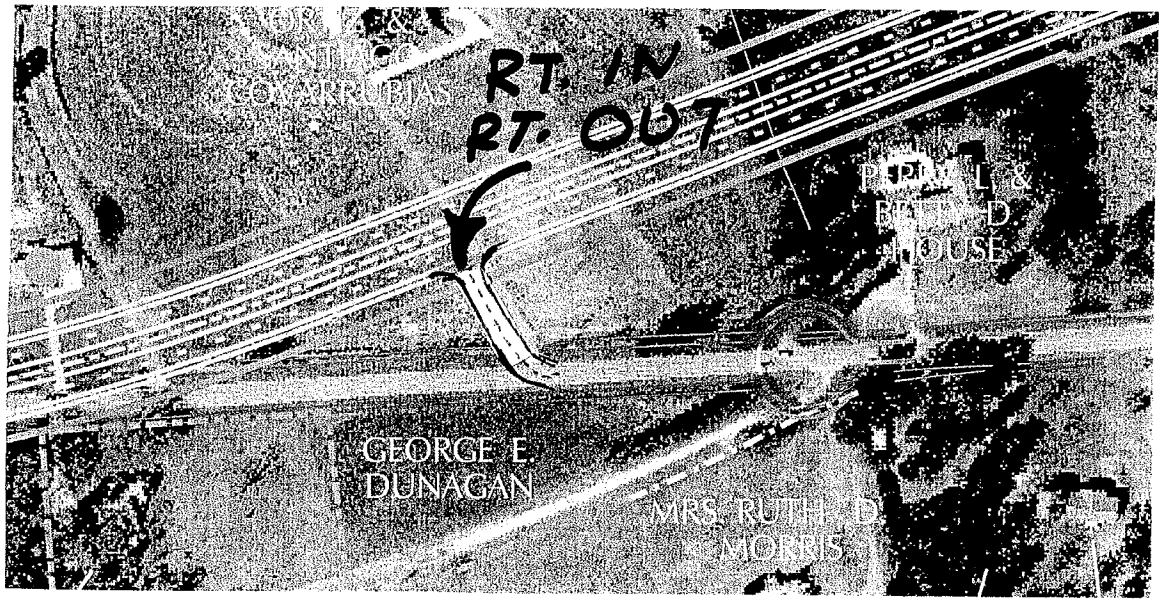
ALTERNATIVE NO.: 6

☑ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 2 of 2

AS - DESIGNED





ALTERNATE

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**WEST WINDER BYPASS** *CSSTP-0006-00(327); P.I. No.0006327* *Barrow County, GA*	ALTERNATIVE NO.: **7**
DESCRIPTION:	**MOVE THE CUL-DE-SAC ON PATRICK MILL ROAD 500 FT. SOUTH TO PROVIDE ACCESS TO THE HISTORIC PROPERTY**	SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (sketch attached)

The original design calls for construction of a cul-de-sac on Patrick Mill Road and removal of the remaining 800 feet of existing pavement south of the cul-de-sac.

ALTERNATIVE: (sketch attached)

Construct a cul-de-sac on Patrick Mill Road 500 feet south of the original design location and remove the remaining 300 feet of pavement south of the cul-de-sac.

ADVANTAGES:

- Provides easy access to Patrick Mill Road for the owners of the existing historic property
- Less pavement will need to be demolished

DISADVANTAGES:

- None apparent

DISCUSSION:

Since the existing Patrick Mill Road will be terminated by the construction of the new cul-de-sac, shifting the location of the cul-de-sac about 500 ft. south from the original design location would provide more and easier access to the current property owners while retaining as much of the existing pavement as possible. The cost implications of this exercise will be negligible.

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

SKETCHES

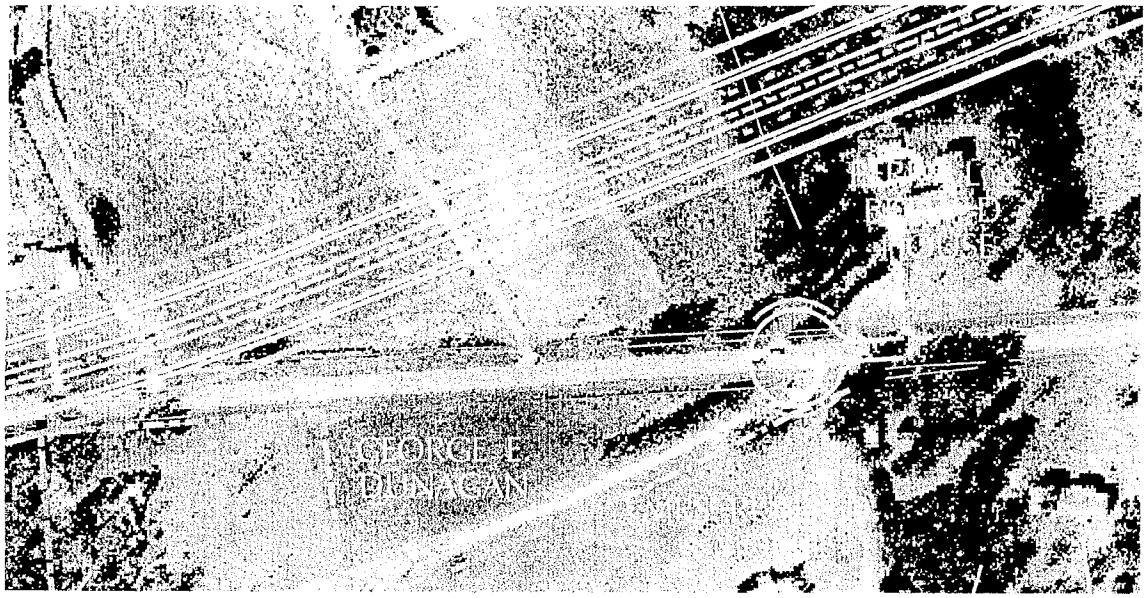
PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

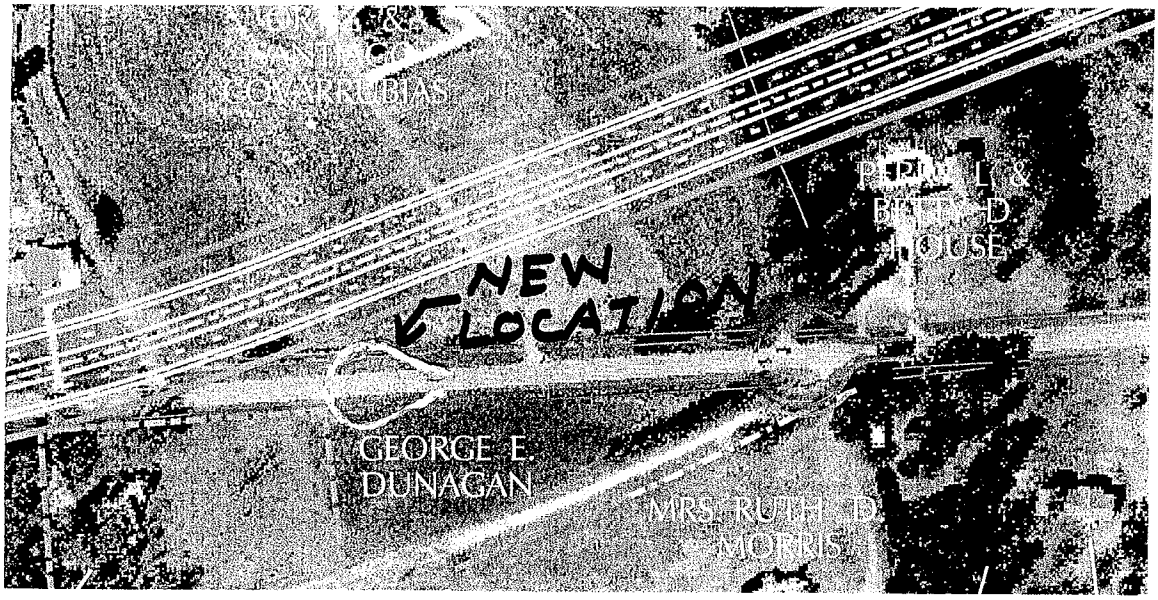
ALTERNATIVE NO.: 7

☒ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 2 of 2

AS-DESIGNED





ALTERNATE

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **9**

DESCRIPTION: **MODIFY THE REALIGNMENT OF TOM MILLER ROAD AND FAIR LONG WAY**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design realigns 2,450 ft. +/- of Tom Miller Road and Fair Long Way.

ALTERNATIVE: (sketch attached)

Modify the realignment of Tom Miller Road and Fair Long Way to move it 1,250 ft.

ADVANTAGES:

- Reduces construction material requirements
- Reduces length of travel trips

DISADVANTAGES:

- Reduces the distance between the ramp median opening and the next intersection opening to 800 ft.
- Creates an S-curve on Tom Miller Road

DISCUSSION:

The alternate design would shorten the realignment by 1,200 ft. +/- (2,450 ft. vs. 1,250 ft.) placing the median opening for Tom Miller Road 800 ft. from the adjacent ramps intersection. It is recommended that limit of access rights be acquired from the ramps to the new median opening for Tom Miller Road/ Fair Long Way because the desirable distance for the first median opening from the ramps is 1,000 ft. However, limiting the access along Patrick Miller Road would help mitigate the shorter distance between median openings. The realigned road design speed is 35 mph which is not a problem since traffic approaching the intersection will be decelerating to turn left or right onto Patrick Miller Road. Also, there is very little through traffic on Tom Miller Road since Fair Long Way is a dead-end road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 646,000	—	$ 646,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 646,000	—	$ 646,000

SKETCHES 4

ALTERNATIVE NO.: 9

Original Sketch

SHEET NO.: 2 of 5

RELOCATED TOM MILLER RD

TOM MILLER RD

FAIR LONG WAY

MICHAEL KENNETH PATRICK

CELSO & SAN JUANITA RODRIGUEZ

CHARLES M. SINGER

WILLIAM STUDDARD JR.

VINCENT L & JANE WATSON

JOSE

MARY JACQUELINE PINION

CHOW SHU TEU LEE CHOW I & CHOW THOMAS FE CO W.M. COPELAND

PROPOSED

PIPELINE/PATRICK MILL PARTNERS LP

ROAD CLOSED PAVEMENT TO BE REMOVED

KARUHRO PROPERTIES, LLC

PATRICK MILL, LLC

KENNETH MICHAEL PATRICK

JAMES H. & MUEL D. BARNES DUNCAN

ARZ

W. & FRANNIE B. EVANS

COGGINS LAND CO.

BECKY L. BROADWEL

BLAIR SUMMERCUR

COMMER LANELL MOORE

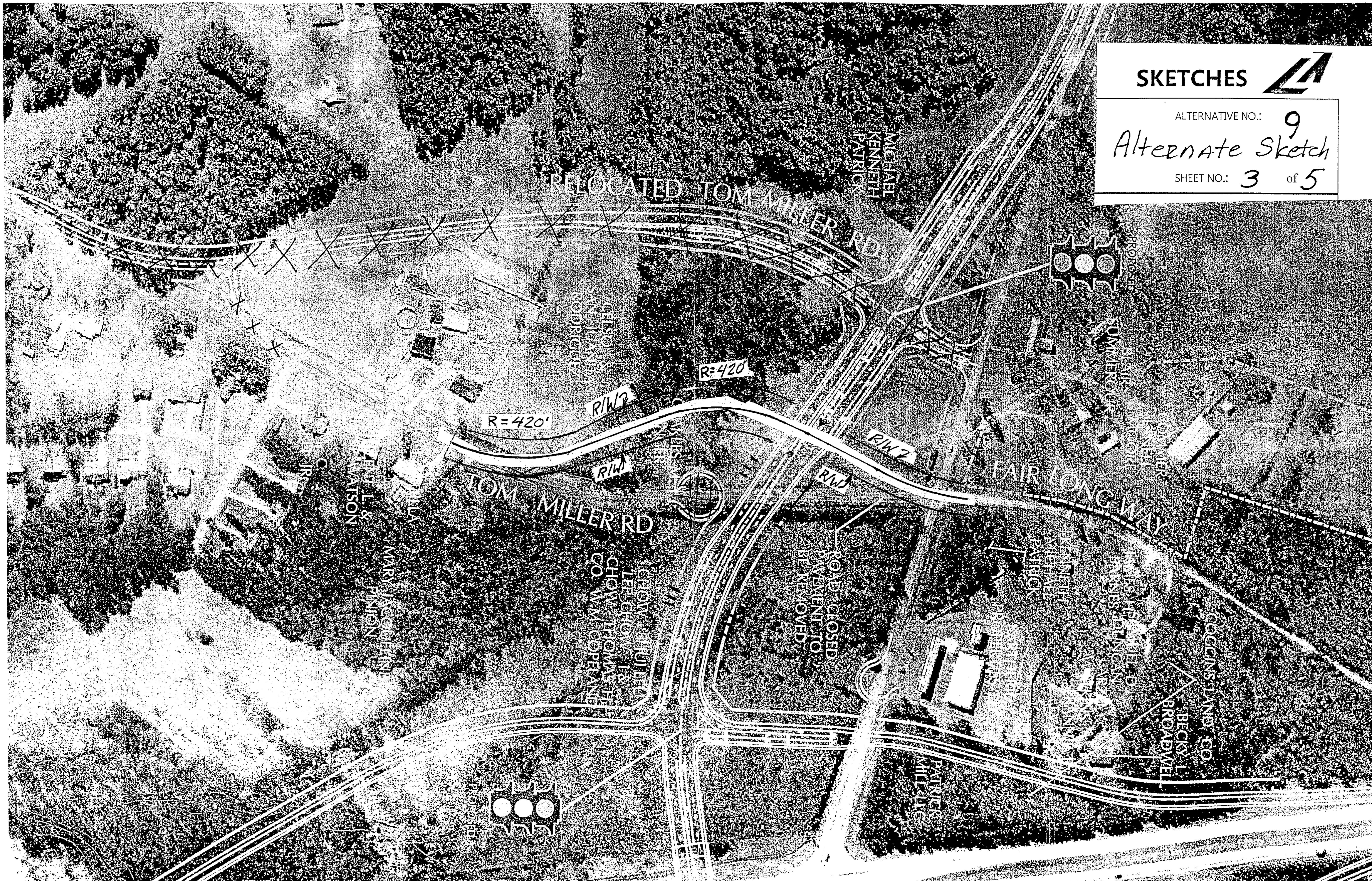
PROPOSED

SKETCHES

ALTERNATIVE NO.: 9

Alternate Sketch

SHEET NO.: 3 of 5



PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **9**

SHEET NO.: **4 of 5**

The alternate realignment would save 1,200 ft (0.23 miles) of two-lane roadway consisting of two 12 ft lanes with 4 ft paved shoulders. It is assumed that the current length of 4-lane realignment would be approximately the same for both designs since the turn lanes length is based on traffic volumes.

Full-depth Pavement area saved: [1,200' x 2 lanes x 12']/9sf/sy = 3,200 SY

Use $ 60.56/sy for unit price including Fuel & Liquid AC adjustments (see pavement calculations)

Shoulder Pavement area saved [1,200' x 2 shoulders x 4']/9sf/sy = 1,067 SY

Use $ 26.39/sy for unit price including Fuel & Liquid AC adjustments (see pavement calculations)

Estimated earthwork saved: [1,200' x 4' x (24' + 6' + 6')]/27cf/cy = 6,400 CY

Use $4/cy + $1.26/cy (Fuel adjustment) = $5.26/cy

6,400 CY x .29 gal/cy = 1,856 gal Diesel

6,400 CY x .15 gal/cy = 960 gal Unleaded

[(1,856 gal x $2.89/gal) + (960 gal x $2.83/gal)]/6,400cy = 1.26/CY

R/W area saved: 1,200' x 80' = 96,000 sf

Use $1.50/sf from GaDOT R/W estimate

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS** ALTERNATIVE NO.:

CSSTP-0006-00(327); P.I. No. 0006327 **9**

Barrow County, GA SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved:							
Full-depth pavement saved	SY	3,200	60.56	193,792			
Shoulder pavement saved	SY	1,067	26.39	28,158			
Estimated earthwork saved	CY	6,400	5.26	33,664			
Signing & Striping saved	LM	0.23	15,000.00	3,450			
Grassing & Eros comtrol saved	LM	0.23	35,000.00	8,050			
Engineering & Construction Mkup	%	8%	267,114	21,369			
				-			
				-			
				-			
R/W land saved	SF	96,000	1.50	144,000			
Engineering & Construction Mkup	%	148%	144,000.00	213,120			
				-			
				-			
Subtotal				645,603			
Markup (%) at included							
TOTAL				645,603			
TOTAL (ROUNDED)				646,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **12**

DESCRIPTION: **REDUCE THE LENGTH OF THE RAMPS TO AND FROM SR 316 AND THE WEST WINDER BYPASS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The original design includes four diamond interchange ramps ranging from 1,800 ft. to 1,600 ft. in length from the West Winder Bypass to the ramp gore of SR 316.

ALTERNATIVE: (sketch attached)

Make all ramps 1,400 ft. long from the West Winder Bypass to the ramp gore (length is in the desirable range for a diamond interchange by AASHTO guidelines).

ADVANTAGES:

- Reduces construction requirements
- Reduces right-of-way requirements
- Less concrete pavement to maintain

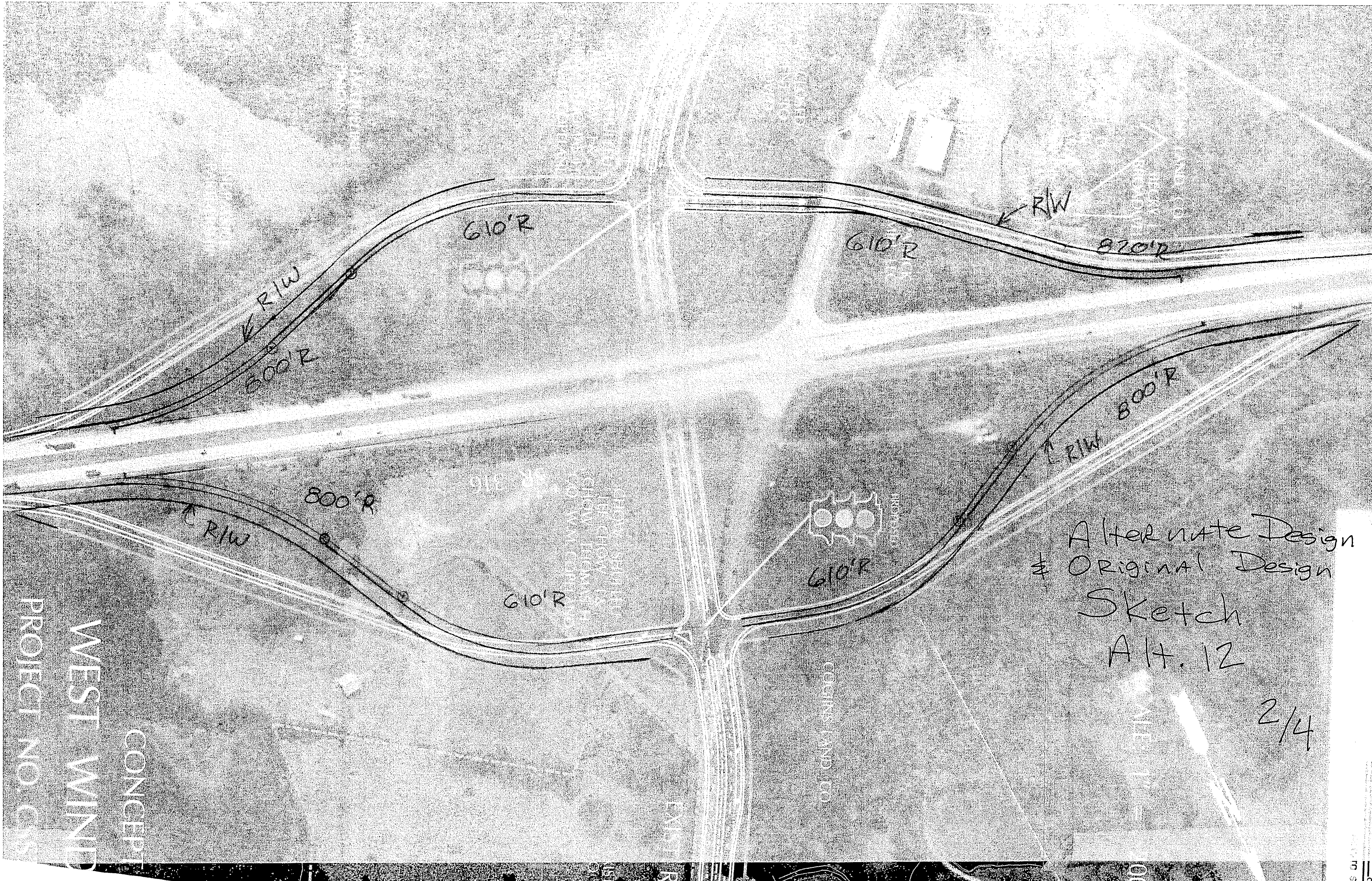
DISADVANTAGES:

- Shorter acceleration and deceleration distances

DISCUSSION:

The current ramps are longer than is desirable by AASHTO guidelines which is 1,200 ft. (see Freeway design for diamond interchanges in the "Greenbook"). The shorter lengths will save both construction and right-of-way requirements.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 2,188,000	—	$ 2,188,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 2,188,000	—	$ 2,188,000



R/W
610'R
610'R
820'R
R/W
800'R
800'R
R/W
800'R
R/W
610'R
610'R
Alternate Design
& Original Design
Sketch
Alt. 12
2/4

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **12**

SHEET NO.: **3 of 4**

Shorten the diamond interchange ramps to 1,400 ft in length from cross-road to gore:

[(1,800'-1,400') + (1,600'-1,400') + (1,700'-1,400') + (1,700'-1,400')] x (6'+16+10') = 38,400sf or 4,267sy

R/W saved: 1 ramp x 800' x 200/2 = 64,000 sf/ramp average (triangular pieces of land)

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS** ALTERNATIVE NO.:

CSSTP-0006-00(327); P.I. No. 0006327 **12**

Barrow County, GA SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved							
Ramp pavement saved	SY	4,267.00	$95.11	$405,834			
R/W Markup	%	8%	405,834.00	32,467			
land saved commercial 2 ramps	SF	128,000	4.00	512,000			
land saved residential 1 ramp	SF	64,000	1.50	96,000			
land saved agricultural 1ramp	SF	64,000	0.50	32,000			
R/W Markup	%	148%	640,000.00	947,200			
Subtotal				$2,025,501			
Markup (%) at 8.0%				$162,040			
TOTAL				$2,187,541			
TOTAL (ROUNDED)				$2,188,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **13**

DESCRIPTION: **USE 11-FT.-WIDE INSIDE LANES IN LIEU OF 12-FT.- WIDE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The original design includes construction of 12-ft.-wide lanes throughout the project.

