VALUE ENGINEERING STUDY
OF
SR 400 FROM HOLCOMB BRIDGE RD.
TO MCFARLAND RD.
PROJECT NO. NH-056-1(59)
PI NOS. 722010

Fulton & Forsyth Counties, GA

APRIL 28 – 29, 2005

Prepared by:
Ventry Engineering, L.L.C.

In Association With:
Georgia Department of Transportation

VALUE ENGINEERING STUDY
TEAM LEADER

_____

William F. Ventry, P.E., C.V.S.

C.V.S. Registration No. 840603 (LIFE)

DATE_____

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I. EXECUTIVE SUMMARY

INTRODUCTION

This Value Engineering report summarizes the results of the Value Engineering Study performed by Ventry Engineering for the Georgia Department of Transportation. The study was performed during the period of April 28 – 29, 2005.

The subject of the study was Georgia 400 reconstruction.

PROJECT DESCRIPTION

This project proposes to add general use lanes in the median of SR 400 from Holcomb Bridge Road to McFarland Road for approximately 9.0 miles.

In the northbound direction one lane will be added from Holcomb Bridge Road to Haynes Bridge Road, two lanes from Haynes Bridge to Windward Parkway, and one lane from Windward Parkway to McFarland Road. In the southbound direction, one lane will be added from McFarland Road to Haynes Bridge.

In addition, it is proposed by the concept team to construct a concrete median barrier and widen full depth concrete pavement in the median from Holcomb Bridge Road to McFarland Road.

No bridge work is anticipated in this project.

METHODOLOGY

The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation
4. Development
5. Presentation
6. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Future Maintenance
- Construction Time
- Construction Cost
- Future Flexibility

I. EXECUTIVE SUMMARY

RESULTS – AREAS OF FOCUS

The following Areas of Focus were analyzed by the Value Engineering Team and from these areas the following Value Engineering Alternatives were developed and are recommended for Implementation:

A. Pavement and Base

Recommendation No. 1:

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative matches the existing 10 inches of concrete pavement.

If this recommendation can be implemented, there is a possible savings of: **$3,109,081**

B. Typical Section/Median

Recommendation No. 2:

The Value Engineering Team recommends that Value Engineering Alternative No. 2 be implemented. This alternative uses cable with a grass median.

If this recommendation can be implemented, there is a possible savings of: **$12,347,423**

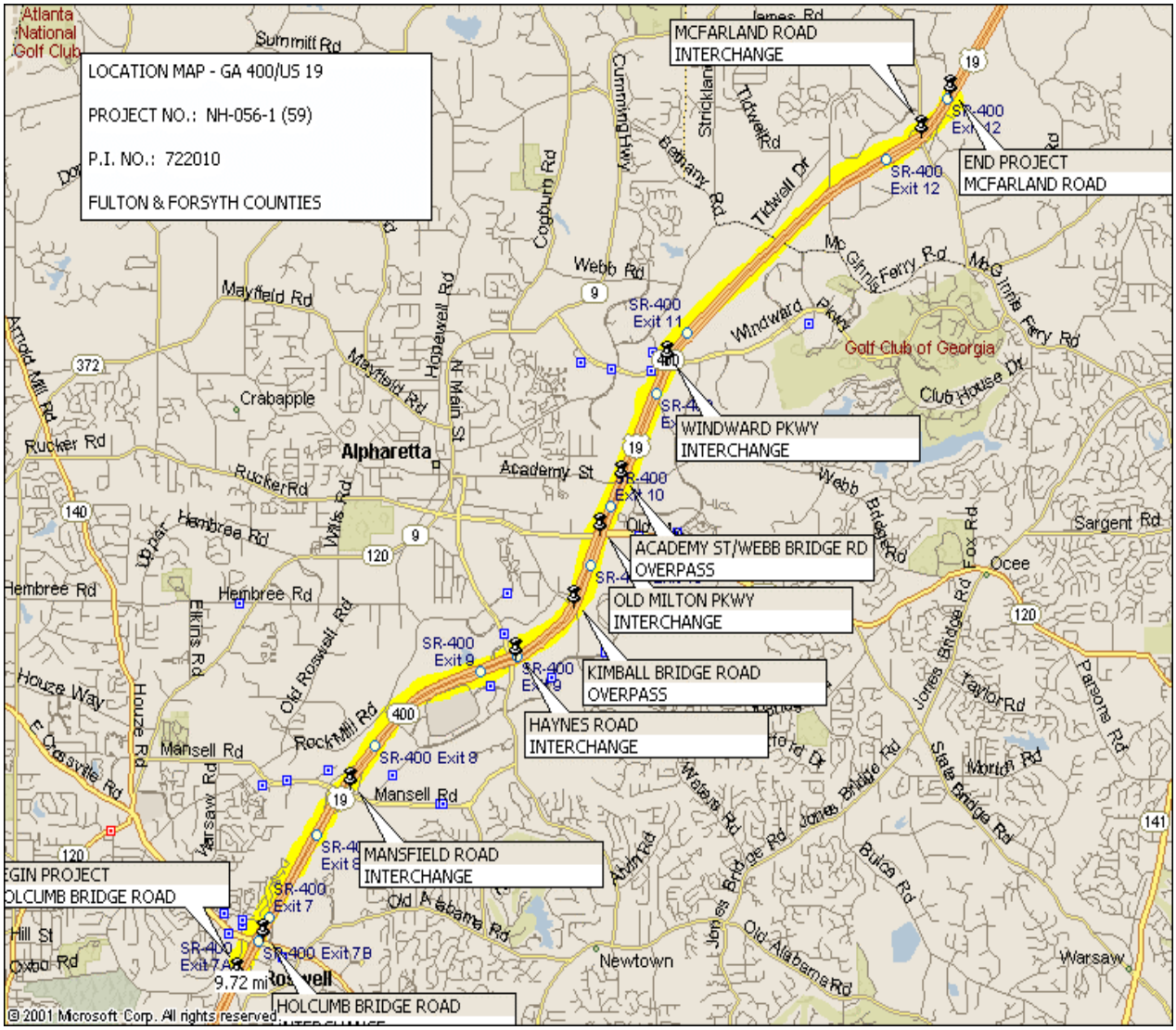
C. Noise Walls

Recommendation No. 3:

The Value Engineering Team recommends that Value Engineering Alternative No. 3 be implemented. This alternative places the noise walls at the shoulder point in the fill sections and at the right of way line in the cut sections.