ALTERNATIVE: (sketch attached)

On the West Winder Bypass, construct the inside lanes 11 ft. wide and keep the outside lanes and turn lanes 12 ft. wide.

ADVANTAGES:

- Saves construction time and material requirements
- Less impervious area; less storm water; lesser need for drainage infrastructure

DISADVANTAGES:

- None apparent

DISCUSSION:

With 55 mph speed limit, 11-ft.-wide lanes have existed on I-75 and I-85 in Metro Atlanta since 1996. The speed limit on the West Winder Bypass is 45 mph. Since the inside lanes will have two feet of gutter, the effective travel width with 11-ft.-wide lanes will be 13 feet. A foot of reduction on each side will decrease impervious area. This will reduce storm water. As a result, the amount of drainage infrastructure will also decrease. Since drainage design has not been completed, no savings in drainage items are included with the alternative design. Also, no savings in right-of-way is included because it is assumed that the same amount of right-of-way would still be acquired even though one foot less width will be required on each side. However, if combined with Alt. No. 17 which narrows the median 4 ft., then the total right-of-way could be reduced by 10 ft.

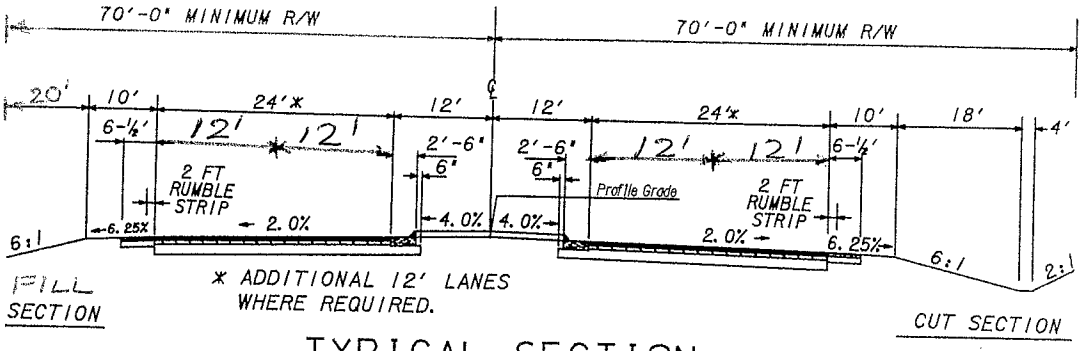
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 509,000	—	$ 509,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 509,000	—	$ 509,000

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: 13

☒ AS DESIGNED ☒ ALTERNATIVE

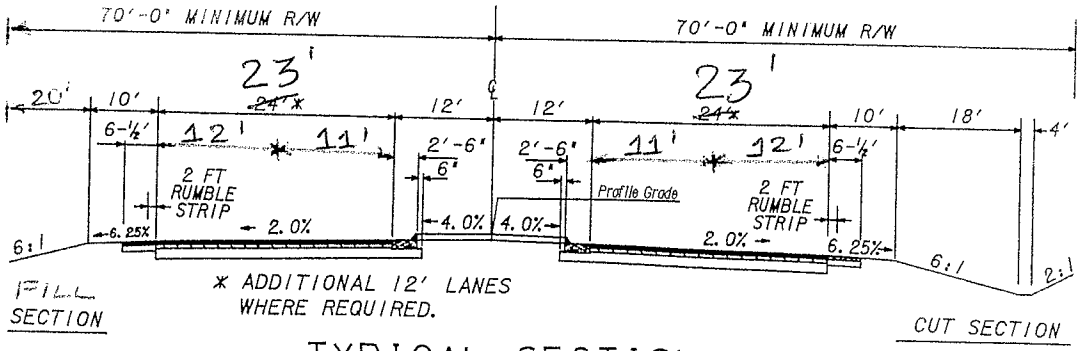
SHEET NO.: 2 of 4



TYPICAL SECTION

NOT TO SCALE

AS-DESIGNED



TYPICAL SECTION

NOT TO SCALE

ALTERNATE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **13**

SHEET NO.: **3 of 4**

Total length of Winder Bypass: 5.0 miles = 26,400 feet.

Where the Bypass ties to existing roads, it tapers down to two lanes. Subtract a total of 1,700 feet.

The two bridges are 456' and 290' long. Therefore, subtract a total of 746 feet from the length of the roadway.

Thus, the total length of 4-lane A.C. Pavement on Winder Bypass is: 26,400' – 1,700' – 746' = 23,954 feet.

The total pavement area saved is equal to: 23,954' x (1'+1') = 47,908 sf or 5,323 sy.

The total bridge area saved: 746' x 2' = 1,492 sf.

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **13**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
A.C. Pavement	SY	5,323	60.56	322,361			
Bridge	SF	1,492	100.00	149,200			
Subtotal				471,561			
Markup (%) at 8.0%				37,725			
TOTAL				509,286			
TOTAL (ROUNDED)				509,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **14**

DESCRIPTION: **MOVE THE BURSON MADDOX ROAD INTERSECTION 300 FEET SOUTH OF THE ORIGINAL DESIGN INTERSECTION WITH WEST WIDER BYPASS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The original design includes construction of the new Burson Maddox Road intersection with the West Winder Bypass about 350 feet north of its existing intersection with Patrick Mill Road.

ALTERNATIVE: (sketch attached)

Retain as much of Burson Maddox Road as possible by moving the Burson Maddox Road intersection with Winder Bypass 300 feet south of the original design intersection.

ADVANTAGES:

- Saves construction time and material requirements
- Eliminates the requirement of deeding permanent easement to the one existing homeowner for his/her access to Burson Maddox Road

DISADVANTAGES:

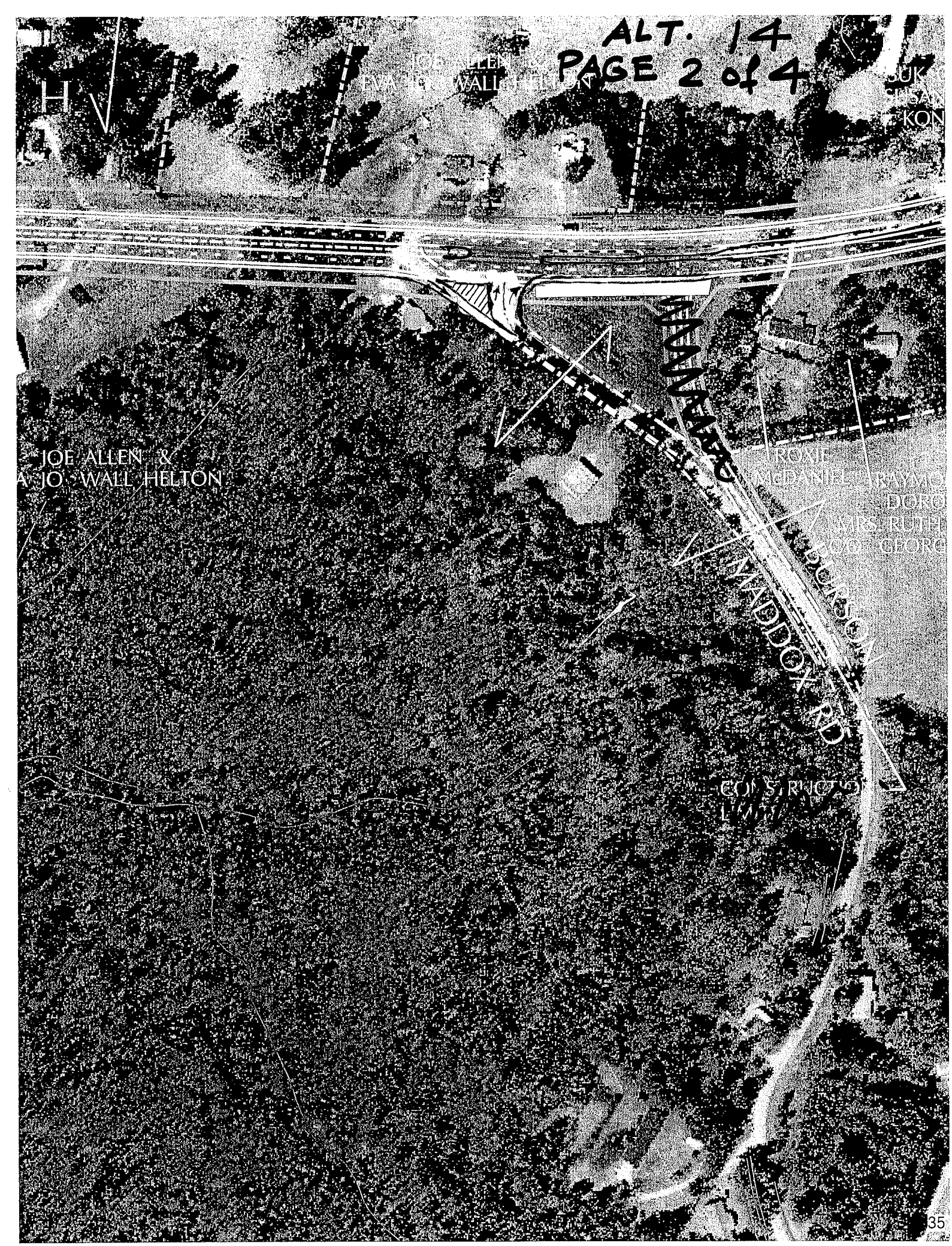
- To keep access open for existing homeowners, construction staging would be comparatively more difficult as Burson Maddox Road is widened at its existing intersection with the West Winder Bypass. However, since there are no more than two dozen houses on Burson Maddox Road, traffic is negligible and construction staging should not be a major problem.

DISCUSSION:

The original design alignment of Burson Maddox Road will necessitate one permanent easement to the current homeowner so that his/her driveway can be extended from the house to the road. The other alternative is to sell the land to the homeowner at a price acceptable to them.

The alternate design recommends maintaining the alignment of Burson Maddox Road in its current position until it almost intersects with the West Winder Bypass. As a result, the existing access from the current homeowner's property to Burson Maddox Road will not change and it will not be necessary to acquire a large triangular tract of land from Roxie McDaniel on the north side of the existing road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 435,000	—	$ 435,000
ALTERNATIVE	$ 91,000	—	$ 91,000
SAVINGS (Original minus Alternative)	$ 344,000	—	$ 344,000


ALT. 14
PAGE 2 of 4
JOE ALLEN &
A JO WALL HELTON
MANATEE
ROAD

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **14**

SHEET NO.: **3 of 4**

Length of as designed Burson Maddox Road: 700'. Width of this road: 28' (includes 2' shoulder on each side)

Area of as designed Burson Maddox Road: 700'x28'/9 = 2,178 sy

Area of pavement for the alternate design of Burson Maddox Road:10,000 sf or 1,111 sy

Area of R/W needed per as designed Burson Maddox Road: 78,750 sf

Area of R/W needed per alternate design of Burson Maddox Road: 5,000 sf

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **14**
SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
A.C. Pavement	SY	2,178	60.56	131,900	1,111	60.56	67,282
Construction Markup - 8%				10,552			5,383
Subtotal				142,452			72,665
Right-of-Way	SF	78,750	1.50	118,125	5,000	1.50	7,500
R/W Markup - 148%				174,825			11,100
				292,950			18,600
Subtotal				435,402			91,265
Markup (%) at							
TOTAL				435,402			91,265
TOTAL (ROUNDED)				435,000			91,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **15**

DESCRIPTION: **REVISE THE ALIGNMENT OF MATTHEWS SCHOOL ROAD TO CONNECT TO SR 8 CLOSE TO THE EXISTING CONNECTION**

ORIGINAL DESIGN: (sketch attached)

The original design realigns Matthews School Road to the south to cross the new Winder Bypass at less of a skew angle. The realigned road proceeds west from the intersection and turns north to connect to SR 8 at a signalized T-intersection. The existing connection of Matthews School Road to SR 8 is removed and a cul-de-sac is constructed to end the road. This portion of existing Matthews School Road is tied into the new alignment segment connecting to SR 8 with a T-intersection.

ALTERNATIVE: (sketch attached)

Realign Matthews School Road east of the intersection with the new West Winder Bypass. Continue the alignment west of the West Winder Bypass and use an S-curve to connect back into the existing Matthews School Road alignment. Where the existing Matthews School Road alignment ties into SR 8, convert it to a one-way exit off of SR 8 to Matthews School Road eastbound. Connect Matthews School Road to SR 8 with a signalized T-intersection about 200 ft. east of the existing connection.

ADVANTAGES:

- Avoids impacts to the A.L. & Emmer Mae Hayes property
- Avoids having to cut the John F. Donoghue property into two pieces
- Uses more of existing Matthews School Road
- Avoids having to create a dead-end road
- Reduces amount of new pavement construction

DISADVANTAGES:

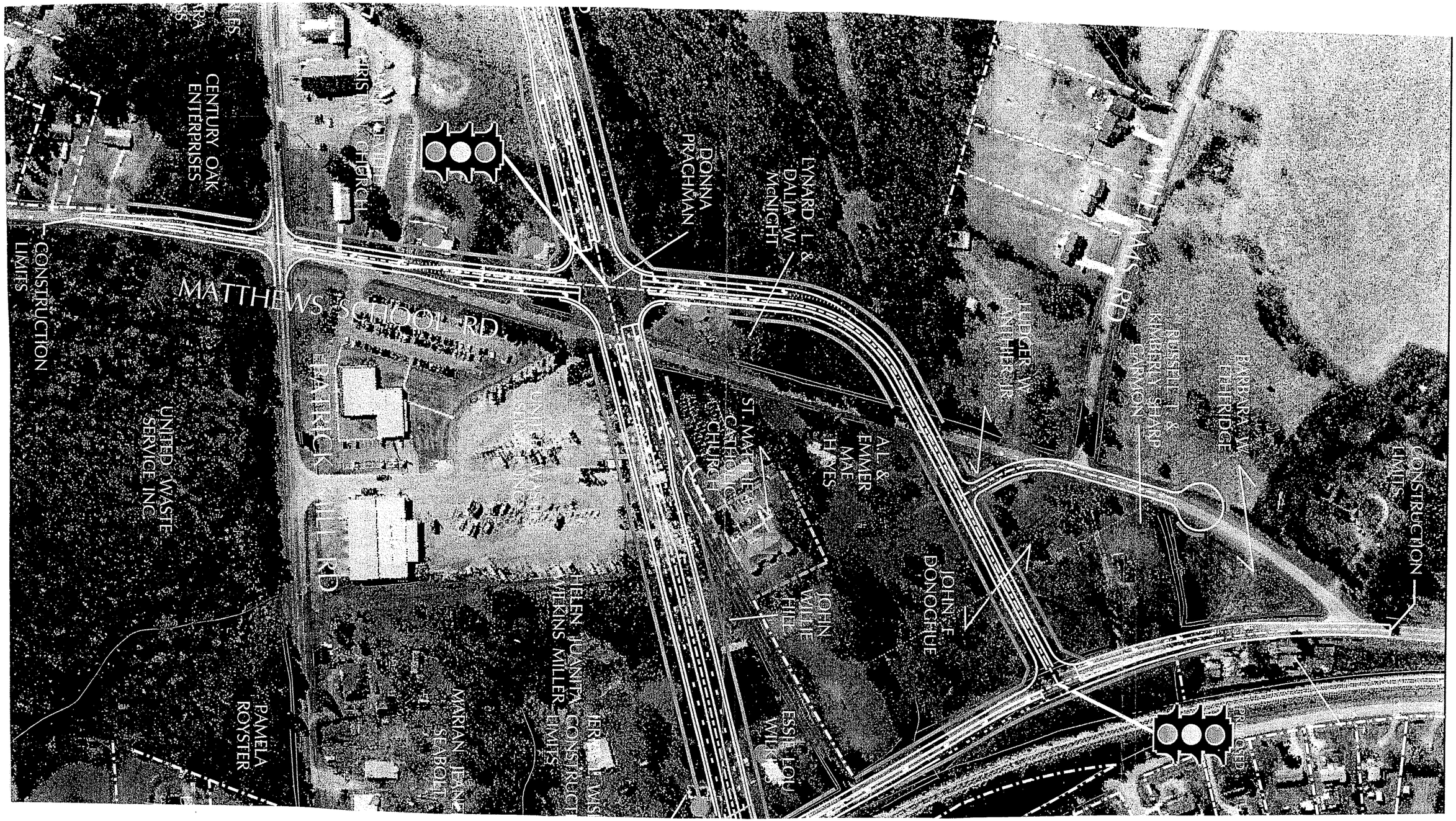
- Requires acquisition of a triangular piece of property where existing Matthews School Road intersects with SR 8. However, this property is not viable for development
- Requires acquisition of some additional property from Ludger W. Lanthier, Jr.

DISCUSSION:

This alternative takes advantage of existing Matthews School Road to avoid having to acquire land from two owners and build part of the new road on new right-of-way. An analysis of the traffic may make it advantageous to eliminate the direct eastbound connection from SR 8 to Matthews School Road.

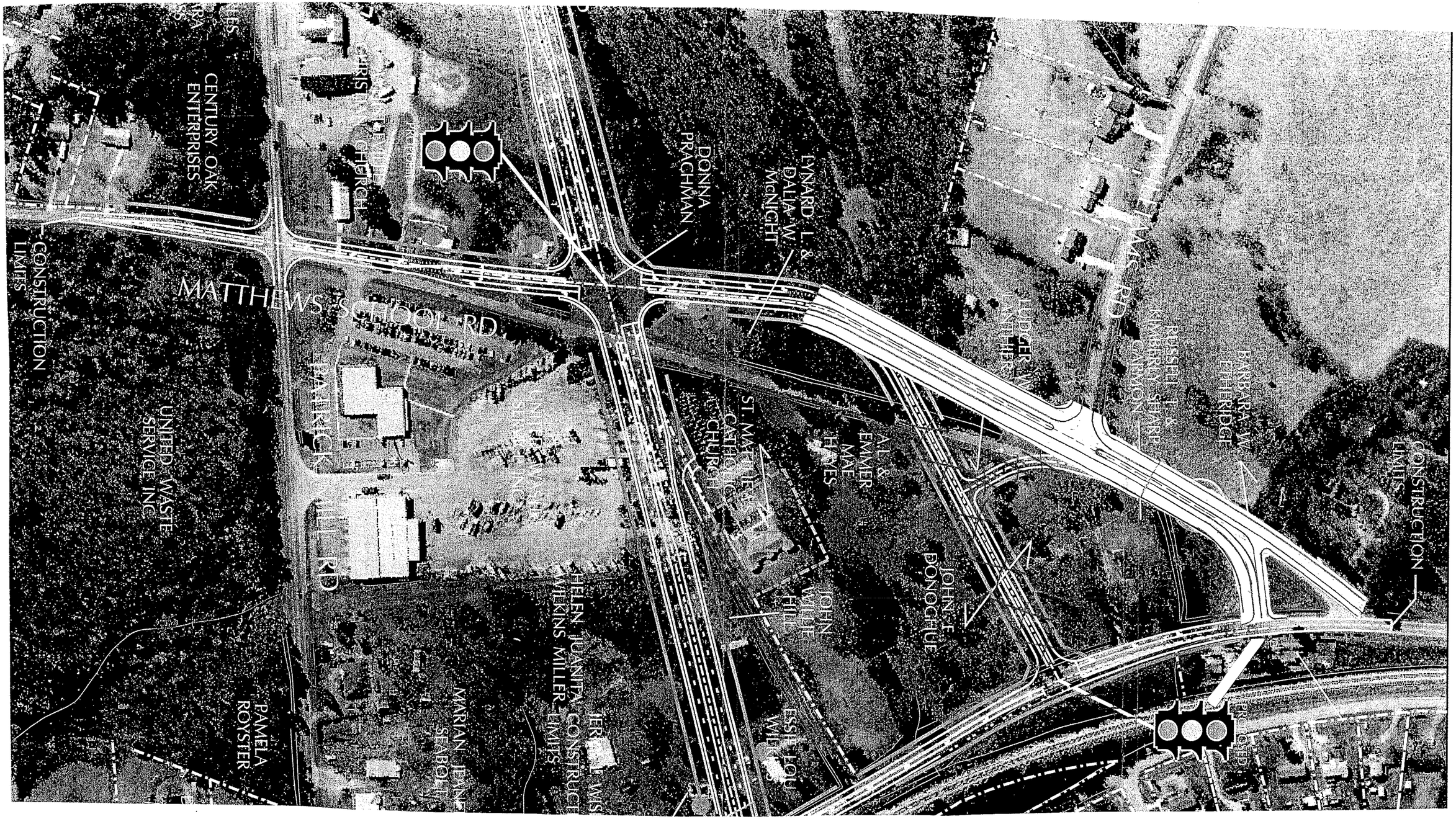
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 223,000	—	$ 223,000
ALTERNATIVE	$ 209,000	—	$ 209,000
SAVINGS (Original minus Alternative)	$ 14,000	—	$ 14,000

ALT. NO. 15
SHT. 2 of 4



AS DESIGNED

ALT. NO.
15
Sht. 3 of 4



ALTERNATIVE

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **15**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Residential Right-of-Way							
(80' x 700')	SF	56,000	1.50	84,000			
(180' x 180' x 0.5)	SF				16,200	1.50	24,300
(80' x 500')	SF				40,000	1.50	60,000
(40' x 100')	SF	4,000	1.50	6,000			
Subtotal				90,000			84,300
Markup (%) at 148.0%				133,200			124,764
TOTAL				223,200			209,064
TOTAL (ROUNDED)				223,000			209,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **16**

DESCRIPTION: **REDUCE THE CONCRETE PAVED SHOULDER WIDTHS ON THE RAMPS TO AND FROM SR 316 AND THE NEW WEST WINDER BYPASS**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (sketch attached)

The original proposed ramp design includes 16-ft.-wide single-lane and 24-ft.-wide two-lane sections with 6-ft.-wide inside concrete paved shoulders and 10-ft.-wide outside concrete paved shoulders.

ALTERNATIVE: (sketch attached)

Reduce the concrete paved shoulder widths on the ramps to 4 ft. inside and 8 ft. outside. The graded shoulders will remain the same width.

ADVANTAGES:

- Reduces ramp construction requirements

DISADVANTAGES:

- None apparent

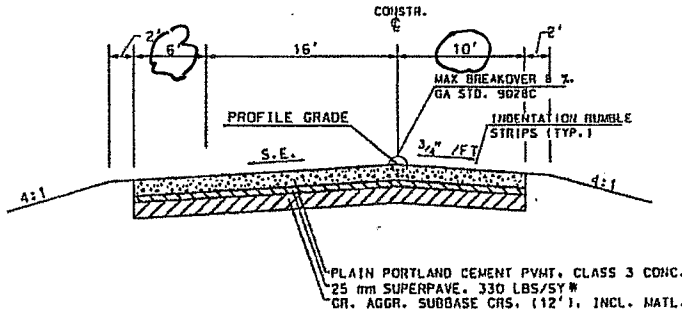
DISCUSSION:

The AASHTO guideline (pages 838 and 839) for freeway ramp paved width is 20 ft. minimum (including paved shoulders). AASHTO also requires a paved inside shoulder width of 2 to 4 ft. and an outside paved shoulder width of 8 to 10 ft. Therefore the alternate proposed paved shoulder widths of 4 ft. and 8 ft. meet the AAHTO guidelines. AASHTO also states that for one-way ramp operations the sum of the widths of the right and left paved shoulders should not exceed 10 to 12 ft. The total paved ramp width including paved shoulders for a single-lane ramp would be at least 28 ft. (4 ft. + 16 ft. + 8 ft.) with the alternate proposed design which is wide enough for trucks to pass stalled vehicles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 310,000	—	$ 310,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 310,000	—	$ 310,000

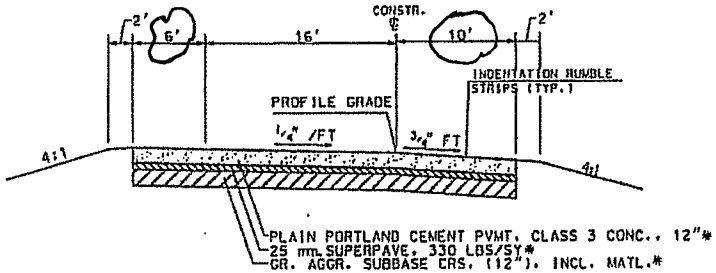
SR 316 RAMPS

Original Design



* PAVEMENT SECTION FOR ESTIMATION PURPOSES ONLY

SUPER ELEVATION SECTION



* PAVEMENT SECTION FOR ESTIMATION PURPOSES ONLY

NORMAL CROWN SECTION

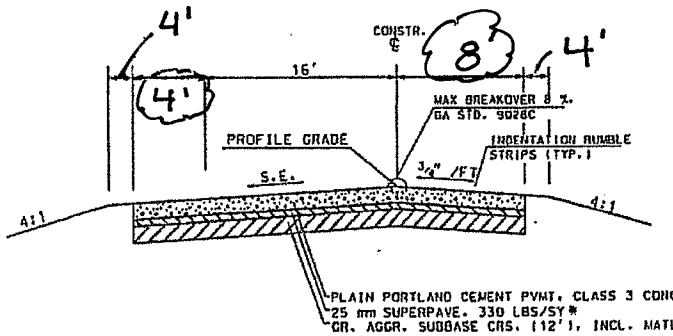
TYPICAL SECTION

NOT TO SCALE

ALT. NO. 16 SH. 2 of 7

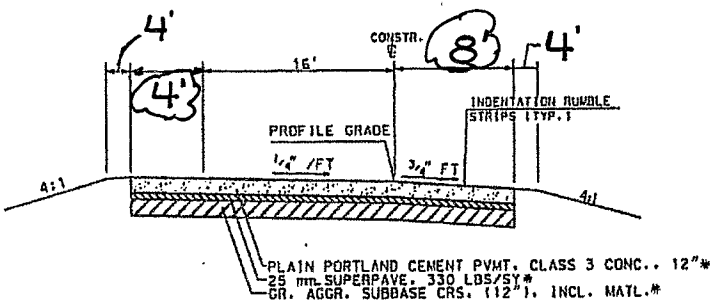
SR 316 RAMPS

Alternate Design



* PAVEMENT SECTION FOR ESTIMATION PURPOSES ONLY

SUPER ELEVATION SECTION



* PAVEMENT SECTION FOR ESTIMATION PURPOSES ONLY

NORMAL CROWN SECTION

TYPICAL SECTION

NOT TO SCALE

ALT. NO. 16 Sht. 3 of 7

ACT. NO. 16 Sht. 4 of 7

Ramp Traveled-Way Widths

Width and cross section. Ramp traveled-way widths are governed by the type of operation, curvature, and volume and type of traffic. It should be noted that the roadway width for a turning roadway includes the traveled-way width plus the shoulder width or equivalent clearance outside the edges of the traveled way. The section "Widths for Turning Roadways at Intersections" in Chapter 3 may be referenced for additional discussion on the treatments at the edge of traveled way. Design widths of ramp traveled ways for various conditions are given in Exhibit 10-67. Values are shown for three general design traffic conditions, as follows:

Traffic Condition A—predominantly P vehicles, but some consideration for SU trucks.

Traffic Condition B—sufficient SU vehicles to govern design, but some consideration for semitrailer vehicles.

Traffic Condition C—sufficient buses and combination trucks to govern design.

Traffic conditions A, B, and C are described in broad terms because design traffic volume data for each type of vehicle are not available to define these traffic conditions with precision in relation to traveled-way width. In general, traffic condition A has a small volume of trucks or only an occasional large truck, traffic condition B has a moderate volume of trucks (in the range of 5 to 10 percent of the total traffic), and traffic condition C has more and larger trucks.

Shoulders and lateral clearances. Design values for shoulders and lateral clearances on the ramps are as follows:

- When paved shoulders are provided on ramps, they should have a uniform width for the full length of ramp. For one-way operation, the sum of the right and left shoulder widths should not exceed 3.0 to 3.6 m [10 to 12 ft]. A paved shoulder width of 0.6 to 1.2 m [2 to 4 ft] is desirable on the left with the remaining width of 2.4 to 3.0 m [8 to 10 ft] used for the paved right shoulder.
- The ramp traveled-way widths from Exhibit 10-67 for Case II and Case III should be modified when paved shoulders are provided on the ramp. The ramp traveled-way width for Case II should be reduced by the total width of both right and left shoulders. However, in no case should the ramp traveled-way width be less than needed for Case I. For example, with condition C and a 125-m [400-ft] radius, the Case II ramp traveled-way width without shoulders is 6.4 m [21 ft]. If a 0.6-m [2-ft] left shoulder and a 2.4-m [8-ft] right shoulder are provided, the minimum ramp traveled-way width should be 4.8 m [15 ft].
- Directional ramps with a design speed over 60 km/h [40 mph] should have a paved right shoulder width of 2.4 to 3.0 m [8 to 10 ft] and a paved left shoulder width of 0.3 to 1.8 m [1 to 6 ft].
- For freeway ramp terminals where the ramp shoulder is narrower than the freeway shoulder, the paved shoulder width of the through lane should be carried into the exit terminal. It should also begin within the entrance terminal, with the transition to the

Metric

Radius on inner edge of pavement R (m)	Pavement width (m)								
	Case I One-lane, one-way operation—no provision for passing a stalled vehicle			Case II One-lane, one-way operation—with provision for passing a stalled vehicle			Case III Two-lane operation—either one-way or two-way		
	Design traffic conditions								
	A	B	C	A	B	C	A	B	C
15	5.4	5.5	7.0	6.0	7.8	9.2	9.4	11.0	13.6
25	4.8	5.0	5.8	5.6	6.9	7.9	8.6	9.7	11.1
30	4.5	4.9	5.5	5.5	6.7	7.6	8.4	9.4	10.6
50	4.2	4.6	5.0	5.3	6.3	7.0	7.9	8.8	9.5
75	3.9	4.5	4.8	5.2	6.1	6.7	7.7	8.5	8.9
100	3.9	4.5	4.8	5.2	5.9	6.5	7.6	8.3	8.7
125	3.9	4.5	4.8	5.1	5.9	6.4	7.6	8.2	8.5
150	3.6	4.5	4.5	5.1	5.8	6.4	7.5	8.2	8.4
Tangent	3.6	4.2	4.2	5.0	5.5	6.1	7.3	7.9	7.9
Width modification regarding edge treatment									
No stabilized shoulder	None			None			None		
Sloping curb	None			None			None		
Vertical curb:									
one side	Add 0.3 m			None			Add 0.3 m		
two sides	Add 0.6 m			Add 0.3 m			Add 0.6 m		
Stabilized shoulder, one or both sides	Lane width for conditions B & C on tangent may be reduced to 3.6 m where shoulder is 1.2 m or wider			Deduct shoulder width; minimum pavement width as under Case I			Deduct 0.6 where shoulder is 1.2 m or wider		

Note: A = predominantly P vehicles, but some consideration for SU trucks.
B = sufficient SU vehicles to govern design, but some consideration for semitrailer combination trucks.
C = sufficient bus and combination-trucks to govern design.

US Customary

Radius on inner edge of pavement R (ft)	Pavement width (ft)								
	Case I One-lane, one-way operation—no provision for passing a stalled vehicle			Case II One-lane, one-way operation—with provision for passing a stalled vehicle			Case III Two-lane operation—either one-way or two-way		
	Design traffic conditions								
	A	B	C	A	B	C	A	B	C
50	18	18	23	20	26	30	31	36	45
75	16	17	20	19	23	27	29	33	38
100	15	16	18	18	22	25	28	31	35
150	14	15	17	18	21	23	26	29	32
200	13	15	16	17	20	22	26	28	30
300	13	15	15	17	20	22	25	28	29
400	13	15	15	17	19	21	25	27	28
500	12	15	15	17	19	21	25	27	28
Tangent	12	14	14	17	18	20	24	26	26
Width modification regarding edge treatment									
No stabilized shoulder	None			None			None		
Sloping curb	None			None			None		
Vertical curb:									
one side	Add 1 ft			None			Add 1 ft		
two sides	Add 2 ft			Add 1 ft			Add 2 ft		
Stabilized shoulder, one or both sides	Lane width for conditions B & C on tangent may be reduced to 12 ft where shoulder is 4 ft or wider			Deduct shoulder width; minimum pavement width as under Case I			Deduct 2 ft where shoulder is 4 ft or wider		

Note: A = predominantly P vehicles, but some consideration for SU trucks.
B = sufficient SU vehicles to govern design, but some consideration for semitrailer combination trucks.
C = sufficient bus and combination-trucks to govern design.

Exhibit 10-67. Design Widths for Turning Roadways

ALT. NO. 16 Sht 5 of 7

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **16**

SHEET NO.: **6 of 7**

Ramp paved area saved with 4 ft. concrete paved left shoulder and 8 ft. concrete paved right shoulder.

{[(10' + 6') – (8' + 4')] x (1,700' + 1,700' + 1,800' + 1,600')}/9sf/sy = 3,022 SY

See Pavement unit costs SECTION for these calculations.

Full Depth Concrete Pave unit cost = $77.60/SY

Fuel and Liquid asphalt adjustments = $17.51/SY

Total Unit cost = $95.11/SY

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **16**
SHEET NO.: **7 of 7**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original cost saved:							
Concrete Pavement saved	SY	3,022.00	$95.11	$287,422			
Subtotal				$287,422			
Markup (%) at 8.0%				$22,994			
TOTAL				$310,416			
TOTAL (ROUNDED)				$310,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **17**

DESCRIPTION: **REDUCE THE WIDTH OF THE MEDIAN FROM 24 FT. WIDE TO 20 FT. WIDE**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

The original design includes the West Winder Bypass designed with a 24-ft.-wide median.

ALTERNATIVE: (sketch attached)

Reduce the width of the West Winder Bypass median to 20 ft. wide.

ADVANTAGES:

- Reduces right-of-way requirements
- Allows bridges to be narrowed reducing both initial material and labor requirements and long-term maintenance requirements

DISADVANTAGES:

- None apparent

DISCUSSION:

Using a narrower median will result in a significant reduction in material and labor requirements for the project. Numerous projects in Georgia are being designed with the 20-ft.-wide median to achieve the cost avoidance without sacrificing functionality.

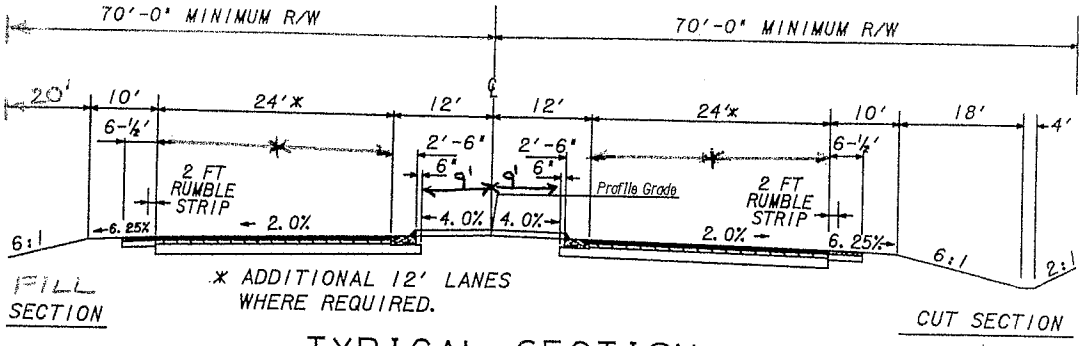
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 935,000	—	$ 935,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 935,000	—	$ 935,000

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: 17

☒ AS DESIGNED ☒ ALTERNATIVE

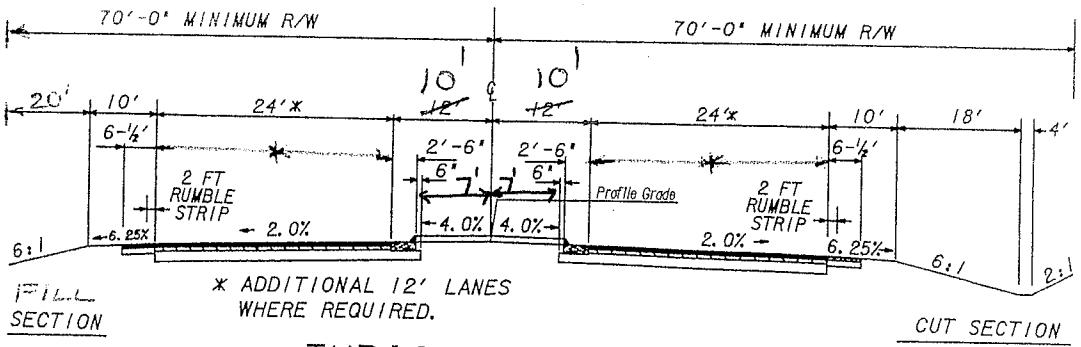
SHEET NO.: 2 of 3



TYPICAL SECTION

NOT TO SCALE

AS-DESIGNED



TYPICAL SECTION

NOT TO SCALE

ALTERNATE

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **17**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge Savings							
Bridge over SR 316 (290' x 4')	SF	1,160	100.00	116,000			
Bridge over SR 8, CSX, Bankhead							
(456' x 4')	SF	1,824	100.00	182,400			
Subtotal Construction				298,400			
Markup at 8%				23,872			
Total Construction				322,272			
Right-of-Way Savings							
Commercial (19,000' x 4' x .7)	SF	53,200	4.00	212,800			
Residential (19,000' x 4' x .3)	SF	22,800	1.50	34,200			
Subtotal Right-of-Way				247,000			
Markup @ 148%				365,560			
Total Right-of-Way				612,560			
Subtotal				934,832			
Markup (%) at				Included			
TOTAL				934,832			
TOTAL (ROUNDED)				935,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **18**

DESCRIPTION: **USE 4-FT.-WIDE OUTSIDE PAVED SHOULDERS IN LIEU OF 6.5-FT.-WIDE OUTSIDE PAVED SHOULDERS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The original design proposes 6.5-ft.-wide outside paved shoulders.

ALTERNATIVE: (sketch attached)

Use 4-ft.-wide outside paved shoulders.