If this recommendation can be implemented, there is a possible savings of: **$1,098,207**

II. LOCATION OF PROJECT



III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAMMEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
Bill Ventry	Ventry Engineering	Project Manager/ Team Leader	850-627-3900
Tom Hartley	Ventry Engineering	Roadway Design/Traffic	850-627-3900
Bruce Nicholson	Ventry Engineering	Construction	850-627-3900
Floyd Moore	FHWA		404-562-3654

PROJECT DESCRIPTION

This project proposes to add general use lanes in the median of SR 400 from Holcomb Bridge Road to McFarland Road for approximately 9.0 miles.

In the northbound direction one lane will be added from Holcomb Bridge Road to Haynes Bridge Road, two lanes from Haynes Bridge to Windward Parkway, and one lane from Windward Parkway to McFarland Road. In the southbound direction, one lane will be added from McFarland Road to Haynes Bridge.

In addition, it is proposed by the concept team to construct a concrete median barrier and widen full depth concrete pavement in the median from Holcomb Bridge Road to McFarland Road due to safety and maintenance issues. The additional width can be used for future projects currently programmed. All the existing SR 400 mainline bridges are widened to the median and it appears that all bridges over SR 400 provide standard acceptable horizontal and vertical clearance.

Therefore, no bridge work is anticipated in this project.

IV. INVESTIGATION PHASE

SR 400 FROM HOLCOMB BRIDGE TO MCFARLAND ROAD
VALUE ENGINEERING STUDY BRIEFING

APRIL 28, 2005

NAME	AFFILIATION	PHONE
Bill Ventry	Ventry Engineering	850-627-3900
Tom Hartley	Ventry Engineering	850-627-3900
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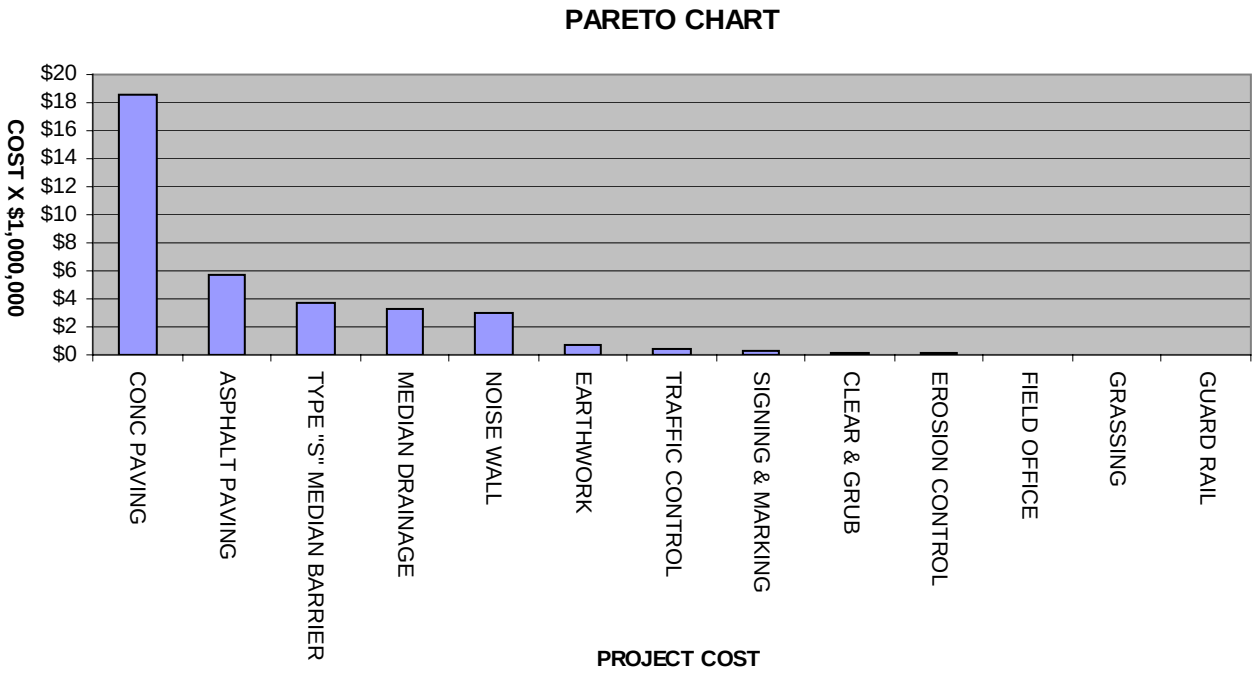
Scott Zehngraff	GADOT	scott.zehngraff@dot.state.ga.us
Lisa Myers	GADOT	404-651-7468 lisa.myers@dot.state.ga.us
Floyd Moore	FHWA	404-562-3654

STUDY RESOURCES

NAME	AFFILIATION	PHONE
Darrell Richardson	GADOT	404-657-9872
Lisa Myers	GADOT	404-651-7468
Robert Moses	Parsons Brinkerhoff	404-364-2674

INVESTIGATION PHASE



FUNCTIONAL ANALYSIS WORKSHEET
SR 400 FROM HOLCOMB BRIDGE TO MCFARLAND ROAD

DATE: APRIL 28 – 29, 2005

ITEM	FUNCT. VERB	FUNCT. NOUN	* TYPE	COST	WORTH	VALUE INDEX
Pavement & Base	Improve	Capacity	S	$ 24,000,000	$ 21,000,000	1.14
Median Barrier	Redirect	Vehicles	B	$ 4,000,000	$ 500,000	8.00
Median Drainage	Convey	Water	B	$ 3,300,000	$ 3,300,000	1.00
Noise Walls	Deflect	Noise	S	$ 3,000,000	$ 2,500,000	1.20
Earthwork	Establish	Grades	B	$ 700,000	$ 700,000	1.0
Traffic Control	Maintain	Traffic	B	$ 500,000	$ 500,000	1.0

***B – Basic S - Secondary**

** Note: This worksheet is a tool of the Value Engineering process and is only used for determining the areas that the Value Engineering team should focus on for possible alternatives. The column for COST indicates the approximate amount of the cost as shown in the cost estimate. The column for WORTH is an estimated cost for the lowest possible alternative that would provide the FUNCTION shown. Many times the lowest cost alternatives are not considered implementable but are used only to establish a worth for a function. A value index greater than 1.00 indicates the Value Engineering team intends to focus on this area of the project.