ADVANTAGES:

- Reduces construction requirements
- Reduces imperious paved area of storm water runoff

DISADVANTAGES:

- Narrower paved shoulder

DISCUSSION:

Since this county road route is not a bicycle route, a 4-ft.-wide paved shoulder is sufficient for an arterial type highway as long as the graded shoulder width is 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 418,000	—	$ 418,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 418,000	—	$ 418,000

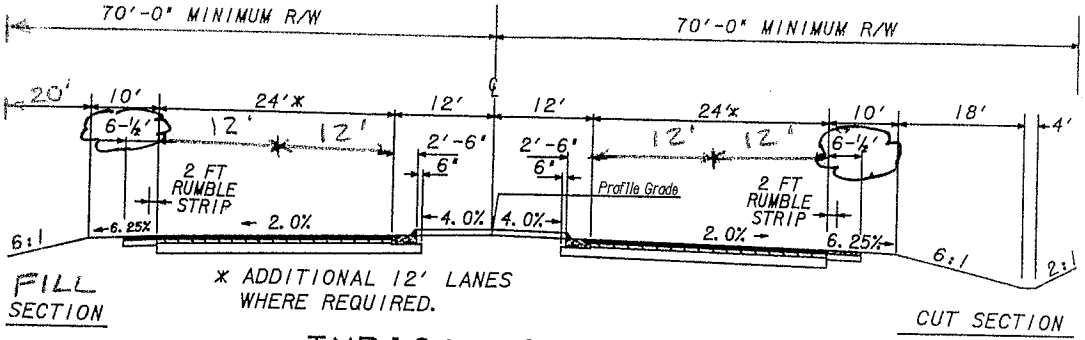
PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: 18

☑ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 2 of 4

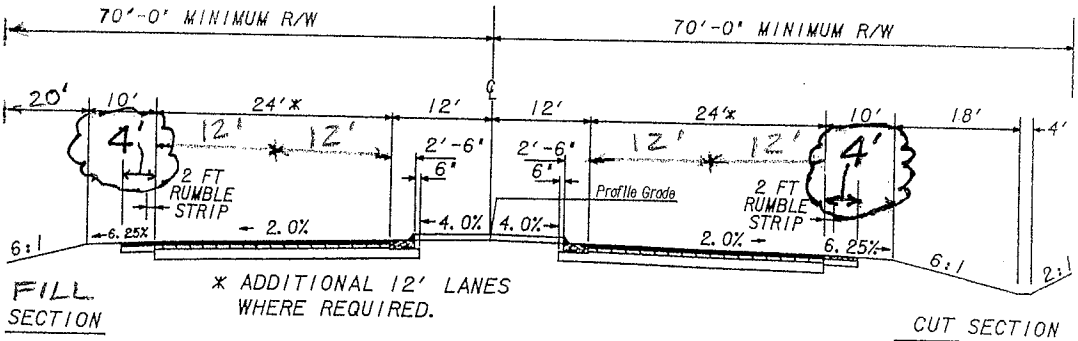
Original Design (6.5' Paved Shldr)



TYPICAL SECTION

NOT TO SCALE

(4' Paved Shoulder) Alternate Design



TYPICAL SECTION

NOT TO SCALE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **18**

SHEET NO.: **3 of 4**

Alternate design is to use a 4 ft paved outside shoulder in lieu of a 6.5 ft outside paved shoulder.

Outside Paved shoulder saved: [(6.5' – 4') x 2 shoulders x 5 mi x 5,280'/mi]/9sf/sy = 14,667 SY

Asphalt Shoulder Pavement Section Unit Cost = $19.70/SY (see Pavement Unit Cost calculations)

see Fuel Adjustment and Liquid AC Adjustment factor Calculations for #/SY of pavement

Adjustment for shoulders = 41 % of Full-depth Pavement Fuel &Liquid AC Adjustments x $16.03 = $6.57/sy

Total shoulder pavement unit cost = $19.70/SY + $6.69/sy = $26.39/SY

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **18**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved							
Shoulder pavement section	SY	14,667.00	$26.39	$387,062			
Subtotal				$387,062			
Markup (%) at 8.0%				$30,965			
TOTAL				$418,027			
TOTAL (ROUNDED)				$418,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **19**

DESCRIPTION: **USE VERTICAL BRIDGE ABUTMENTS IN LIEU OF SLOPE PAVING**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design has 60 ft. end spans with slope pavement for the two West Winder Bypass bridges.

ALTERNATIVE: (sketch attached)

Replace the 60 ft. end spans and slope pavement with vertical abutments and retaining walls.

ADVANTAGES:

- Reduces bridge labor and material requirements
- Reduces the bridge length by 120 ft. (2 spans @ 60 ft.) saving long-term maintenance requirements

DISADVANTAGES:

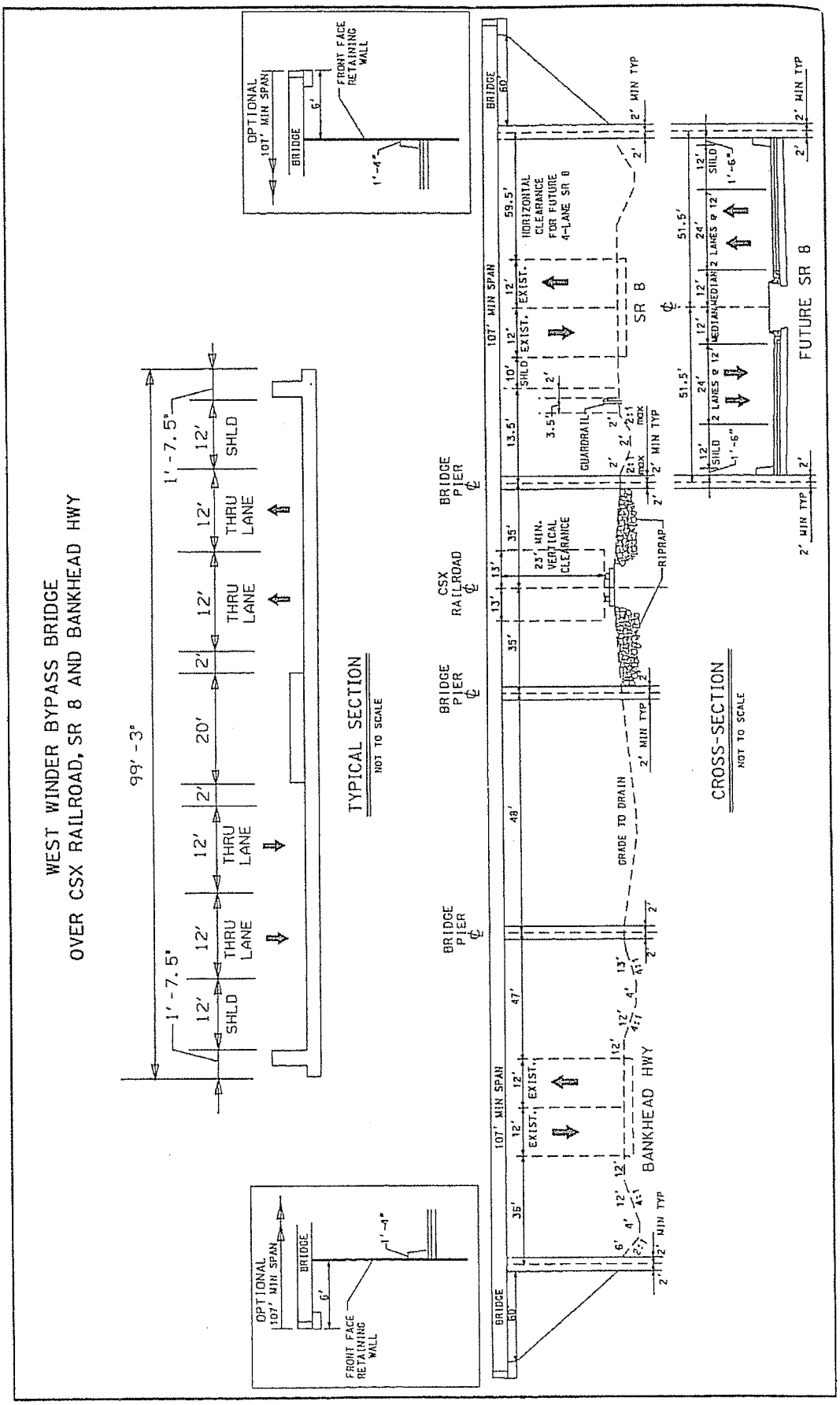
- Additional retaining wall construction in front of end bents is required with its long-term maintenance requirements

DISCUSSION:

Removing the 60 ft. end spans and the slope pavement saves 120 ft. of bridge length. There is plenty of horizontal clearance at both bridge ends, even with the future SR 8 lanes (with 12 ft. shoulders). Additional retaining walls will be constructed in front of the end bents.

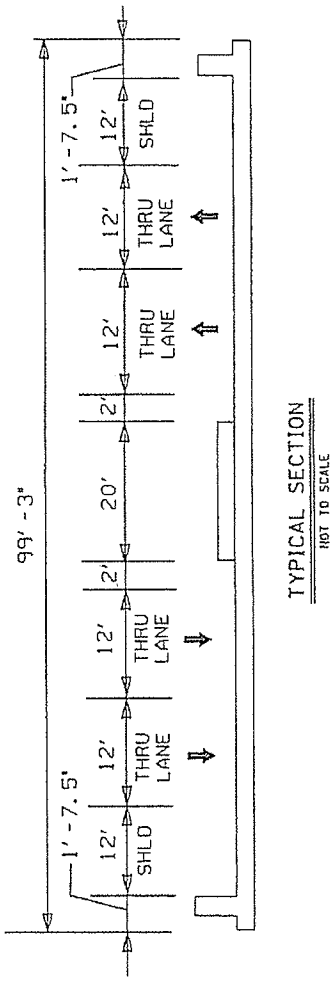
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 7,997,000	—	$ 7,997,000
ALTERNATIVE	$ 6,778,000	—	$ 6,778,000
SAVINGS (Original minus Alternative)	$ 1,219,000	—	$ 1,219,000

ALT NO. 19 Sht. 2 of 5

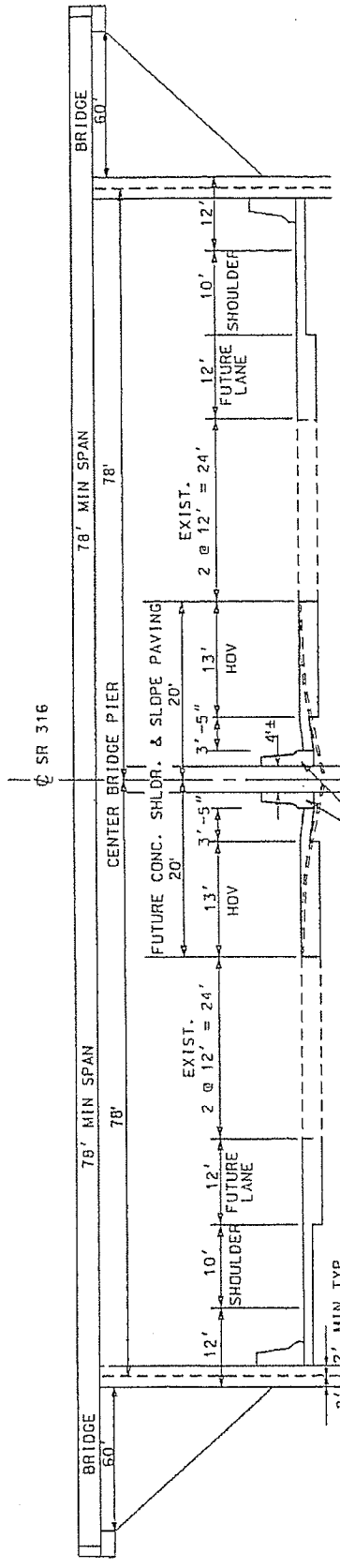


ALT. NO. 19
Sht. 3 of 5

WEST WINDER BYPASS BRIDGE OVER SR 316



TYPICAL SECTION
NOT TO SCALE



CROSS-SECTION
NOT TO SCALE

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **19**
SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Conc. Bridge (Concept)(SR 316)	SF	28,783	100.00	2,878,300			
Conc. Bridge (Concept)(SR 316)	SF				16,873	100.00	1,687,300
MSE Wall 20-30 Ht. in front of bent							
Say wall is 25' high at 2 End Bents	SF				4,962	58.36	289,582
Wall taper outside bridge							
Say 25' x 50' = 1250 SF (for 2 ends)	SF				1,250	58.36	72,950
Foundation Backfill Material							
North Side End Bent Only							
60' x 25'/2 x 99.25' = 74,437.5 CF	CY				2,757	54.60	150,532
Concrete Pavement - 40'							
40' x 99.25' x 2 = 7940 SF	SY				883	52.84	46,658
Subtotal				2,878,300			2,247,022
Markup (%) at 8.0%				230,264			179,762
TOTAL				3,108,564			2,426,784
TOTAL (ROUNDED)				3,109,000			2,427,000

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **19**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Conc. Bridge (Concept)(RR)	SF	45,258	100.00	4,525,800			
Conc. Bridge (Concept)(RR)	SF				33,348	100.00	3,334,800
North End Bent - Wrap EB with Wall							
MSE Wall 20-30 Ht. in front of bent	SF						
99.25'+1'+1'+3'+3'=107.25'							
Say wall is 30' high at End Bent	SF				3,217	58.36	187,744
South End Bent							
MSE Wall 20-30 Ht. in front of bent							
Say wall is 30' high at End Bent	SF				2,978	58.36	173,796
Wall taper outside bridge							
Say 30' x 60' = 1800 SF (for 2 ends)	SF				1,800	58.36	105,048
Foundation Backfill Material							
North Side End Bent Only							
60' x 30'/2 x 99.25' = 89,325 CF	CY				3,309	54.60	180,671
Concrete Pavement - 40'							
40' x 99.25' x 2 = 7940 SF	SY				883	52.84	46,658
Subtotal				4,525,800			4,028,717
Markup (%) at 8.0%				362,064			322,297
TOTAL				4,887,864			4,351,014
TOTAL (ROUNDED)				4,888,000			4,351,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **24**

DESCRIPTION: **USE A PARTIAL CLOVERLEAF INTERCHANGE FOR THE WEST WINDER BYPASS AND SR 316 CONNECTION IN LIEU OF A DIAMOND INTERCHANGE**

ORIGINAL DESIGN: (sketch attached)

The original design for the West Winder Bypass and SR 316 interchange is a diamond configuration.

ALTERNATIVE: (sketch attached)

Realign the West Winder Bypass to cross over SR 316 closer to the current alignment of Patrick Mill Road and use a partial cloverleaf interchange in lieu of a diamond interchange. Widen the bridge over SR 316 by 12 ft. to accommodate an acceleration/deceleration lane for the loop ramps.

ADVANTAGES:

- Reduces right-of-way requirements
- Eliminates impacts to properties on the west side of existing Patrick Mill Road
- Converts the main PM left turn movement from the SR 316 eastbound off-ramp to northbound on the West Winder Bypass to a free right turn from the loop ramp

DISADVANTAGES:

- Increases construction material and labor requirements
- Requires a slightly longer and wider bridge with associated additional maintenance
- Requires a heavy AM left turn movement from southbound on the West Winder Bypass to the loop ramp to SR 316 westbound which may require two left turn lanes and two receiving lanes on the ramp

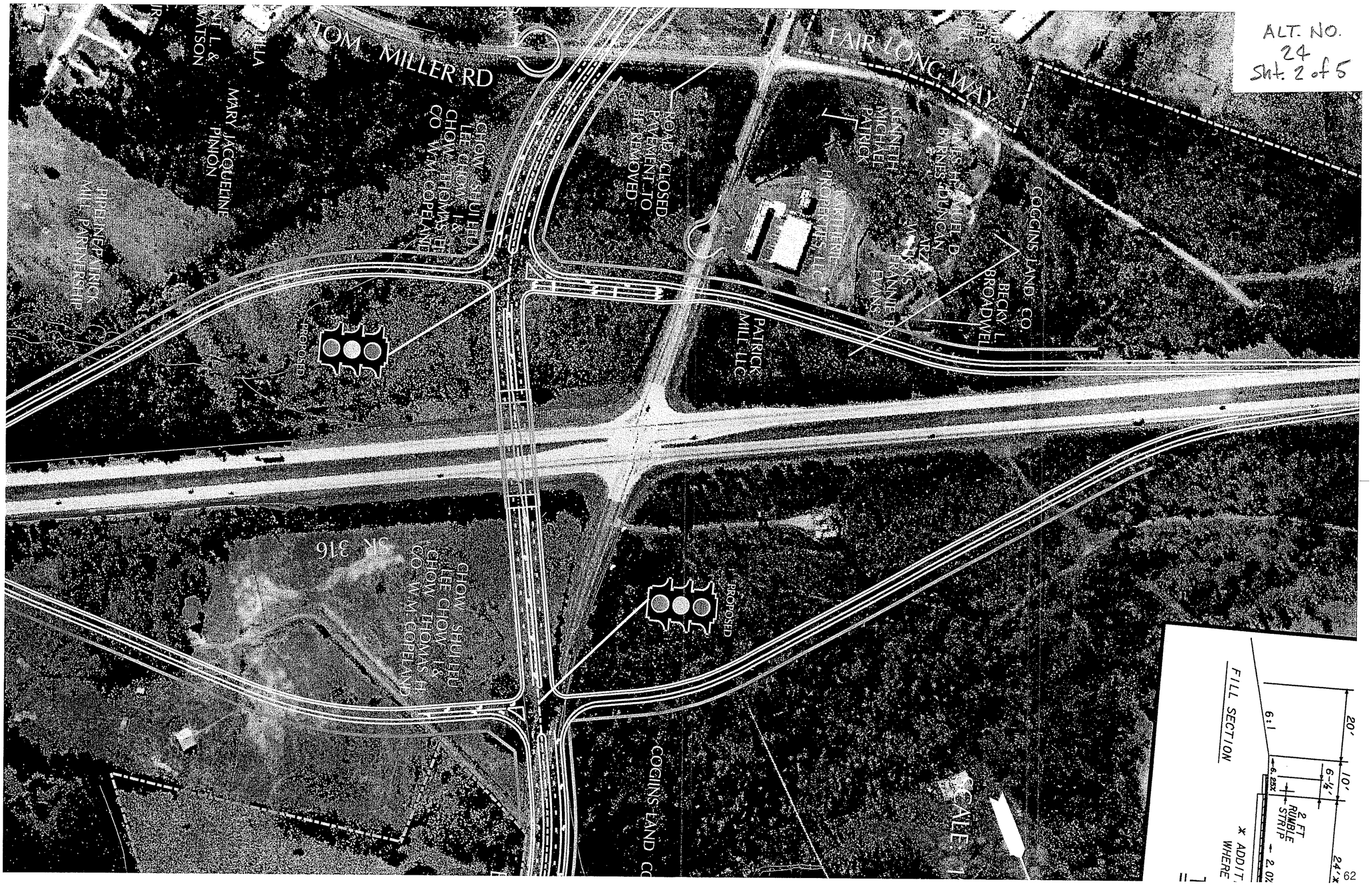
DISCUSSION:

The partial cloverleaf interchange requires slightly more right-of-way in the southeast quadrant to accommodate the loop ramp. However, all the right-of-way for the diamond interchange in the northwest and southwest quadrants is saved. All of the saved right-of-way is zoned industrial/commercial from the Barrow County Parcel information website. The additional right-of-way required for the partial cloverleaf interchange is zoned residential. The net result is a significant cost reduction.

This design would eliminate the left turning movement for traffic returning from Atlanta and traveling to West Winder Bypass and replace it with a free right turn. However, vehicles desiring to travel towards Atlanta would have to make a left turn onto the loop ramp.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 7,939,000	—	$ 7,939,000
ALTERNATIVE	$ 1,210,000	—	$ 1,210,000
SAVINGS (Original minus Alternative)	$ 6,180,000	—	$ 6,180,000

ALT. NO. 24
Sht. 2 of 5



ALT. NO.
24
Sht. 3 of 5

MILLER RD

75'R

R/W

R/W

SKEW=81°30'

6.5%

250'R

250'R

R/W

WEST
PROJECT
P.I.
BAD

ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **24**

SHEET NO.: **4 of 5**

Additional alternate design Costs:

Original Design for Bridge over SR 316 = (290' x 99.25') = 28,783 sf

Alternate-24 Design for Bridge over SR 316 = [(290' + 24')/Sin 81°30'] x 111.25') = 35,321 sf

Alternate bridge is longer in order to span the two loop ramps acceleration and deceleration lanes and the bridge is on an 81°30' skew.

Additional Alternate bridge area = (35,321 sf – 28,783 sf) = 6,538 sf Use $100/sf for bridge unit cost

Additional R/w required in the SE quadrant (THOMAS H. CHOW, SHIU CHOW) =

[(850' x 150') + (700' x 150'/2) – (550' x 200'/2)] = 125,000 sf

R/W unit cost = $1.50/sf for residential (Zoning from Barrow County Parcel info website)

Additional pavement for lane between ramps on Patrick Mill Rd = (12' x 450')/9sf/sy = 600 SY

Original costs saved:

R/W saved in SW quadrant (1,100' x 350'/2) + (550' x 50'/2) = 206,250 sf

R/W saved in NW quadrant (900' x 250') + (1200' x 500'/2) + (550 x 50'/2) = 538,750 sf

Total commercial R/W saved = 745,000 sf

There is basically not a difference in the ramp costs since the Loop ramps are shorter but they are wider in the single lane portion (20' vs. 16').

R/W unit costs: Use commercial/industrial (Zoning from Barrow County Parcel info website) value of $4/sf

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **24**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original Costs saved:							
Commerical Land saved	sf	745,000	4.00	2,980,000			
R/W Markup	%	148%	2,980,000	4,410,400			
Additonal Alternate costs							
Additonal bridge area required	sf				6,538	100.00	653,800
additional pavement					600	60.56	36,336
Engineering & Construction Mkup	%				8%	690,136.00	55,211
Additional residential R/W	sf				125,000	1.50	187,500
R/W Markup	%				148%	187,500.00	277,500
Subtotal				7,390,400			1,210,347
Markup (%) at							
TOTAL				7,390,400			1,210,347
TOTAL (ROUNDED)				7,390,000			1,210,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **25**

DESCRIPTION: **REMOVE THE MIDDLE PIER ON THE BRIDGE OVER BANKHEAD HIGHWAY, THE CSX RAILROAD, AND SR 8**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design has six spans of 60 ft., 107 ft., 48 ft., 70 ft., 107 ft. and 60 ft. for the West Winder Bypass bridge over Bankhead Highway, the CSX Railroad, and SR 8.

ALTERNATIVE: (sketch attached)

Remove the middle pier creating five spans of 60 ft., 107 ft., 118 ft., 107 ft. and 60 ft.

ADVANTAGES:

- Eliminates one pier
- Decreases construction time

DISADVANTAGES:

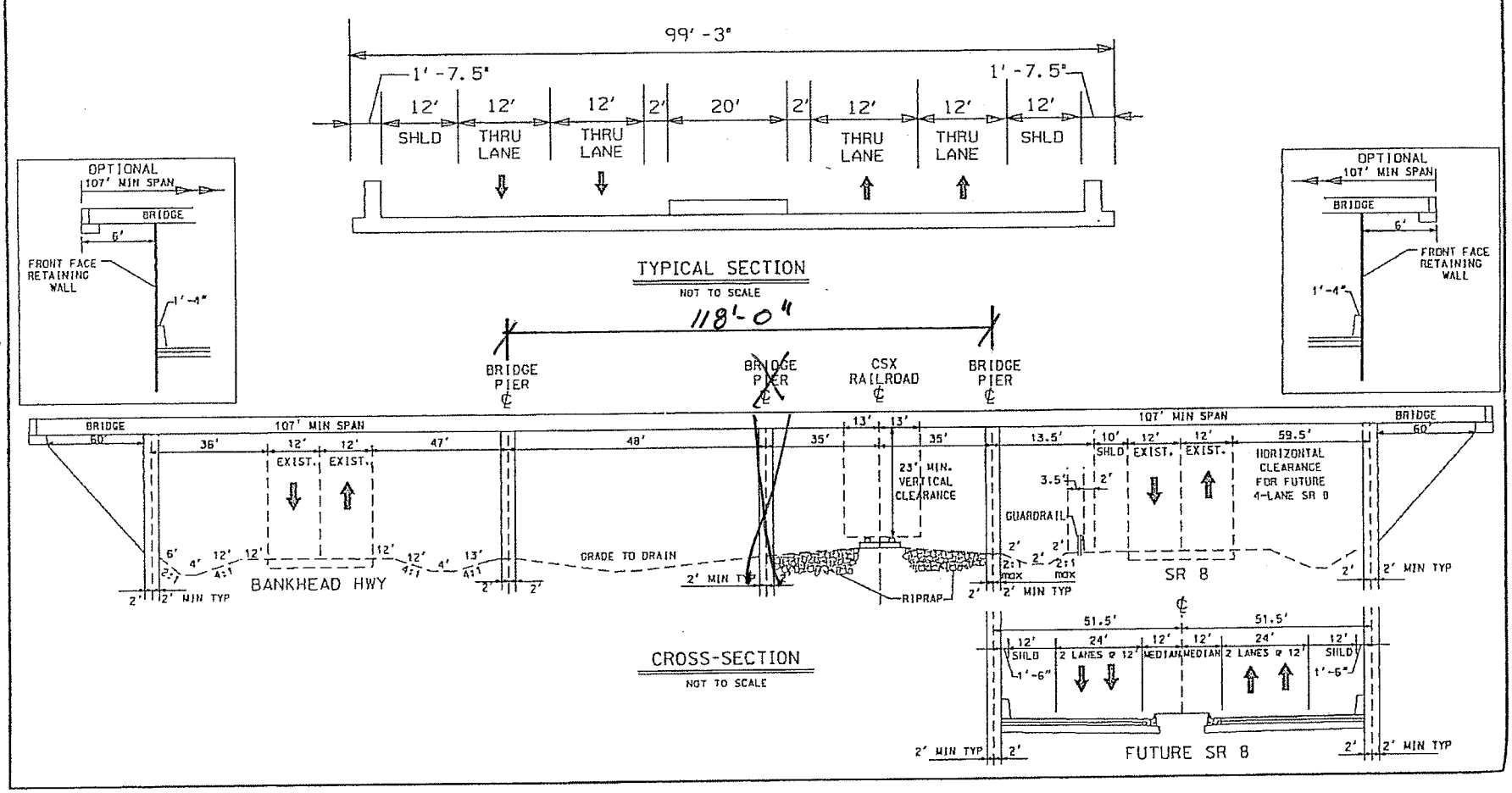
- None apparent

DISCUSSION:

Removing the middle pier on the bridge near the railroad will create a 118-ft.-long middle span (48 ft. + 70 ft.), creating more horizontal clearance to the railroad. The removal of the pier will also decrease the construction time. The engineer will still be able to use the same beam type for the 107 ft. spans as the 118 ft. span, probably a Type IV beam.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 160,000	—	$ 160,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 160,000	—	$ 160,000

WEST WINDER BYPASS BRIDGE
OVER CSX RAILROAD, SR 8 AND BANKHEAD HWY



ALT. NO 25
Sht. 2 of 5

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

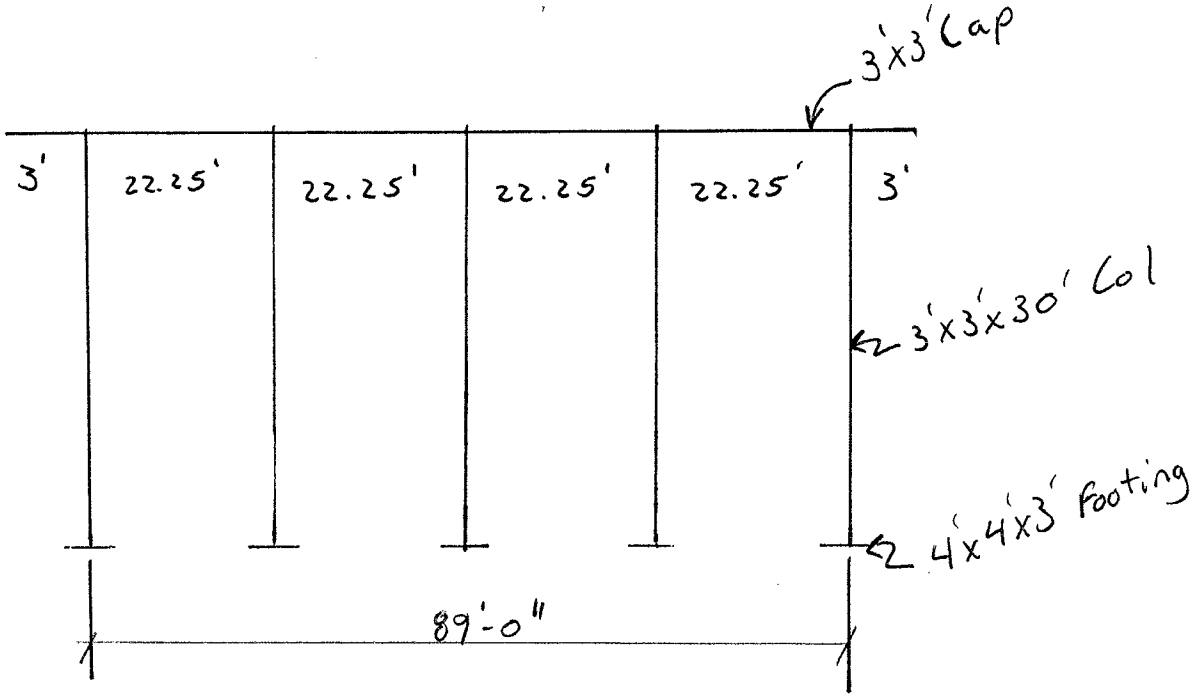
ALTERNATIVE NO.: 25

☐ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 3 of 5

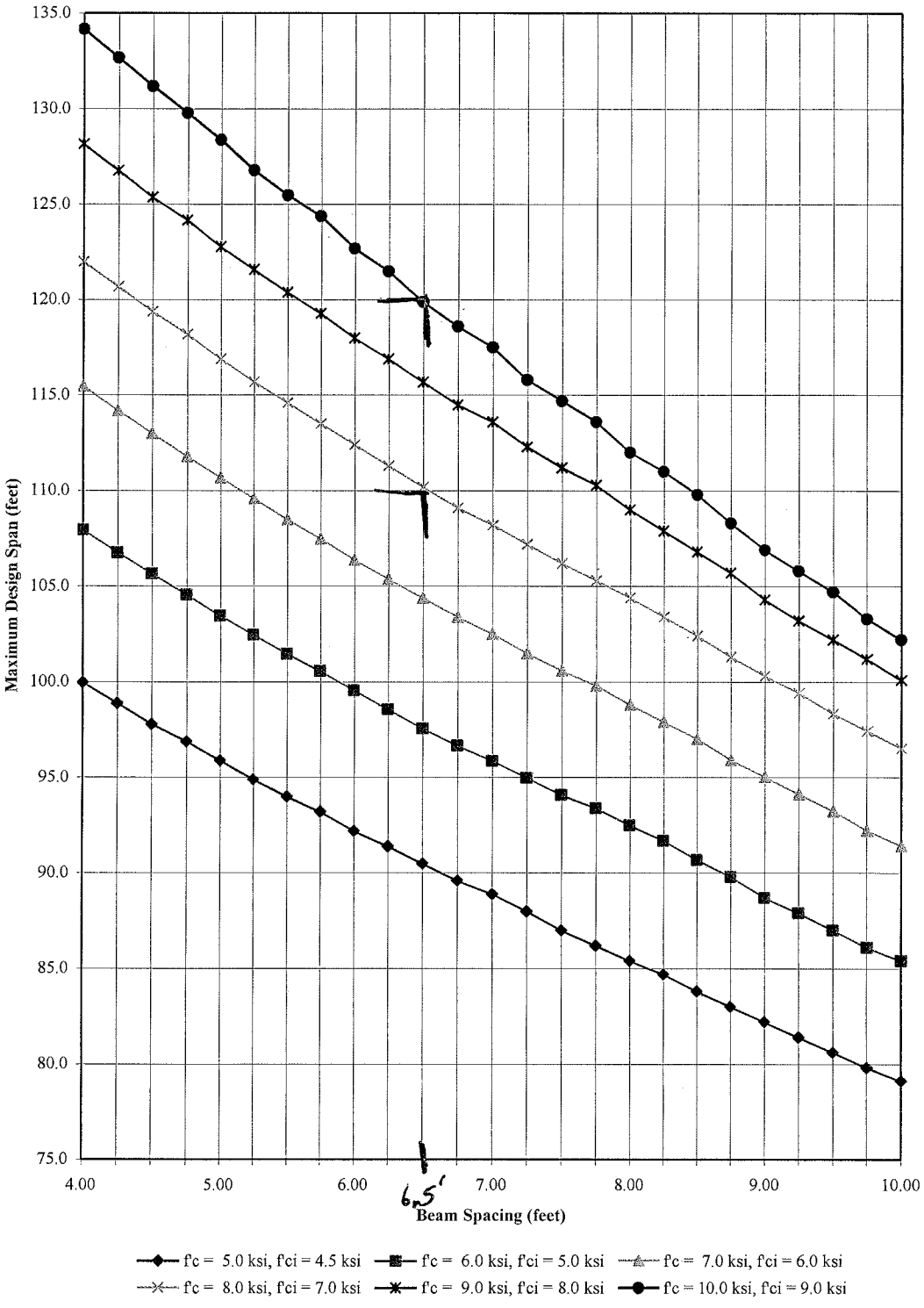
Remove Middle Pier on Bridge Over Railroad.

- Calculate number of beams
  - Say 14 spaces at 6.5' = 91'
  - Overhang = (99.25' - 91')/2 = 4.125' = 4'-1½"
  - Cap width = 91' + 2' + 2' = 95'



ALT. NO. 25 Sht. 4 of 5

Type IV PSC Beam



118'

107'

6.5'

Figure 3-7

All strands are ½" diameter low relaxation strands each stressed to 33,818 pounds.

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **25**
SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Remove middle pier of bridge							
over railroad.							
Concrete Cap							
3' x 3' x 95' = 855 CF	CY	32	491.00	15,712			
Concrete Column							
3' x 3' x 30' x 5 Cols = 1350 CF	CY	50	491.00	24,550			
Concrete Footing							
4' x 4' x 3' x 5 footings = 240 CF	CY	9	491.00	4,419			
Reinforcing Steel							
91 CY x 200 lb/CY = 18,200 lbs	LB	18,200	0.60	10,920			
Steel Piling HP 14 x 73							
Say 40' long, 5 piles per footing							
5 piles x 5 footings x 40' = 1000'	LF	1,000	42.50	42,500			
Subtotal				98,101			
Markup (%) at 8.0%				7,848			
TOTAL				105,949			
TOTAL (ROUNDED)				106,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **26**

DESCRIPTION: **USE 10-FT.-WIDE SHOULDERS ON BRIDGES IN LIEU OF 12-FT.-WIDE SHOULDERS**

ORIGINAL DESIGN: (sketch attached)

The original design uses 12-ft.-wide shoulders on the bridges.

ALTERNATIVE: (sketch attached)

Use 10-ft.-wide shoulders on the bridges.

ADVANTAGES:

- Reduces the bridge width by 4 ft.
- Reduces long-term bridge maintenance requirements
- Reduces storm water volume on bridge

DISADVANTAGES:

- None apparent

DISCUSSION:

Reducing the shoulders to 10 ft. wide will reduce the bridge width by 4 ft. to 95 ft. 3 in. A 10-ft.-wide shoulder is appropriate per AASHTO guidelines and the GDOT standard guidelines which indicate that the width of the bridge shoulders should match the roadway shoulder width, which in this case is 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 7,997,000	—	$ 7,997,000
ALTERNATIVE	$ 7,674,000	—	$ 7,674,000
SAVINGS (Original minus Alternative)	$ 323,000	—	$ 323,000

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **26**

SHEET NO.: **2 of 2**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Conc. Bridge (Concept)(RR)	SF	45,258	100.00	4,525,800			
Conc. Bridge (Concept)(RR)	SF				43,434	100.00	4,343,400
95.25' x 456' = 43,434 SF							
Conc. Bridge (Concept)(SR 316)	SF	28,783	100.00	2,878,300			
Conc. Bridge (Concept)(SR 316)	SF				27,622	100.00	2,762,200
95.25' x 290' = 27,622 SF							
Subtotal				7,404,100			7,105,600
Markup (%) at 8.0%				592,328			568,448
TOTAL				7,996,428			7,674,048
TOTAL (ROUNDED)				7,996,000			7,674,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **28**

DESCRIPTION: **REDUCE THE LENGTH OF THE BRIDGE OVER BANKHEAD HIGHWAY, THE CSX RAILROAD, AND SR 8 BY 22 FT. 6 IN.**

ORIGINAL DESIGN: (sketch attached)

The original design has 36 ft. clear from the edge of pavement to the southern pier of the West Winder Bypass Bridge over Bankhead Highway, the CSX Railroad, and SR 8.

ALTERNATIVE: (sketch attached)

Move the southern bridge end 22.5 ft. north, putting the pier on the shoulder edge of Bankhead Highway.

ADVANTAGES:

- Reduces the bridge length 22 ft. 6 in.
- Reduces long-term bridge maintenance

DISADVANTAGES:

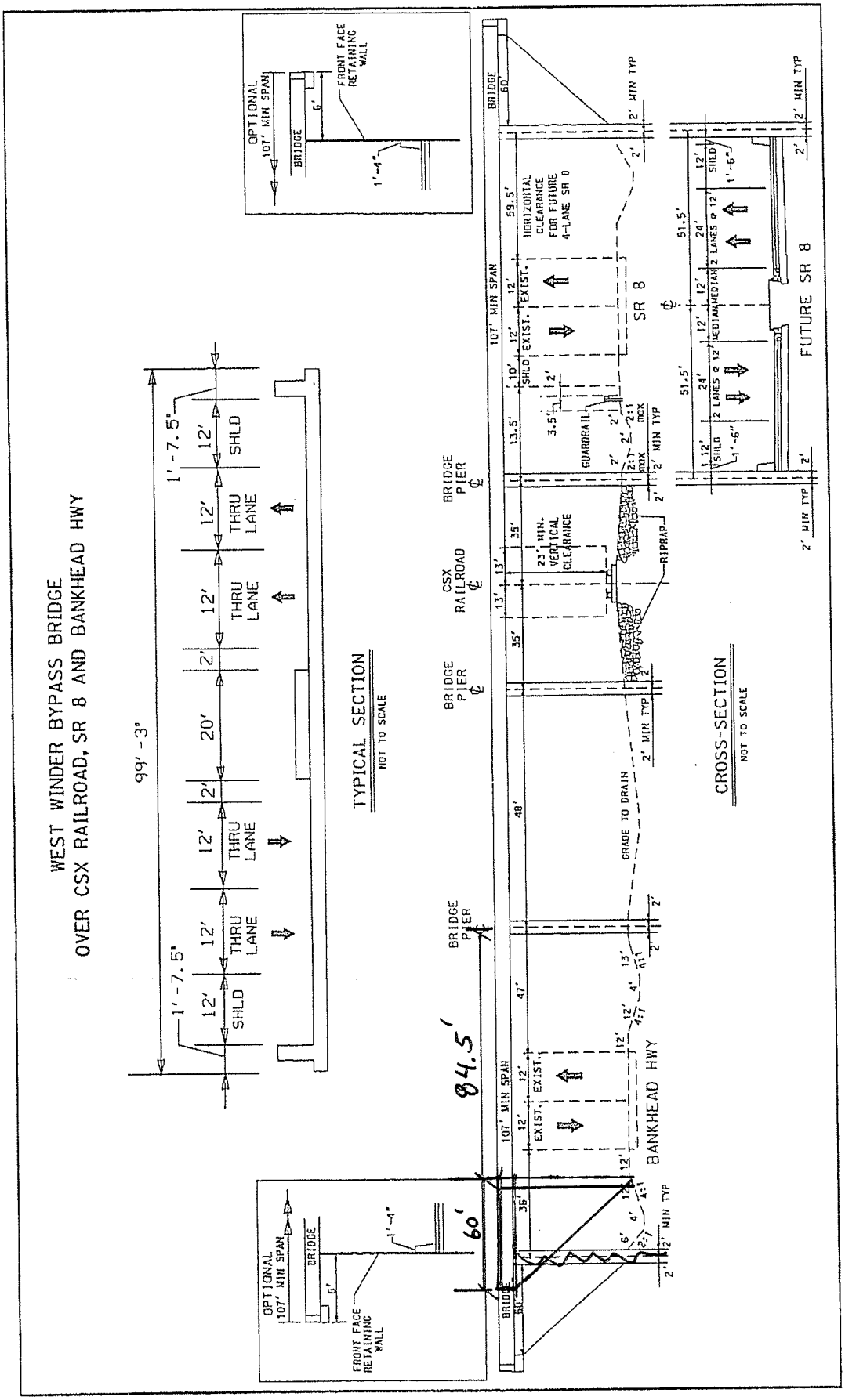
- None apparent

DISCUSSION:

Moving the southern bridge end north will reduce the bridge length 22 ft. 6 in. This section will be similar to the future SR 8 section with the piers on the edge of the shoulder. There is a need for a 12 ft. shoulder and 1.5 ft. traffic barrier, resulting in a 13.5 ft. clear distance for the roadway to the bridge abutment. From the existing contours it appears that no fill will be required.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,888,000	—	$ 4,888,000
ALTERNATIVE	$ 4,647,000	—	$ 4,647,000
SAVINGS (Original minus Alternative)	$ 241,000	—	$ 241,000

ALT. NO. 28
Sht. 2 of 3



COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **28**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Conc. Bridge (Concept)(RR)	SF	45,258	100.00	4,525,800			
Conc. Bridge (Concept)(RR)	SF				43,025	100.00	4,302,500
433.5' x 99.25' = 43, 025 SF							
Subtotal				4,525,800			4,302,500
Markup (%) at 8.0%				362,064			344,200
TOTAL				4,887,864			4,646,700
TOTAL (ROUNDED)				4,888,000			4,647,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **33**

DESCRIPTION: **USE 4:1 SLOPES WHERE 6:1 SLOPES ARE BEING USED TO SAVE RIGHT-OF-WAY ACQUISTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The current design proposed 6:1 slopes for all cut (ditch) sections and for shallow fills (usually 4 ft or less).

ALTERNATIVE: (sketch attached)

Use 4:1 slopes for all cut (ditch sections) and for shallow fills (usually 5 ft. or less).