INVESTIGATION PHASE

The following areas have a value index greater than 1.00 on the proceeding Functional Analysis Worksheet and therefore have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

A. Pavement and Base

B. Typical Section/Median

C. Noise Walls

V. SPECULATION PHASE

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

A. Pavement and Base

- Match existing pavement thickness.
- Use asphalt pavement.
- Use equivalent black base.

B. Typical Section/Median

- Double face guardrail.
- Cable barrier with grass median.
- Use double face guardrail with grass median.

C. Noise Walls

- Eliminate the walls that would be replaced by the future HOV project.
- Determine noise walls that would be required using $30,000/home.
- Place the noise walls at the shoulder point in the fill sections and at the right of way line in the cut sections

VI. EVALUATION PHASE

A. ALTERNATIVES

The following alternatives were formulated during the "eliminate and combine" portion of the Evaluation Phase.

A. Pavement and Base

Value Engineering Alternative:	Match the existing 10 inches of concrete pavement with a base of 3 inches of asphalt and 12 inches of graded aggregate base.

B. Typical Section/Median

Value Engineering Alternative No. 1:	Double face guardrail.
Value Engineering Alternative No. 2:	Cable barrier with grass median.

C. Noise Walls

Value Engineering Alternative No. 1:	Eliminate the walls that would be replaced by the future HOV project.
Value Engineering Alternative No. 2:	Determine noise walls that would be required using $30,000/home.
Value Engineering Alternative No. 3:	Place the noise walls at the shoulder point in the fill sections and at the right of way line in the cut sections.

VI. EVALUATION PHASE

B. ADVANTAGES AND DISADVANTAGES

The following Advantages and Disadvantages were developed for the Value Engineering Alternatives previously generated during the speculation phase. It also includes the Advantages and Disadvantages for the As Proposed.

A. Pavement and Base

"As Proposed": 12 inches of Portland Cement Concrete with 3 inches of asphalt and 12 inches of graded aggregate base.

Advantages

- Longer service life for widened portion of pavement.

Disadvantages

- Dissimilar thickness of old and new pavement for maintenance/replacement.
- Higher construction cost.

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative: Match the existing 10 inches of concrete pavement with a base of 3 inches of asphalt and 12 inches of graded aggregate base.

Advantages

- Lower construction cost.
- Same pavement thickness for maintenance/replacement.

Disadvantages

- None apparent.

Conclusion

Carry forward for further evaluation.

B. Typical Section/Median

"As Proposed": Concrete barrier

Advantages

- Less future maintenance.
- Could support glare screen.

Disadvantages

- Increase drainage cost.
- Higher barrier cost.
- Longer construction time.

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative No. 1: Double face guardrail.

Advantages

- May be more appropriate since this is an interim project.
- Lower barrier cost.
- Less construction time.

Disadvantages

- Higher maintenance cost.
- Difficult construction.

Conclusion

Eliminate from further evaluation.

B. ADVANTAGES AND DISADVANTAGES (Cont'd)

Value Engineering Alternative No. 2: Cable barrier with grass median.

Advantages

- May be more appropriate since this is an interim project.
- Lower barrier cost.
- Less construction time.
- More flexible for future HOV project.
- Shorter construction time.
- Lower drainage requirements.

Disadvantages

- Higher maintenance cost.

Conclusion

Carry forward for further evaluation.

C. Noise Walls

"As Proposed": Varying heights and locations.

Advantages

- May be less clearing.
- Overlaps avoid wet ditches.
- Meets requirements.

Disadvantages

- High cost for secondary function.

Conclusion

Carry forward for further evaluation.

C. Noise Walls (continued)

Value Engineering Alternative No. 1: Eliminate the walls that would be replaced by the future HOV project.

Advantages

- Avoids constructing walls that will be removed during the future HOV project.
- Less construction cost.
- May be more appropriate since this is an interim project.

Disadvantages

- Does not meet requirements in two areas.

Conclusion

Eliminate from further evaluation.

Value Engineering Alternative No. 2: Determine noise walls that would be required using $30,000/home.

Advantages

- May meet FHWA requirements.
- May be more appropriate since this is an interim project.

Disadvantages

- Has no impact on amount of walls required.

Conclusion

Eliminate from further evaluation.

C. Noise Walls (continued)

Value Engineering Alternative No. 3: Place the noise walls at the shoulder point in the fill sections and at the right of way line in the cut sections.

Advantages

- May be more appropriate since this is an interim project
- Lower area of walls required
- Lower construction cost

Disadvantages

- May be more clearing
- Will be more throwaway at time of future HOV project

Conclusion

Carry forward for further evaluation.

VII. DEVELOPMENT PHASE

A. PAVEMENT AND BASE

(1) AS PROPOSED

(2) VALUE ENGINEERING ALTERNATIVE

B. TYPICAL SECTION/MEDIAN

(1) AS PROPOSED

(2) VALUE ENGINEERING ALTERNATIVE NO. 2

C. NOISE WALLS

(1) AS PROPOSED

(2) VALUE ENGINEERING ALTERNATIVE NO. 3

D. DESIGN COMMENTS

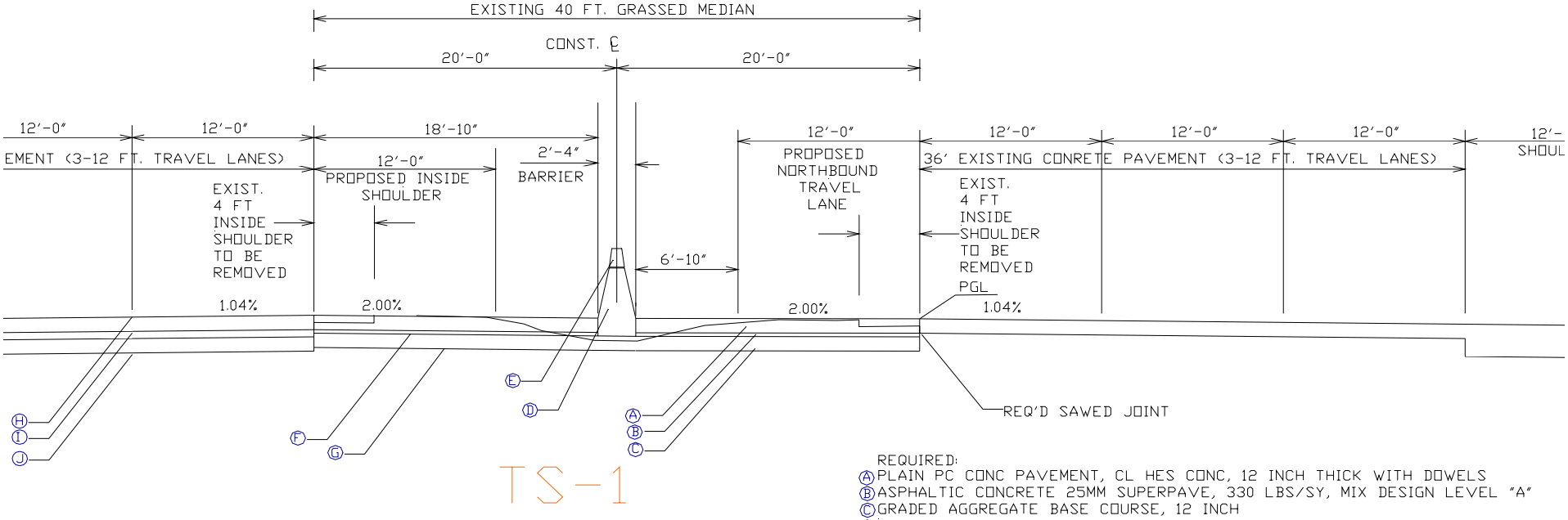
VII. DEVELOPMENT PHASE

A. PAVEMENT AND BASE

1. AS PROPOSED

Project NH-056-1(59) proposes to widen GA 400 from just south of Haynes Bridge Road in Fulton County to McFarland Road in Forsyth County. The widening will be accomplished entirely in the median and will be adding one or two lanes to give the roadway a consistent balance of lanes in this corridor. The new widening will have a 0.02 cross slope directed entirely to the median in tangent sections. New drainage inlets will be constructed in the median and a concrete median barrier with a glare screen will be placed at the construction centerline.

The existing roadway was constructed some 40 years ago. This original pavement consisted of two or three 12-ft. travel lanes and was constructed of plain Portland cement concrete pavement. The typical section for the proposed widening will be a 12-inch layer of graded aggregate base, 330 lbs/sy of 25mm Superpave and 12 inches of PCC pavement.



TS-1

REQUIRED:
- A PLAIN PC CONC PAVEMENT, CL HES CONC, 12 INCH THICK WITH DOWELS
- B ASPHALTIC CONCRETE 25MM SUPERPAVE, 330 LBS/SY, MIX DESIGN LEVEL "A"
- C GRADED AGGREGATE BASE COURSE, 12 INCH
- D CONCRETE BARRIER TYPE S-2 & S-3
- E 27" GLARE SCREEN (GA STD. 4940)
- F LOW STRENGTH FILTER FABRIC
- G GEOGRID
- H EXISTING 10" PCC
- I EXISTING 6" GAB
- J EXISTING 12' OF SELECT BORROW

NOTES:
1. REQ'D DOWEL BAR DIAMETER-11/2"
REQD MAXIMUM JOINT SPACING 15'-0'
2. GEOGRID TO BE USED AS NEEDED AND AS DIRECTED BY THE ENGINEER

AS PROPOSED

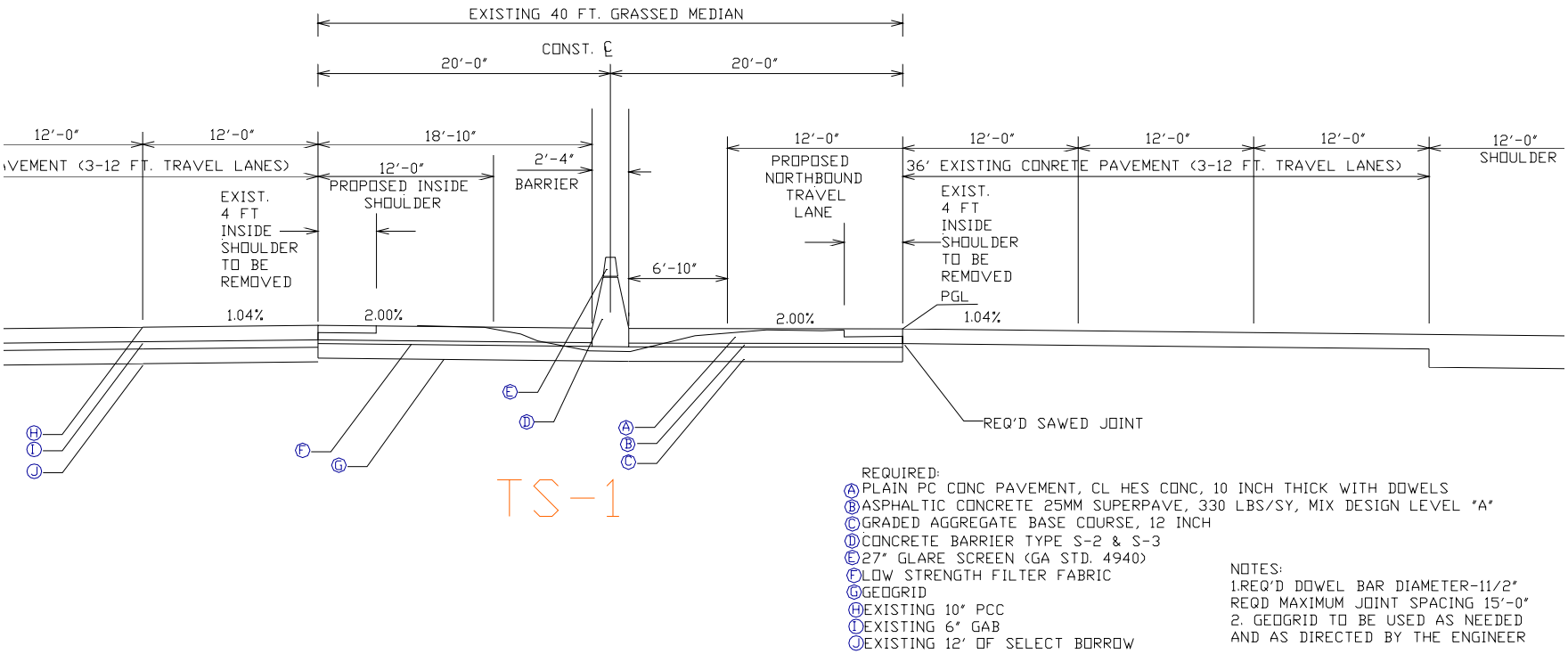
VII. DEVELOPMENT PHASE

A. PAVEMENT AND BASE (Cont'd)

2. VALUE ENGINEERING ALTERNATIVE

The typical section for the original construction of GA 400 consisted of 12 inches of select borrow, 6 inches of cement stabilized graded aggregate subbase course and 10 inches of plain Portland cement concrete pavement. The value engineering alternative to the proposed pavement and base is to change the PCC pavement from 12 to 10 inches to match the original construction. The original pavement is reported to be in good condition after almost 40 years. By having the same depth of paving, any adverse effects of lateral movement between these adjacent pavements should be minimized.