ADVANTAGES:

- Reduces earthwork quantities
- Reduces right-of-way requirements

DISADVANTAGES:

- None for a 45 mph design speed

DISCUSSION:

The design speed for Patrick Mill Road is 45 mph, therefore 4:1 slopes meet the design requirements for clear zone and recovery area for vehicles leaving the roadway. This typical section provides 26 ft. (10 ft. + 12 ft. + 4 ft.) of clear zone, which is in the desirable range for 45 mph design speed and 4:1 slopes. This alternate typical section would save 12 ft. of right-of-way where 6:1 slopes are used in cut sections and shallow fills. The length of right-of-way saved in this cost comparison is estimated since there are no earthwork cross-sections available at this time.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,718,000	—	$ 1,718,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 1,718,000	—	$ 1,718,000

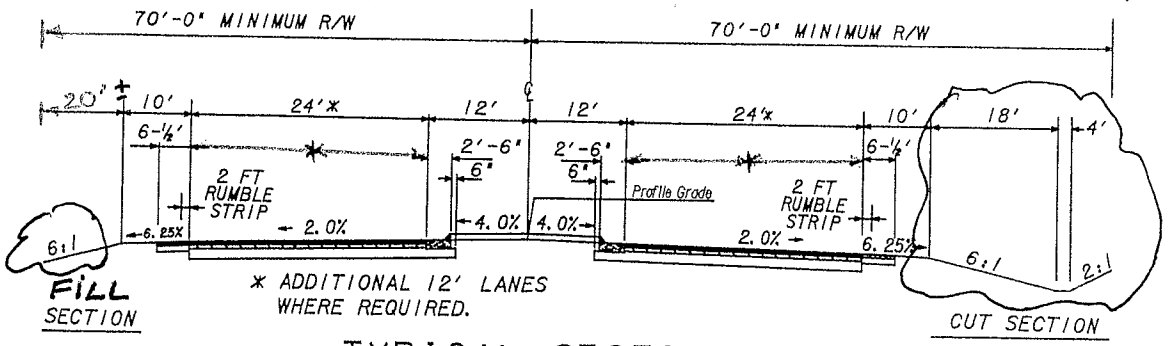
PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: 33

☑ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 2 of 4

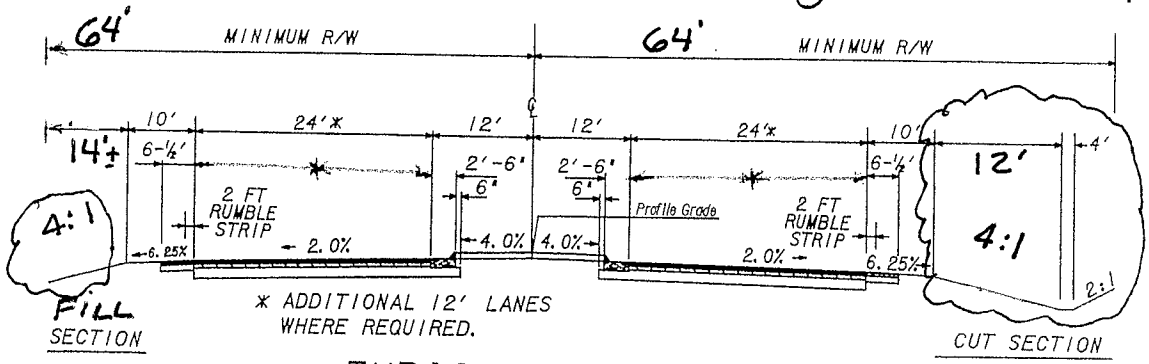
Original Design (6:1 slopes)



TYPICAL SECTION

NOT TO SCALE

Alternate Design (4:1 slopes)



TYPICAL SECTION

NOT TO SCALE

(Will save 12' of R/W±)

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **33**

SHEET NO.: **3 of 4**

The length of project is approximately 5 miles or 26,400 ft.

It is assumed that the sections of roadway sections approaching both bridges (interchange and over CSX railroad) will be retained by walls. This will reduce the length for R/W savings by approximately (1,400 ft + 2,600 ft) 4,000 ft.

R/W area saved: [(26,400'– 4,000') bridge areas) x (6'+6')] x .75 (estimated 75% in cut or shallow fills) = 201,600sf

Weighted R/W unit cost computed from GaDOT R/W estimate:

= [(3,070,143sf/5,741,107sf) x $4/sf] + [(190,170sf/5,741,107sf) x $8/sf] + [(33,227sf/5,741,107sf) x $1.5/sf] +

[(2,446,567/5,741,107) x $.50/sf = $2.63/sf

Estimated to save 20% of R/W damages and cost to cure (based on 12'/60' average additional R/W required)

R/W damages and cost to cure = $205,000

$205,000 x .20 (20%) = $41,000

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**

CSSTP-0006-00(327); P.I. No. 0006327

Barrow County, GA

ALTERNATIVE NO.: **33**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Earthwork saved in fills	LUMP	7%	3,950,130	276,509			
Engineering & construction Mkup	LUMP	8%	276,509	22,121			
R/W saved:							
Land saved	sf	202,000	2.63	531,260			
Damages & cost to cure saved	Lump	20%	205,000.00	41,000			
R/W markup		148%	572,260.00	846,945			
Subtotal				1,717,835			
Markup (%) at				Included			
TOTAL				1,717,835			
TOTAL (ROUNDED)				1,718,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **34**

DESCRIPTION: **ELIMINATE THE TRAFFIC SIGNAL AT THE INTERSECTION OF BILL RUTLEDGE ROAD AND FRED KILCREASE ROAD**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (sketch attached)

The original design has a traffic signal at the intersection of Bill Rutledge Road and Fred Kilcrease Road.

ALTERNATIVE: (sketch attached)

Remove the traffic signal at the intersection of Bill Rutledge Road and Fred Kilcrease Road.

ADVANTAGES:

- Reduces construction cost
- Reduces maintenance costs

DISADVANTAGES:

- Level of service at the intersection is decreased

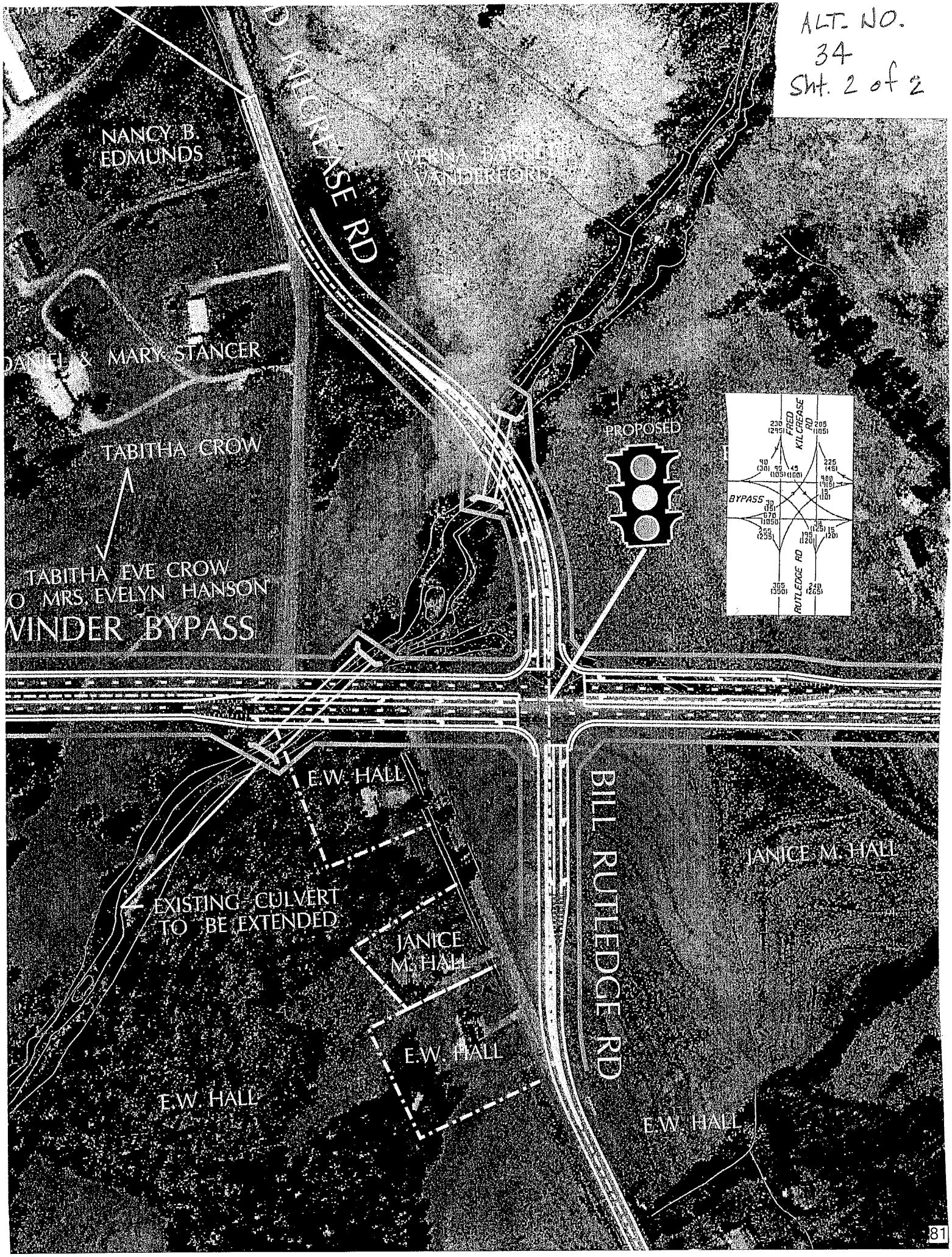
DISCUSSION:

Traffic counts are low at this intersection and there are traffic signals to the north and south that are close. The signals to the north and south will create a break in the traffic allowing traffic on Bill Rutledge Road and Fred Kilcrease Road to turn onto the bypass and traffic on the Bypass to turn left onto these streets.

The average cost of a traffic signal derived from the cost data is $127,000.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 127,000	—	$ 127,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 127,000	—	$ 127,000

ALT. NO.
34
Sht. 2 of 2



VALUE ENGINEERING ALTERNATIVE

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **35**

DESCRIPTION: **REDUCES TURN LANE STORAGE LENGTHS AT THE INTERSECTION OF CARL BETHLEHEM ROAD AND THE WEST WINDER BYPASS**

ORIGINAL DESIGN: (sketch attached)

The original design includes construction of 350 feet of turn lane storage length with 100 feet of taper on all left and right turn lanes at the intersection of Carl Bethlehem Road and the West Winder Bypass.

ALTERNATIVE: (sketch attached)

Construct 350 ft. of storage length with 100 ft. taper only on the northbound left turn lane going from the West Winder Bypass to Carl Bethlehem Road. For the other three left turn lanes, reduce storage length to 200 ft. with a 100 ft. taper. Reduce storage lengths on all right turn lanes from 350 ft. to 100 ft. and keep the 100 ft. tapers.

ADVANTAGES:

- Reduces pavement area
- Decreases in pavement area will cause a decrease in impervious area which will result in less storm water drainage infrastructure

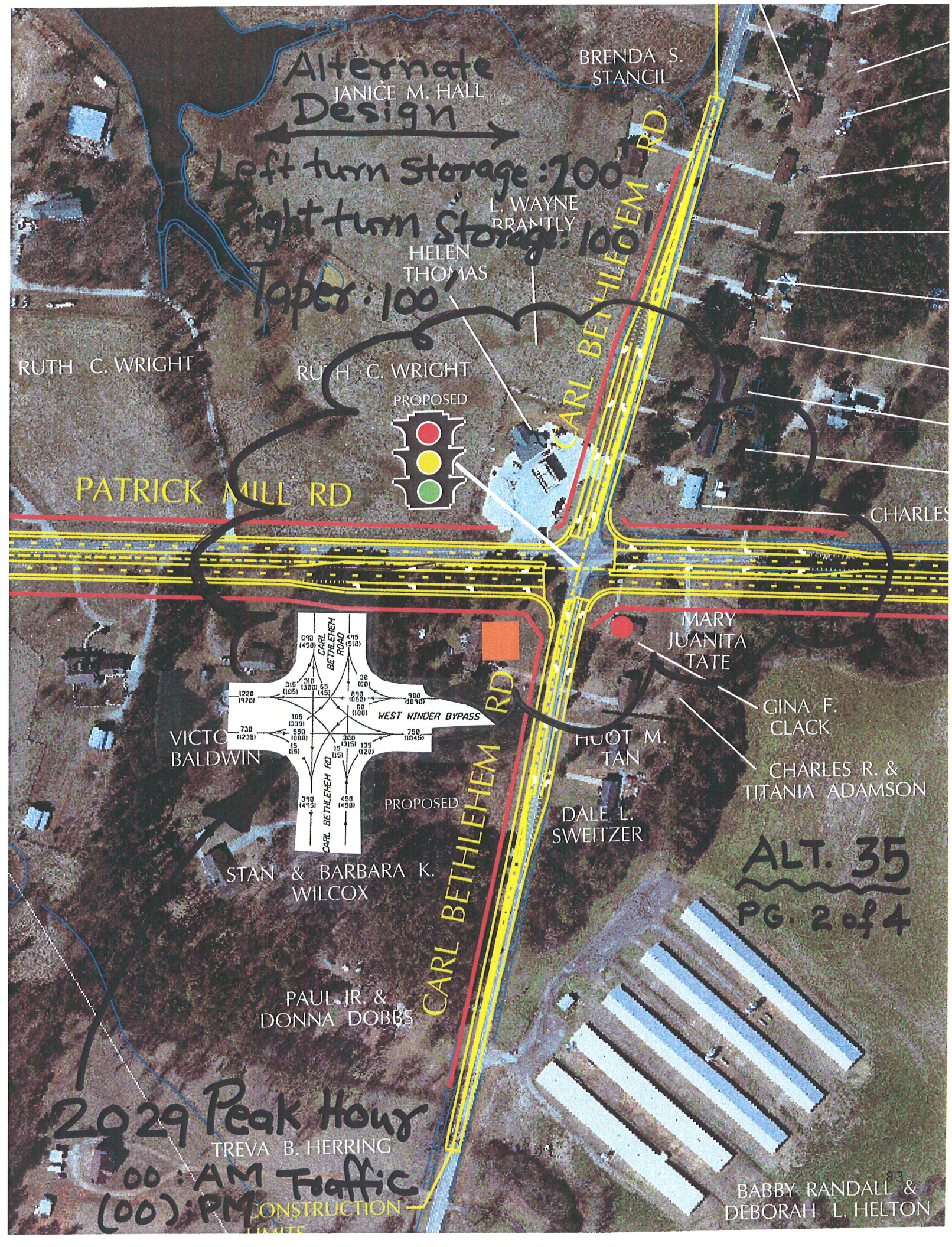
DISADVANTAGES:

- None apparent

DISCUSSION:

The Peak Hour Traffic count for the Design Year 2029 shows that the 350 feet of storage length will be necessary only for vehicles traveling north turning left from the West Winder Bypass to Carl Bethlehem Road. For all other turning movements, a reduced storage area will suffice. Reduction in pavement area will decrease impervious area. This will reduce storm water runoff and, as a result, the amount of drainage infrastructure will also be reduced. Since drainage design has not been completed, no cost avoidance in drainage items is included below.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 171,000	—	$ 171,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 171,000	—	$ 171,000


Alternate
Design
Left turn Storage: 200'
Right turn Storage: 100'
Taper: 100'
JANICE M. HALL
BRENDA S. STANCIL
L. WAYNE BRANTLY
HELEN THOMAS
RUTH C. WRIGHT
RUTH C. WRIGHT
PROPOSED
CARL BETHLEHEM RD
PATRICK MILL RD
CHARLES
MARY JUANITA TATE
GINA F. CLACK
CHARLES R. & TITANIA ADAMSON
VICTO BALDWIN
HUOT M. TAN
DALE L. SWEITZER
PROPOSED
STAN & BARBARA K. WILCOX
CARL BETHLEHEM RD
PAUL JR. & DONNA DOBBS
ALT. 35
PG. 2 of 4
2029 Peak Hour
TREVA B. HERRING
00:AM Traffic
(00):PM
CONSTRUCTION
BABBY RANDALL & DEBORAH L. HELTON
CARL BETHLEHEM ROAD
WEST WINDER BYPASS
CARL BETHLEHEM RD

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

ALTERNATIVE NO.: **35**

SHEET NO.: **3 of 4**

By reducing one left turn storage length from 350' to 200', the area of pavement saved is 150'x12' = 1,800 sf. For 3 left turn lanes, pavement area saved is 5,400 sf.

By reducing one right turn storage length from 350' to 100', the area of pavement saved is 250'x12' = 3,000 sf. For 4 right turn lanes, pavement area saved is 12,000 sf.

The total pavement area saved is 5,400 + 12,000 = 17,400 sf or 1,933 SY

The amount of right-of-way saved will be when the right turn storage length is reduced from 350' to 100'. Thus, the right-of-way area saved is 12,000 sf.

COST WORKSHEET

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No. 0006327
Barrow County, GA

ALTERNATIVE NO.: **35**
SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
A.C. Pavement	SY	1,933	60.56	117,062			
Construction Markup - 8%				9,365			
Subtotal				126,427			
Right-of-Way	SF	12,000	1.50	18,000			
R/W Markup - 148%				26,640			
Subtotal				44,640			
Subtotal				171,067			
Markup (%) at							
TOTAL				171,067			
TOTAL (ROUNDED)				171,000			

SECTION THREE – PROJECT DESCRIPTION

This project provides a bypass route on the west side of the City of Winder from SR 316 to SR 211 and constructs a grade-separated railroad crossing at the intersection of the West Winder Bypass and SR 8. The purpose is to alleviate the percentage of trucks using minor arterial routes and to reduce congestion and accident rates along Patrick Mill Road, SR 8, SR 211 and Pearl Pentecost Road.

In the 1990s, commercial and industrial land uses began to develop along SR 8, Bankhead Highway, and Patrick Mill Road. The west side of the City of Winder includes the West Winder Industrial Park, business centers and manufacturing plants. SR 8 and Bankhead Highway parallel the CSX railroad that passes through the City of Winder. Industrial and commercial traffic from this area of Barrow County primarily travel to and from the interstate system via SR 316 and SR 211. This travel pattern requires that the industrial truck traffic from this area use an at-grade railroad crossing and travel on residential collector roadways to reach SR 211 or travel through the downtown area of the City of Winder.

Currently, the only grade separated railroad crossing for the City of Winder is the Center Street underpass located approximately 3 miles east of Patrick Mill Road. To address this need, this project was begun in 2000 and has developed as follows.

The project comprises the western bypass of the City of Winder from Patrick Mill Road/CR 93, 1,000+/- ft. south of SR 316 northward on new and existing location to SR 211 for a total of approximately 5.0 miles. The proposed construction will widen Patrick Mill Road/CR 93 from a two-lane to a four-lane divided highway with a 24-ft.-wide raised median from Barrow Industrial Parkway to approximately 300 ft. north of existing Burson Maddox Road.

Starting at Barrow Industrial Parkway, the West Winder Bypass will turn to the east off of the current Patrick Mill Road alignment and then turn to the north to bridge over SR 316. A diamond interchange will be created with SR 316 with signalized intersections at the ramp terminals and the Bypass. Existing Tom Miller Road will be relocated to the south to intersect with the Bypass midway between Barrow Industrial Parkway and the southern ramps to and from SR 316. The relocated Tom Miller Road/Bypass intersection will be signalized and the relocated road will continue west to intersect with the existing Patrick Mill Road at a T-intersection.

After crossing over SR 316, the Bypass will connect back to the existing Patrick Mill Road alignment to north of Burson Maddox Road. Along this section of the Bypass, Fred Kilcrease Road and Bill Rutledge Road will be relocated north to meet at a signalized intersection with the Bypass. Another signalized intersection will be created at Carl Bethlehem Road. The intersection with Burson Maddox Road and the Bypass will be slightly shifted to the north.

The Bypass will continue north on a new location west of existing Patrick Mill Road/CR 93. It will intersect with Matthews School Road that is partially relocated to the south before crossing the new West Winder Bypass and turning north to connect with Atlanta Highway/SR 8 at a new signalized intersection. The existing Matthews Road connection to SR 8 will now connect to the relocated Matthews School Road.

The Bypass continues north past relocated Matthews School Road and bridges over SR 8, the CSX Railroad, and Bankhead Highway before curving to the northeast. A signalized intersection will be created for the West Winder Bypass and the new Bankhead Connector Road that will connect to Bankhead Highway. The Bypass will continue on a northeast heading to a signalized intersection with Pearl Pentecost Road. It will continue on this heading before making a 90 degree turn to the northwest to connect directly into SR 11. The portion of SR 11 to the east of the new road will intersect it with a signalized T-intersection.