The application of this alternative could save an estimated $3.1 million. The cost savings were determined by prorating the square yard unit price.



TS-1

REQUIRED:
- A PLAIN PC CONC PAVEMENT, CL HES CONC, 10 INCH THICK WITH DOWELS
- B ASPHALTIC CONCRETE 25MM SUPERPAVE, 330 LBS/SY, MIX DESIGN LEVEL "A"
- C GRADED AGGREGATE BASE COURSE, 12 INCH
- D CONCRETE BARRIER TYPE S-2 & S-3
- E 27" GLARE SCREEN (GA STD. 4940)
- F LOW STRENGTH FILTER FABRIC
- G GEOGRID
- H EXISTING 10" PCC
- I EXISTING 6" GAB
- J EXISTING 12' OF SELECT BORROW

NOTES:
1. REQ'D DOWEL BAR DIAMETER-11/2"
REQD MAXIMUM JOINT SPACING 15'-0"
2. GEOGRID TO BE USED AS NEEDED AND AS DIRECTED BY THE ENGINEER

VE ALTERNATIVE

GA 400 - PAVEMENT AND BASE
VALUE ENGINEERING ALTERNATIVE
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
CONCRETE PAVING AS PROPOSED	SY	$61.00	303734.0	$18,527,774		$0
CONCRETE PAVING VE ALTERNATIVE	SY	$50.84			303734.0	$15,441,837
SUBTOTAL				$18,527,774		$15,441,837
ENGINEERING AND CONTINGENCY			10.0%	$1,852,777	12.0%	$1,853,020
GRAND TOTAL				**$20,380,551**		**$17,294,857**

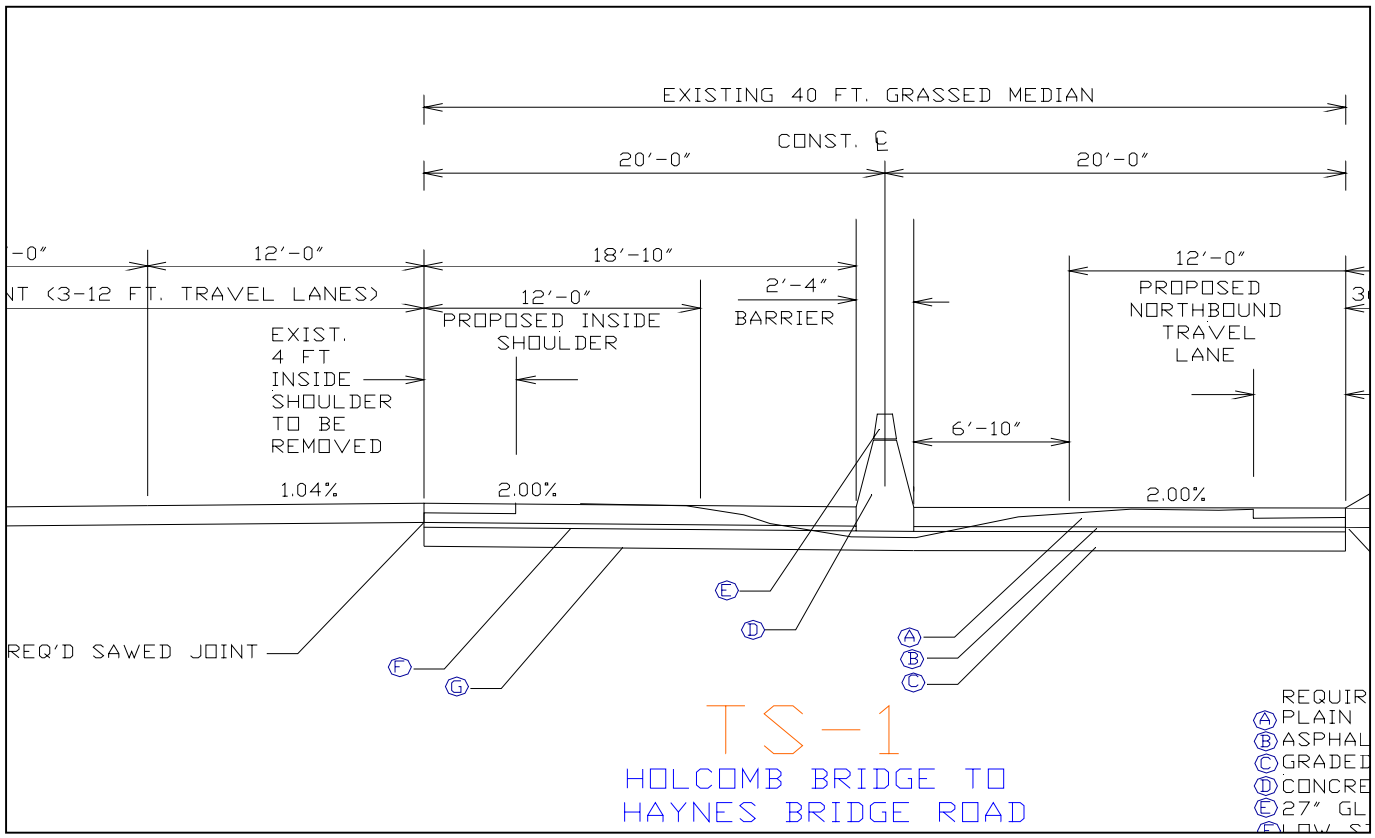
POSSIBLE SAVINGS: $3,085,694

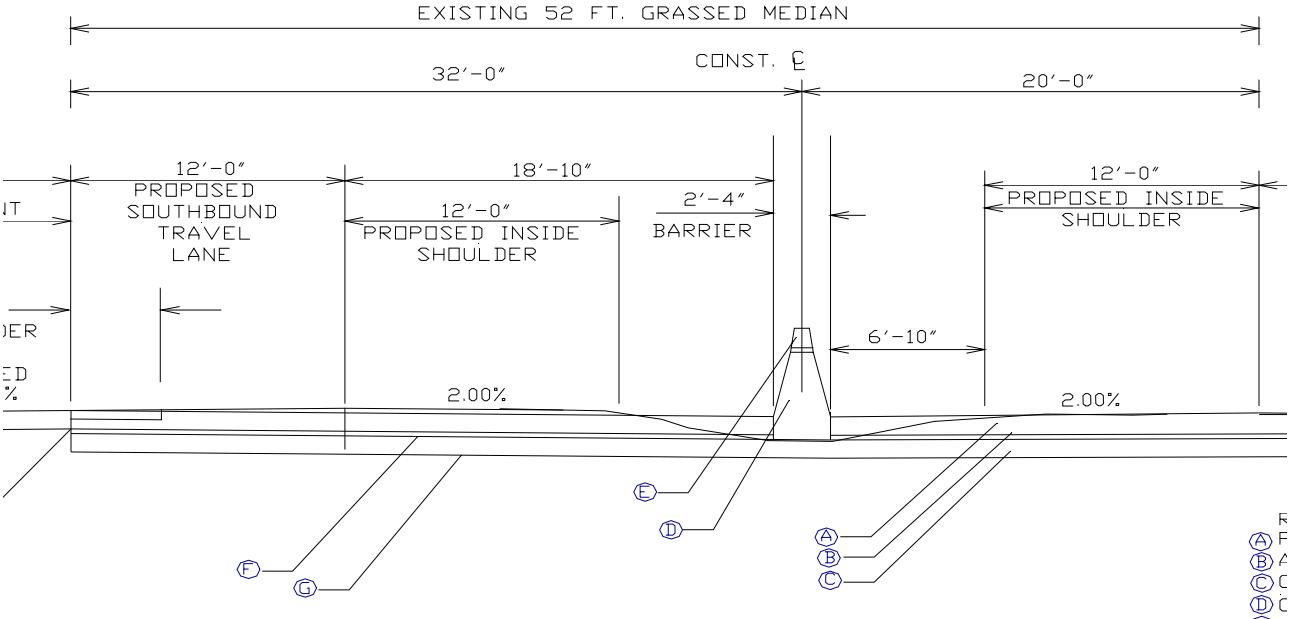
VII. DEVELOPMENT PHASE

B. TYPICAL SECTION/MEDIAN

1. AS PROPOSED

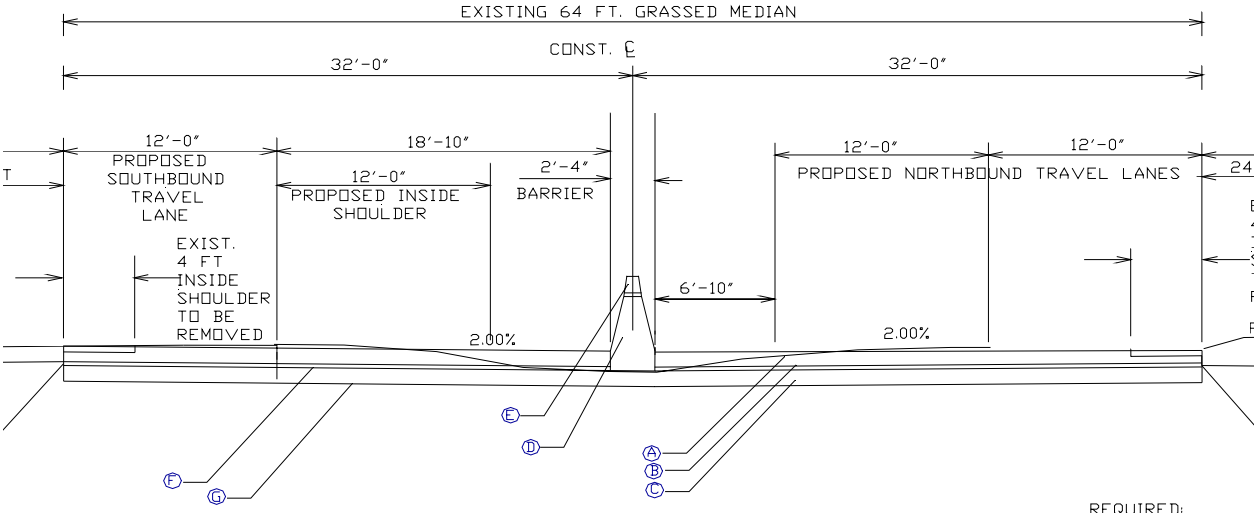
The as proposed typical section, as shown below, calls for a 2’ 4” wide concrete median barrier (Type S-1) at the centerline of construction. In addition to the pavement and barrier, $3,281,600 +/- worth of drainage improvements will be required to remove the water from the median.