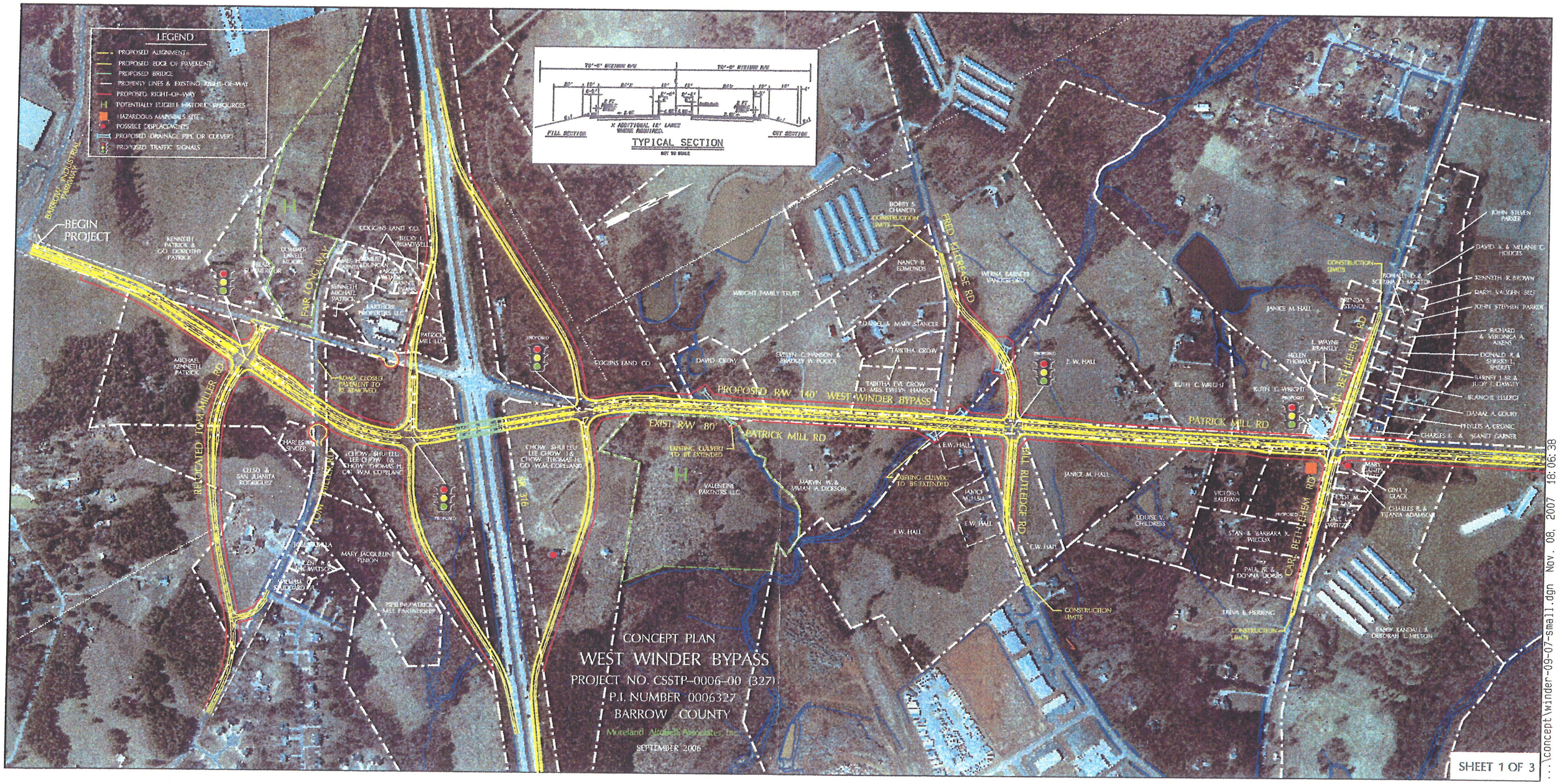
The typical section includes two, 12-ft.-wide travel lanes in each direction with a 24-ft.-wide raised median, with 10-ft.-wide shoulders on both sides (6.5-ft. paved with a 2-ft. rumble strip) and 12-ft.-wide right turn (auxiliary) lanes and 12-ft.-wide left turn lanes at all major intersections and major commercial drives.

Roads being relocated or that intersect with the new Bypass will be expanded to include right turn lanes and left turn lanes leading up to the intersections. Also included will be grading, storm water management provisions, utility relocations, signing and striping, and utility relocations. Asphalt concrete will be used for all pavement sections except for the interchange ramps which will be Portland cement concrete.

The total project cost is estimated at $87.5 million including $42.1 million for construction, $2.6 million for utilities and $42.8 million for right-of-way.

Due to the magnitude of the project's cost, GDOT is planning to break it into three phases. Phase I will start at Burson Maddox Road and continue north to SR 211. This will provide a separated railroad crossing and a direct route from SR 211 to SR 316. Phase II will be from SR 316 to Burson Maddox Road and will widen existing Patrick Mill Road to increase its capacity. Phase III will construct the SR 316 interchange and extension to Barrow Industrial Parkway.

A project layout plan follows.


LEGEND
PROPOSED ALIGNMENT
PROPOSED EDGE OF PAVEMENT
PROPOSED BRIDGE
PROPERTY LINES & EXISTING RIGHT-OF-WAY
PROPOSED RIGHT-OF-WAY
POTENTIALLY ELIGIBLE HISTORIC RESOURCES
HAZARDOUS MATERIALS SITE
POSSIBLE DISPLACEMENTS
PROPOSED DRAINAGE PIPE OR CULVERT
PROPOSED TRAFFIC SIGNALS
TYPICAL SECTION
NOT TO SCALE
FILL SECTION
CUT SECTION
X ADDITIONAL 12' LANES WHERE REQUIRED.
BEGIN PROJECT
BARROW INDUSTRIAL PARKWAY
FAIR LONG WAY
RELOCATED TOM MILLER RD
TOM MILLER RD
PROPOSED R/W 140' WEST WINDER BYPASS
EXIST. R/W 80'
PATRICK MILL RD
SR 316
FRED KILGREASE RD
CARL BETHLEHEM RD
CONSTRUCTION LIMITS
EXISTING CULVERT TO BE EXTENDED
ROAD CLOSED PAVEMENT TO BE REMOVED
KENNETH PATRICK & CO. DOROTHY PATRICK
COGGINS LAND CO.
BECKY L. BROADWELL
COMMER LASSEL MOORE
KENNETH MICHAEL PATRICK
EARTHCORE PROPERTIES LLC
PATRICK MILL LLC
MICHAEL KENNETH PATRICK
COGGINS LAND CO
DAVID CROW
EVELYN C. HANSON & BARDLEY W. POOLE
TABITHA CROW
TABITHA EVE CROW C/O MRS. EVELYN HANSON
BOBBY S. CHANEY CONSTRUCTION LIMITS
NANCY B. EDMUNDS
WERNA BARNETT VANDIFORD
WRIGHT FAMILY TRUST
DANIEL & MARY STANCER
F. W. HALL
JANICE M. HALL
BRENDA S. STANCE
L. WAYNE BRANTLY
HELEN THOMAS
RUTH C. WRIGHT
JOHN STEVEN PARKER
DAVID K. & MELANIE C. HODGES
RONALD G. & STEPHANIE MORTON
KENNETH R. BROWN
BRENDA VAUGHN SEEP
JOHN STEPHEN PARKER
RICHARD & VERONICA A. AKINS
DONALD K. & SHERRY T. SHORTT
BARNEY J. SR. & JUDY F. DAWLEY
BLANCHE ELLERD
DANIAL A. GOURY
PHYLLIS A. CRONIC
CHARLES K. & JEANET GARNER
CHARLES W. SNIDER
CHOW, SHU LEU LEE CHOW I & CHOW THOMAS H. C/O W.M. COPELAND
CELSO & SAN JUANITA RODRIGUEZ
MARY JACQUELINE PINION
VALENTINE PARTNERS LLC
MARVIN W. & VIVIAN A. DODSON
VICTORIA BALDWIN
LOUISE V. CHILDRESS
STAN & BARBARA K. WILCOX
PAUL JR. & DONNA DOBBS
TREVA B. HERRING
GINA F. GLACK
CHARLES R. & TIFFANY ADAMSON
SANDY RANDALL & DEBORAH L. HELTON
CONCEPT PLAN
WEST WINDER BYPASS
PROJECT NO. CSSTP-0006-00 (327)
P.I. NUMBER 0006327
BARROW COUNTY
Moreland Altobelli Associates, Inc.
SEPTEMBER 2006
SHEET 1 OF 3
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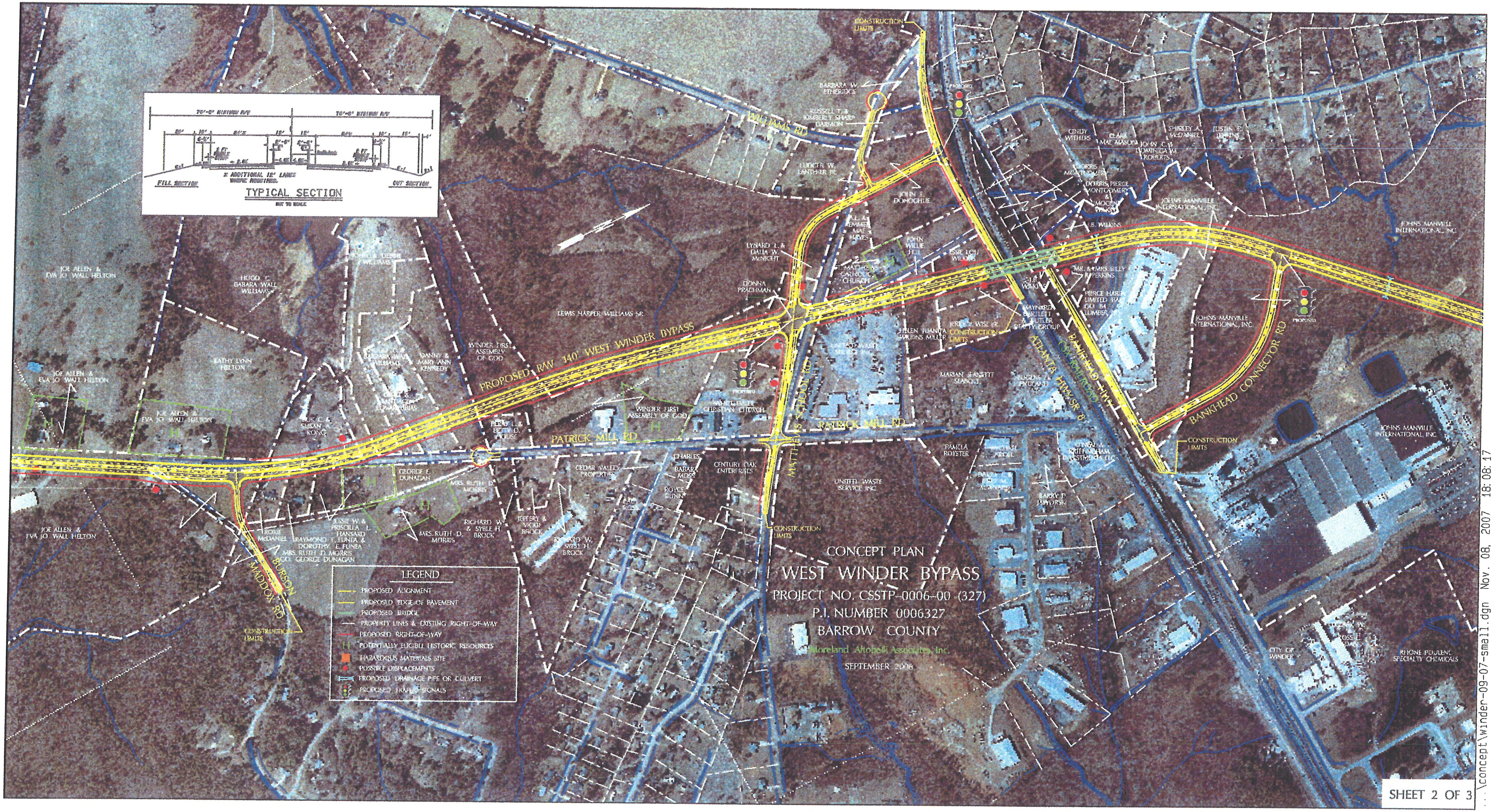

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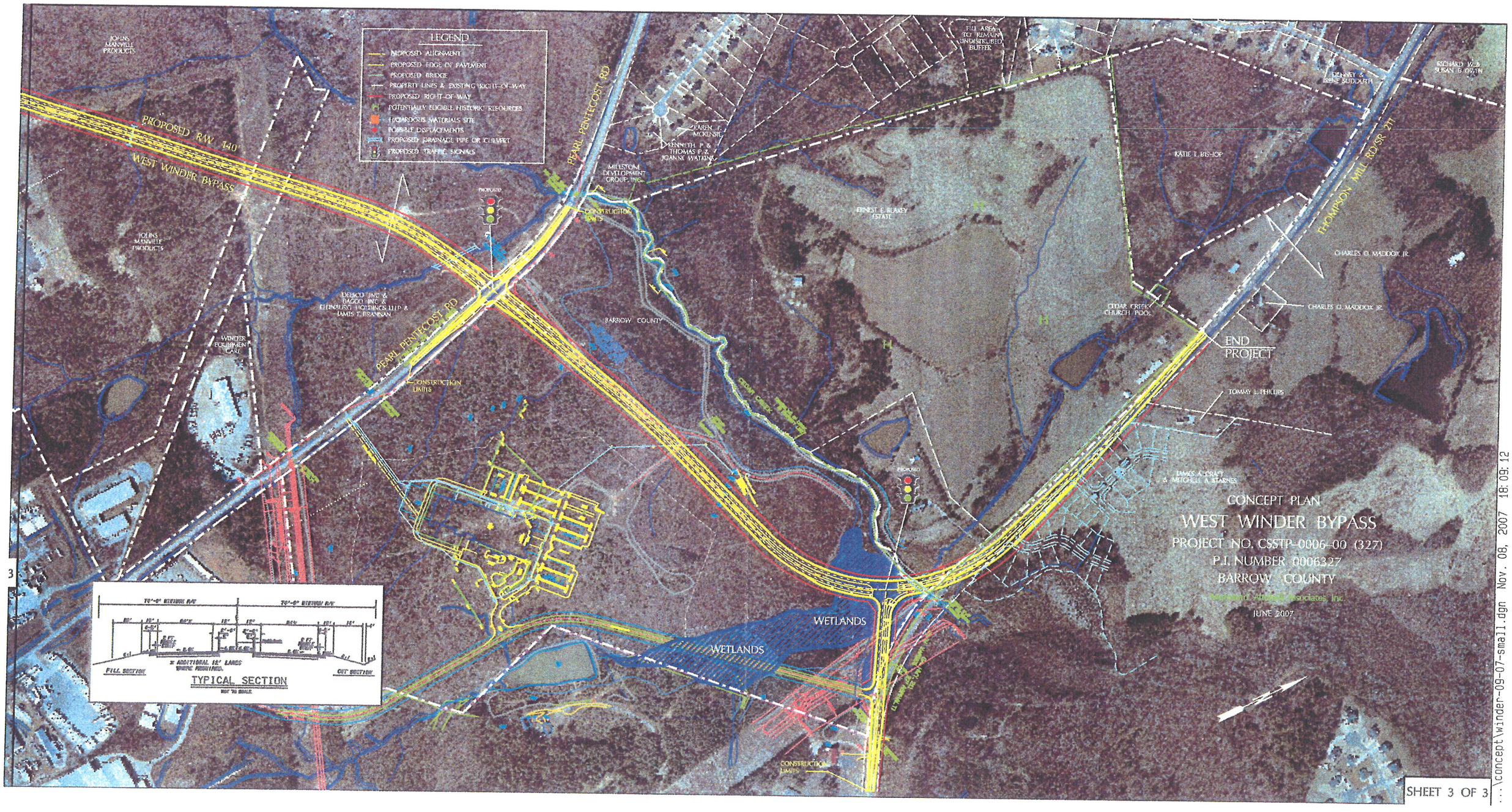
LEGEND
PROPOSED ALIGNMENT
PROPOSED EDGE OF PAVEMENT
PROPOSED BRIDGE
PROPERTY LINES & EXISTING RIGHT-OF-WAY
PROPOSED RIGHT-OF-WAY
POTENTIALLY ELIGIBLE HISTORIC RESOURCES
HAZARDOUS MATERIALS SITE
POSSIBLE DISPLACEMENTS
PROPOSED DRAINAGE PIPE OR CULVERT
PROPOSED TRAFFIC SIGNALS
PROPOSED RW 140'
WEST WINDER BYPASS
PEARL PENTECOST RD
THOMPSON MILL RD/SR 211
JOHNS MANVILLE PRODUCTS
WINDER EQUIPMENT CARE
DEBSCO INC & BAGGO INC & ETHINGTON HOLDINGS LLLP & JAMES T. BRANNAN
MILESTONE DEVELOPMENT GROUP, INC.
CLAREN F. MCKENSIE
KENNETH P. & THOMAS P. & JOANNE WATKINS
ERNEST E. BLAKEY ESTATE
FILL AREA TO REMAIN UNDISTRUBED BUFFER
DENNEY & IRENE SUDDUTH
RICHARD W. & SUSAN B. OWEN
KATIE E. BISHOP
CHARLES O. MADDOX JR.
CEDAR CREEK CHURCH POOL
END PROJECT
TOMMY L. PHILLIPS
JAMES A. CRAFT & MITCHELL A. STARNES
CONSTRUCTION LIMITS
BARROW COUNTY
CEDAR CREEK TRIB
WETLANDS
WETLANDS
PROPOSED
70'-0" MINIMUM R/W
X ADDITIONAL 10' LANES WHERE REQUIRED
FILL SECTION
CUT SECTION
TYPICAL SECTION
NOT TO SCALE
CONCEPT PLAN
WEST WINDER BYPASS
PROJECT NO. CSSTP-0006-00 (327)
P.I. NUMBER 0006327
BARROW COUNTY
Moreland Altobelli Associates, Inc.
JUNE 2007
SHEET 3 OF 3
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SECTION FOUR - VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value methodology followed during the value engineering study on the West Winder Bypass, CSSTP-0006-00(327), P.I. No. 0006327, Barrow County, project for Barrow County and GDOT. The workshop was performed at the conceptual design completion stage. Moreland & Altobelli Associates, Inc. has been selected by Barrow County to assist with the development of the project and has provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study, which was divided into three parts: (1) Preparation Effort, (2) Workshop Effort, and (3) Post-Workshop Effort. A task flow diagram outlining each of the procedures included in the VE study is attached for reference.

Following this description of the VA procedure, separate narratives and supporting documentation identify the following:

- VE workshop participants
- Economic data
- Cost model
- Function analysis
- Creative ideas and evaluations

PREPARATION EFFORT

Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. Documents such as those listed below were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- Concept Plan West Winder Bypass, Project Number CSSTP-0006-00(327), P.I. Number 0006327, Barrow County, dated September 2006, prepared by Moreland Altobelli Associates, Inc.
- Approved Project Concept Report, Project Number: CSSTP-0006-00(327) County: Barrow County, P.I. Number 0006327, dated May 1 2006, prepared by Georgia Department of Transportation
- Approved Revised Project Concept Report, Project Number: CSSTP-0006-00(327) County: Barrow County, P.I. Number 0006327, dated October 1, 2009, prepared by Georgia Department of Transportation
- Estimate Report for file "P.I. No. 0006327 (West Winder Bypass)" dated 7/21/2009, prepared by Moreland Altobelli Associates, Inc.
- Pavement Type Selection and Pavement Design Recommendation West Winder Bypass from 0.18 mile South of SR 316 to SR 211, dated April 16, 2010, prepared by Department of Transportation State of Georgia

Value Engineering Study Task Flow Diagram

Preparation Effort

Coordination Project
- Verify Schedule
- Suggest Format for Designer Presentation
- Outline Project Responsibilities
- Outline Needed Background Data
- Define *Project Value Objectives*
- Identify Project Constraints

→

Prepare for Workshop
- Collect Project Data
- Distribute Data to Team Members
- Team Members Become Familiar with Project

→

Construct Cost Models
- Construct Cost Models
- Construct Graphic Function Analysis
- Outline High Cost Areas

→

LCC Model
- Roadway
- Bridges
- MOT
- Energy
- User Impact

Workshop Effort

Information Phase
- Introduction by VETL
- Project Description and Presentation by Designer
- Outline Owner Requirements
- Review Project Data
- Visit Project Site (Alt.)

→

Function Identification and Analysis Phase
- Analyze Project Costs and Energy Usage
- Perform Function Analysis and FAST Diagram
- Identify High Cost and Energy Areas
- Calculate Cost/Worth Ratios
- Identify Paradigms

List Ideas Generated During Function Analysis

→

Speculation Phase
- Introduction by VETL
- Creative Idea Listing:
  - Quantity of ideas
  - Association of Ideas
- Brainstorm
- Do Creative Thinking
  - Group Thinking
  - Individual Thinking
- Use Checklist for Ideas

→

Evaluation Phase
- Eliminate Impractical Ideas
- Rank Ideas with Advantages/ Disadvantages
- Evaluate Alternatives (Include Non-Economic considerations: Safety, Reliability, Environment, Aesthetics, O&M, etc.)
- Select Best Ideas for Implementation

→

Development Phase
- Develop Proposed Alternatives
- Prepare Alternative Design Sketches
- Estimate Costs
- Perform Life Cycle Comparison
  - Initial Cost
  - Redesign Cost
  - O&M Cost
  - LCC Cost

→

Presentation Phase
- Summarize Findings
- Present VE Ideas to Owner/ User/Designer
- Oral Presentation

Post-Workshop Effort

VE Study Report
- Develop Implementation VE Report
- Designer Prepares Responses to VE Report
- Owner Evaluates Recommendations

→

Implementation Phase
- Participate in Implementation Meeting with Owner/User/ Designer/ VE Team, as needed
- Prepare Final VE Report

→

Final Acceptance
- Redesign by Designer

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 is very important as it provides the VE team with insight about how the project has progressed to its current state.

Project cost information provided by the designers is used by the VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by Moreland Altobelli Associates to develop a cost model for the project. The model was used to distribute the total project cost among the various elements of the project. The VE team used this model to identify the high-cost elements that drive the project and the element providing little or no value so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three and one-half-day effort beginning with an orientation/kickoff meeting on Monday, April 19, 2010, and concluding with the final VE Presentation on Thursday, April 22, 2010. During the workshop, the VE Job Plan was followed in compliance with the U.S. Federal Highway Administration guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative/Speculation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods have to be reviewed and understood. For this reason, the workshop began with a presentation of the project by GDOT, Barrow County, and Moreland Altobelli Associates, Inc. to the team. The presentation highlighted the information provided in the documentation reviewed by the VE team before the workshop and expanded on it 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 clarification about the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to define the functions provided by the project, 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

see if the expenditures actually perform the requirements of the project or if there are disproportionate amounts of money spent on support functions. Elements performing support functions add cost to the project but have a relatively low worth to the basic function.

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. 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) of the major components of the project depicted on the cost models were identified.

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 that 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 met
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. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

To further clarify the impact of the various functions, the team assigned costs to provide the functions or group of functions indicated by a specific project element using the cost estimate and cost models. Where possible, they seek to find the lowest cost, or worth, to perform the function. This is accomplished using published data from other sources or team knowledge obtained from working on other similar projects to establish cost goals and then comparing them to the current costs. By identifying the cost and worth of a function or group of functions, cost/worth ratios were calculated. Cost/worth ratios greater than one indicated that less than optimum value was being provided. Those project functions or elements with high cost/worth ratios became prime targets for value improvement.

As well as looking at areas with high cost/worth ratios, the team used the cost model previously prepared 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 also 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/Speculation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the VE team began to generate 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 constructability 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. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

Barrow County, GDOT and the Moreland Altobelli Associates, Inc. team may wish to review these creative lists since they may contain ideas that were not pursued by the VE team but can be further evaluated for potential use in the design.

Evaluation Phase

Since the goal of the Creative/Speculation Phase was to conceive as many ideas as possible without regard for technical merit or applicability to the project goals, the Evaluation Phase focused on identifying those ideas that do 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 the VE team evaluating the ideas originated during the Creative/Speculation Phase based on Barrow County and GDOT's value objectives identified through conversations during the opening presentation. 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. 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 5, with 5 or 4 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 3 indicating an idea that provides marginal value but could be used if the project was having budget problems, 2 indicating an idea with a major technical flaw, and 1 indicating an idea that does not respond to project requirements. Generally, ideas rated 4 and 5 are pursued in the next phase and presented to the owner 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 constructability, 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 VE process.

Alternative Development Phase

In this phase, each highly rated idea was expanded into a workable solution designated as a VE alternative. The development consisted 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 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 VE alternatives are included in Section Two of this report.

Design suggestions include the same information as the alternatives except that no cost analysis is performed. They too are included in Section Two.

Presentation Phase

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Savings worksheets to hand out at the presentation, and to present the key VE alternatives and design suggestions to GDOT and the Moreland Altobelli Associates, Inc. design team. The presentation was held on Thursday, April 22, 2010, at the GDOT Headquarters office in Atlanta, Georgia. The purpose of the 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 to GDOT and the design team to facilitate a timely review and speedy implementation of the selected ideas.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from GDOT, Barrow County and the Moreland Altobelli Associates, Inc. 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, GDOT will decide which alternatives to implement.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the unique project elements involved with the West Winder Bypass, CSSTP-0006-00(327), P.I. No. 0006327, Barrow County. The multidisciplinary team comprised professionals with highway design, bridge design and construction experience and a working knowledge of VE procedures. The following lists the VE team members:

Participant	Specialization	Affiliation
Joe Leoni, PE	Highway Design	ARCADIS U.S., Inc.
Michael Moilanen, PE	Bridge Design	ARCADIS U.S., Inc.
Paresh J. Parikh	Constructability	Delon Hampton Associates
Howard B. Greenfield, PE, CVS	VE Team Leader	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, April 19, 2010, by representatives from GDOT, Barrow County and the Moreland Altobelli Associates design team. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project specifics. Additionally, the meeting afforded the owner and design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. An attendance list for the meeting is attached.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Thursday, April 22, 2010, at the GDOT Headquarters office in Atlanta, Georgia to review VE alternatives with the GDOT and representatives from the design team. Copies of the Draft Summary of Potential Cost Savings worksheet were provided to the attendees. Attendees checked off their names on the attendance list from the opening presentation.

VE STUDY SIGN-IN SHEET

Project No.: CSSTP-0006-00(327) County: Barrow PI No.:0006327 Date: April 19-22, 2010

1	4	NAME	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers	Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders	Engineering Services	404-631-1752	msanders@dot.ga.gov
✓		James K. Magnus	Construction	404-631-1971	jmagnus@dot.ga.gov
✓		Ken Werho	Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	✓	Mike Moilanen	ARCADIS	770-431-8666	Michael.moilanen@arcadis-us.com
✓	✓	Howard Greenfield	Lewis & Zimmerman	301-984-9590	hgreenfield@lza.com
✓	✓	Douglas Fadool	Program Delivery	404-308-1353	dfadool@dot.ga.gov
✓	✓	Dan Yearwood	Barrow County	770-307-3005	dyearwood@barrowga.org
✓		Darrell Greeson	Barrow County	770-867-0664	dgreeson@barrowga.org
✓	✓	Joe Leoni	ARCADIS	770-384-6564	Joe.leoni@arcadis-us.com
✓		Larry Bowman	GDOT Env. Services	404-631-1362	lbowman@gdot.ga.gov
✓	✓	Paresh J. Parikh	Delon Hampton	404-524-8030	pparikh@delonhampton.com
✓	✓	Shrlijal Amin	MAAI	404-263-5945	samine@maai.net
	✓	Michael Haithcock	GDOT		

✓ Check all that apply 13 Attended Project Overview (Day 1) 9 Attended Project Presentation (Day 4)

ECONOMIC DATA

The comparisons of life cycle costs between the VE alternatives and the current design solutions were performed on the basis of discounted present worth. To accomplish this, the VE team developed economic criteria to use in its calculations based on information gathered from GDOT and the design team. The following parameters were used when calculating discounted present worth:

Year of Analysis:	2010
Construction Start Date:	Unknown
Construction Completion Date:	Unknown
Traffic Planning Period:	2009 - 2029

When computing capital costs, direct material, labor and equipment costs are marked up using a composite markup of 8% that includes:

Engineering and Inspection	5%
Construction Contingency	3%

Right-of-way costs are marked up 148% to account for Scheduling Contingency and Administrative and Court costs.

PROJECT: **West Winder Bypass – Barrow County** ALTERNATIVE NO.:

Pavement unit costs SHEET NO.: **1 of 3**

Full Depth Pavement Unit Cost ($/SY):

12.5mm: 165#/SY x Ton/2,000# x $65.79/Ton = $5.43/SY

19mm: 220#/SY x Ton/2,000# x $63.78/Ton = $7.02/SY

25mm: 550#/SY x Ton/2,000# x $63.99/Ton = $17.60/SY

12" GAB: 1ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.47/Ton = $14.20/SY

Bitumen. Tack Coat: 0.07 Gal/SY x 2 applications x $2/Gal = $ 0.28/SY

Full-Depth Asphalt Pavement Section Unit Cost = $44.53/SY

Price Adjustment for Full-Depth Pavements

Diesel Fuel for HMA [(165# + 220# + 550#) / 2000#/Ton)] x 2.90	=	1.36		
Diesel Fuel for 12" GAB [(147#/cf x 9 cf/sy) / 2000#/Ton] x .29	=	.19		
Total	=	1.55	x 2.885	= $ 4.47/sy
Gasoline for HMA [(165# + 220# + 550#) / 2000#/Ton)] x 0.71	=	.33		
Gasoline for 12" GAB [(147#/cf x 9 cf/sy) / 2000#/Ton] x 0.24	=	.16		
Total	=	.49	x 2.826	= $ 1.38/sy

400/402 Asphalt Cement Price Adjustment
[(165# + 220# + 550#) / 2000#/Ton)] x 0.05 x 435.60 = $10.18/sy

Total Adjustment = $16.03/sy

Full-Depth Asphalt Pavement Section Unit Cost with Adjustments = $60.56/sy

PROJECT: **West Winder Bypass – Barrow County** ALTERNATIVE NO.:

Pavement unit costs SHEET NO.: **2 of 3**

Asphalt Shoulder Pavement Unit Cost ($/SY):

12.5mm: 165#/SY x Ton/2,000# x $65.79/Ton = $5.43/SY

19mm: 220#/SY x Ton/2,000# x $63.78Ton = $7.02/SY

6" GAB: 0.5 ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.47/Ton = $7.11/SY

Bitumen. Tack Coat: 0.07 Gal/SY x 1 applications x $2/Gal = $ 0.14/SY

Asphalt Shoulder Pavement Section Unit Cost = $19.70/SY

Price Adjustments for Shoulder Pavements

Diesel Fuel for HMA [(165# + 220#) / 2000#/Ton)] x 2.90	=	.56		
Diesel Fuel for 6" GAB [(.5 x 147#/cf x 9 cf/sy) / 2000#/Ton] x .29	=	.10		
Total	=	.66 x 2.885	=	$ 1.90/sy
Gasoline for HMA [(165# + 220#) / 2000#/Ton)] x 0.71	=	.14		
Gasoline for 6" GAB [(.5 x 147#/cf x 9 cf/sy) / 2000#/Ton] x 0.24	=	.08		
Total	=	.22 x 2.826	=	$ .62/sy
400/402 Asphalt Cement Price Adjustment [(165# + 220#) / 2000#/Ton)] x 0.05 x 435.60			=	$ 4.17/sy
Total Adjustment			=	$ 6.69/sy
Full-Depth Asphalt Pavement Section Unit Cost with Adjustments			=	**$26.39/sy**

PROJECT: **West Winder Bypass – Barrow County** ALTERNATIVE NO.:

Pavement unit costs SHEET NO.: **3 of 3**

Ramp Concrete Pavement Unit Cost ($/SY):

Plain PC Conc. Pavement, CL 1, 12" Thick: = $52.84/SY

25mm: 330#/SY x Ton/2,000# x $63.99/Ton = $10.56/SY

12" GAB: 1ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.47/Ton = $14.20/SY

Full-Depth Concrete Pavement Section Unit Cost = $77.60/SY

Adjustments for Full-Depth Concrete Pavement Section

Plain PC Conc.	1 cf x 9 cf/sy / 27 cf/cy =	.333 cy/sy x $32.79/cy		= $ 10.92/sy
Diesel Fuel for HMA [(330#) / 2000#/Ton)] x 2.90	=	.48		
Diesel Fuel for 12" GAB [(147#/cf x 9 cf/sy) / 2000#/Ton] x .29	=	.19		
Total	=	.67	x 2.885	= $ 1.93/sy
Gasoline for HMA [(330#) / 2000#/Ton)] x 0.71	=	.12		
Gasoline for 12" GAB [(147#/cf x 9 cf/sy) / 2000#/Ton] x 0.24	=	.26		
Total	=	.38	x 2.826	= $ 1.07/sy

400/402 Asphalt Cement Price Adjustment
[(330#) / 2000#/Ton)] x 0.05 x 435.60 = $ 3.59/sy

Total Adjustment = $17.51/sy

Total Full-Depth Concrete Pavement Section with Adjustments = $95.11

COST MODEL

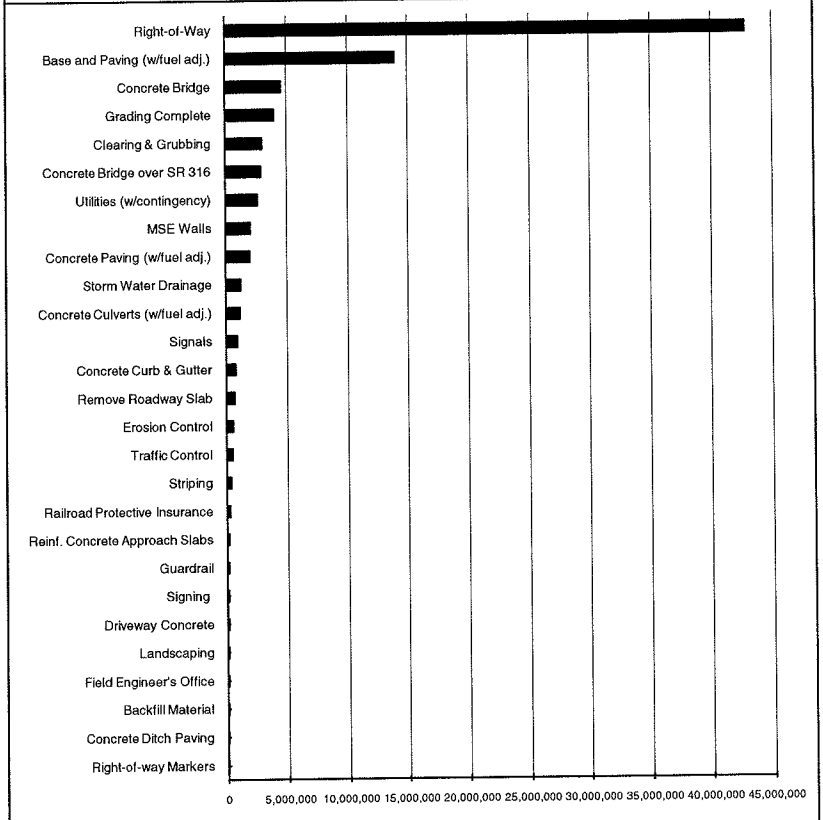
The VE team prepared a Pareto Chart, or Cost Histogram, for the project that follows this page. This Cost Histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project. The high cost elements provide the VE team with one focus for its work during the study.

The right-of-way cost is $42.8 million compared to the project's construction cost of approximately $42.1 million (including oil price adjustments). Thus the team focused its efforts on reducing the right-of-way cost. With respect to the construction costs, pavement, and bridges are the real cost drivers of the project.

COST HISTOGRAM

PROJECT: WEST WINDER BYPASS - P.I. No. 0006327

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Right-of-Way	42,750,000	50.52%	50.52%
Base and Paving (w/fuel adj.)	13,940,909	16.47%	67.00%
Concrete Bridge	4,525,800	5.35%	72.34%
Grading Complete	3,950,130	4.67%	77.01%
Clearing & Grubbing	3,000,000	3.55%	80.56%
Concrete Bridge over SR 316	2,878,300	3.40%	83.96%
Utilities (w/contingency)	2,600,000	3.07%	87.03%
MSE Walls	2,002,140	2.37%	89.40%
Concrete Paving (w/fuel adj.)	1,931,719	2.28%	91.68%
Storm Water Drainage	1,169,048	1.38%	93.06%
Concrete Culverts (w/fuel adj.)	1,118,316	1.32%	94.38%
Signals	889,199	1.05%	95.43%
Concrete Curb & Gutter	748,170	0.88%	96.32%
Remove Roadway Slab	660,489	0.78%	97.10%
Erosion Control	515,469	0.61%	97.71%
Traffic Control	500,000	0.59%	98.30%
Striping	358,339	0.42%	98.72%
Railroad Protective Insurance	252,016	0.30%	99.02%
Reinf. Concrete Approach Slabs	184,548	0.22%	99.24%
Guardrail	123,663	0.15%	99.38%
Signing	112,663	0.13%	99.52%
Driveway Concrete	106,100	0.13%	99.64%
Landscaping	99,102	0.12%	99.76%
Field Engineer's Office	76,830	0.09%	99.85%
Backfill Material	70,980	0.08%	99.94%
Concrete Ditch Paving	34,130	0.04%	99.98%
Right-of-way Markers	20,786	0.02%	100.00%
Subtotal	$ 84,618,846	100.00%	
Engineering & Inspection @ 5.00%	$ 1,779,792		
Construction Contingency @ 3.00%	$ 1,067,875		
TOTAL	$ 87,466,513	Comp Mark-up:	8%



Costs in graph are not marked-up.

FUNCTION ANALYSIS

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

RANDOM FUNCTION ANALYSIS

PROJECT: **WEST WINDER BYPASS**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

SHEET NO.: **1 of 1**

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
PROJECT	Alleviate	Congestion in City	HO
	Reduce	Crashes	HO
	Reroute	Traffic	B
	Separate	Trains from Vehicles	B
	Connect	SR 316 to I-85	HO
	Connect	Crossroads	B
	Bridge	Roadways	B
	Realign	Connecting Roads	S
Base and Paving $$$	Direct	Vehicles	B
	Support	Vehicles	B
Bridges $$	Separate	Traffic	B
	Support	Load	B
Right-of-Way $$$	Create	Space	B
Grading	Establish	Elevation	B
	Direct	Storm Water	RS
Clearing and Grubbing	Create	Space	B
Utilities	Create	Space	S

Function defined as: Action Verb
Measurable Noun

Kind: B = Basic
S = Secondary
RS = Required Secondary
HO = Higher Order
LO = Lower Order

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creative/Speculation Phase, numerous ideas were generated for the project using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheet.

The ideas were ranked on a qualitative scale of 1 to 5 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 owner's value objectives for the project/the responses of the owner. The following are the top value objectives for this project:

- Saves right-of-way
- Saves pavement
- Reduces crashes
- Improves functionality

After discussing each idea, the team evaluated the ideas by consensus. This exercise produced 18 ideas rated 4 or 5 and two design suggestions to research and develop into formal VE alternatives to be included in the Section Two of the report. Highly rated ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The reader is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING

PROJECT: **WEST WINDER BYPASS** SHEET NO.: **1 of 2**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

NO.	IDEA DESCRIPTION	RATING
1	Modify realignment of Bill Rutledge Road	5
2	Realign the bridge over CSX railroad closer to 90 degrees	4
3	Move northern-most section of road to the east	4
4	Tie bypass into existing SR 211	3
5	Retain existing alignment of Matthews School Road and move connection to SR 8 to near existing connection	4
6	Remove cul-de-sac on Patrick Mill Road and create a right-in/right-out intersection	DS
7	Move cul-de-sac on Patrick Mill Road south	DS
8	Widen Patrick Mill Road all the way to the railroad and then cross it	2
9	Modify alignment on Tom Miller Road	4
10	Take the bypass straight across SR 316 on current alignment	3
11	Build the bridge on SR 316 over Patrick Mill Road	2
12	Shorten ramps to SR 316	4
13	Use 11 ft. wide inside lane	4
14	Move Burson Maddox Road south	5
15	Make Matthews Schools Road intersection 90 degrees with the bypass	4
16	Narrow paved shoulders on the ramp	5
17	Narrow the median to 20 ft. in lieu of 24 ft.	5
18	Use 4-ft.-wide paved shoulders in lieu of 6.5 ft. wide paved shoulders	4
19	Use vertical bridge abutments in lieu of sloped paving	4
20	Make Bankhead Connector Road two lanes plus turn lanes	2
21	Remove median on Matthews School Connector Road	2
22	Use flush median in lieu of concrete median	2
23	Use grass median in lieu of concrete median	5
24	Use a partial clover leaf interchange in lieu of a diamond interchange	4
25	Delete center pier for bridge over CSX railroad	4
26	Use 10 ft. shoulders on bridge	5
27	Use 8 ft. shoulders on bridge	2

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

CREATIVE IDEA LISTING

PROJECT: **WEST WINDER BYPASS** SHEET NO.: **2 of 2**
CSSTP-0006-00(327); P.I. No.0006327
Barrow County, GA

NO.	IDEA DESCRIPTION	RATING
28	Shorten railroad bridge	4
29	Use a roundabout at Tom Miller Road intersection	4
30	Use a roundabout at Bankhead Highway Connector Road and Bankhead Highway	2
31	Provide a direct connection for bypass and Tom Miller Road and tie in Patrick Mill Road	2
32	Use a 1 ft. shy distance at median	4
33	Use 4:1 slopes in lieu of 6:1 slopes at the end of the shoulder and reduce width of right-of-way	5
34	Eliminate traffic signal at the intersection of Bill Rutledge Road/Fred Kilcrease Road	4
35	Reduce storage on turn lane lengths at Carl Bethlehem Road	4

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