TS-3

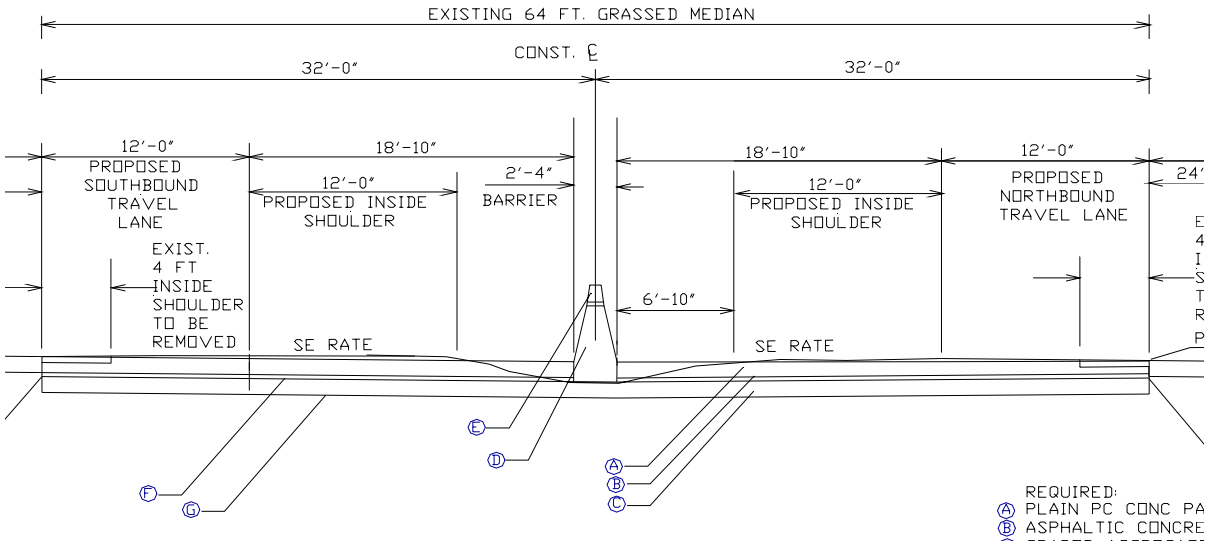
HOLCOMB BRIDGE TO
HAYNES BRIDGE ROAD



TS-6

KIMBALL BRIDGE ROAD TO
WINDWARD PARKWAY

REQUIRED:
Ⓐ PLAIN PC CONC
Ⓑ ASPHALTIC CONC
Ⓒ GRADED AGGREGA
Ⓓ CONCRETE BARRI
Ⓔ 27" GLARE SCRE
Ⓕ LOW STRENGTH



REQUIRED:
Ⓐ PLAIN PC CONC PA
Ⓑ ASPHALTIC CONCRE
Ⓒ GRADED AGGREGATE
Ⓓ CONCRETE BARRIER
Ⓔ 27" GLARE SCREEN
Ⓕ LOW STRENGTH FIL
Ⓖ GEOGRID

TS-9

WINDWARD PARKWAY TO
McFARLAND ROAD

N
1

B. TYPICAL SECTION/MEDIAN (Cont'd)

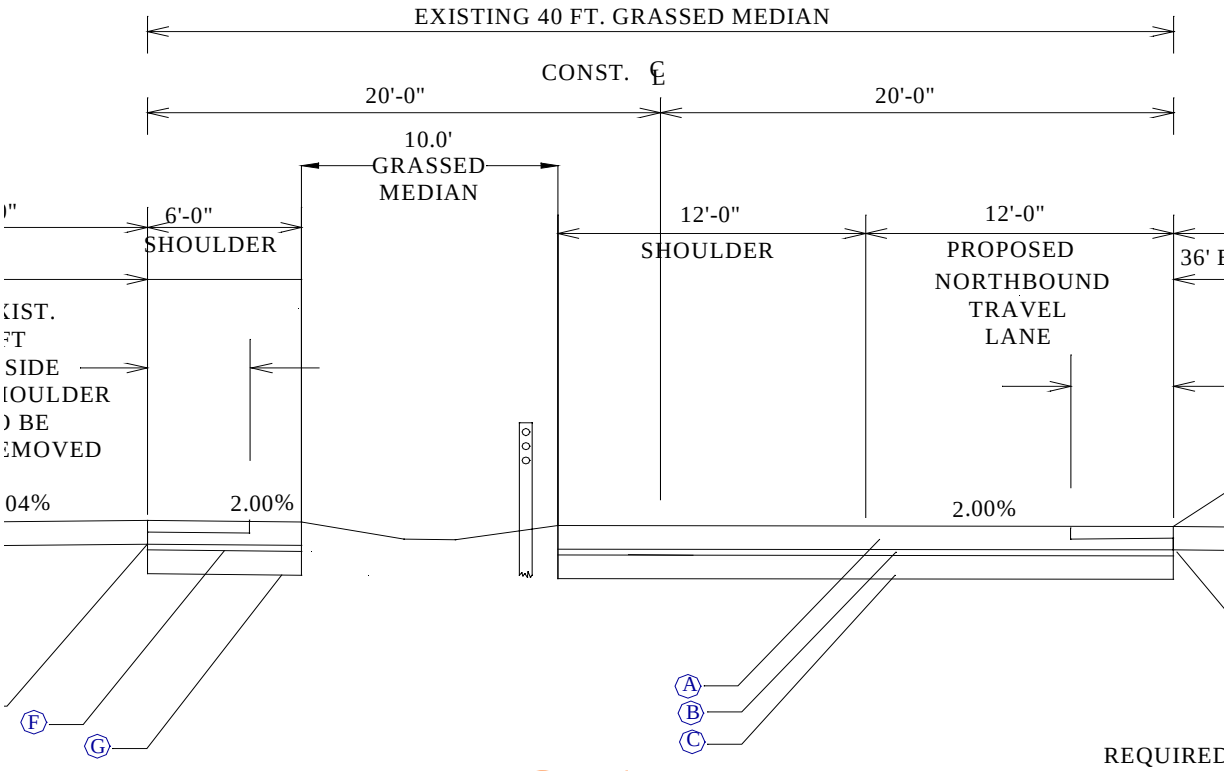
2. VALUE ENGINEERING ALTERNATIVE NO. 2

The proposed project is an interim project and the ultimate median configuration has not been determined. With this understanding, the VE Team recommends replacing the 2' 4" wide Concrete Median Barrier (Type S-1) with a Cable Barrier System that is offset 13 feet from one of the inside travel lanes as shown on the following sheet. With the "As Proposed" Concrete Barrier System, both directions of travel have an obstacle (the barrier). The VE alternative increases this obstacle distance to the travel lane for one direction of travel resulting in a reduced risk for collisions with an obstacle. The following table shows the separation from the barrier:

TYPICAL	AS PROPOSED		VE ALTERNATIVE	
	SB	NB	SB	NB
TS-1	18'10"	6'10"	27'0"	13'0"
TS-3	18'10"	18'10"	15'0"	13'0"
TS-6	18'10"	6'10"	27'0"	13'0"
TS-9	18'10"	18'10"	15'0"	13'0"

This alternative provides several savings:

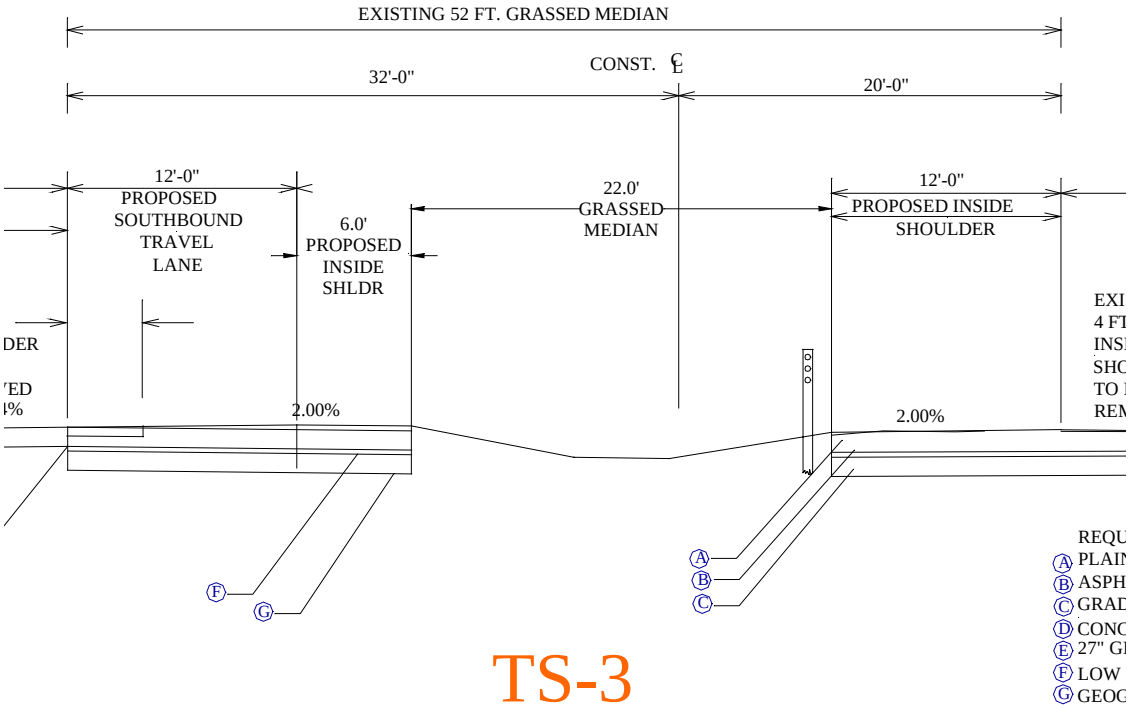
1. Replacing a $77/LF concrete barrier with a $20.50/LF Cable Barrier System.
2. Eliminates the closed drainage system improvements required to remove storm water from the median.
3. Reduces the amount of full depth pavement.
4. Allows more flexibility for design of the ultimate median configuration.



TS-1

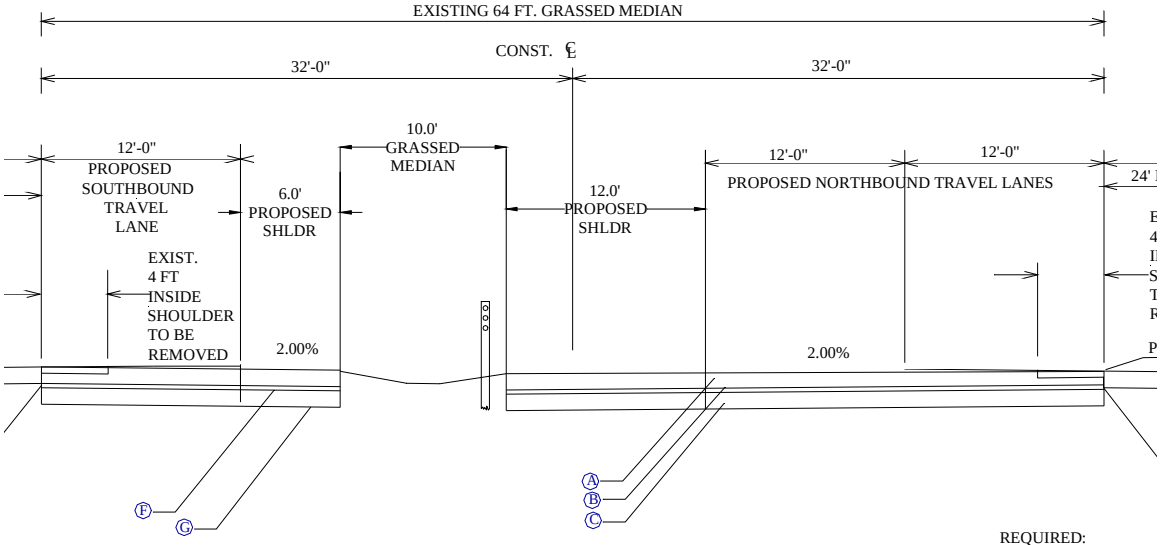
HOLCOMB BRIDGE TO HAYNES BRIDGE ROAD

REQUIRED
A PLAIN PC
B ASPHALTI
C GRADED A
D CONCRETI
E 27" GLARE
F LOW STRE
G GEOGRID



TS-3

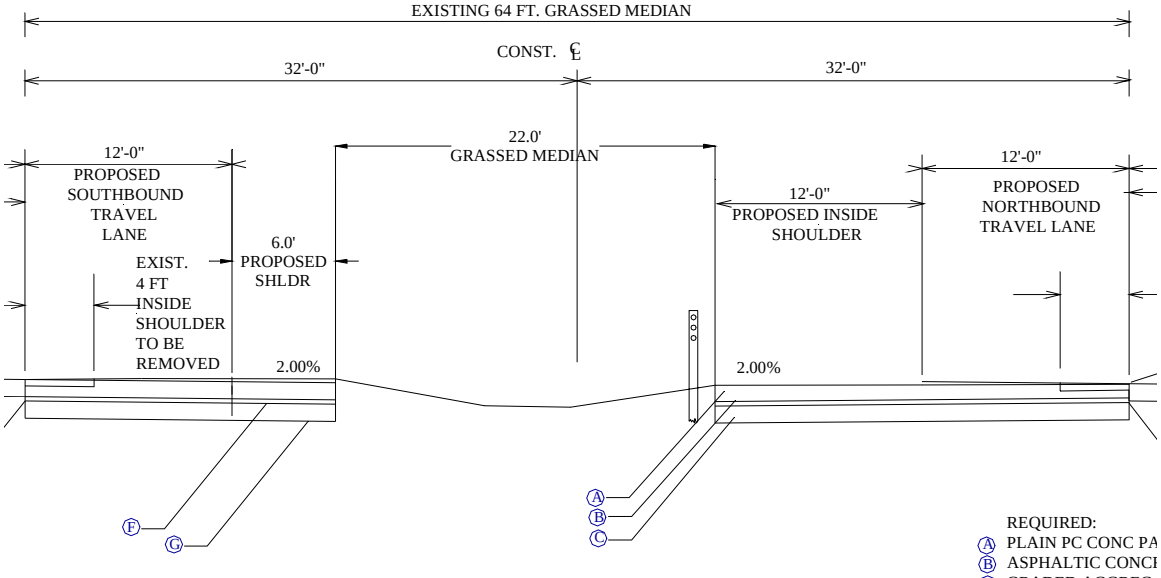
HOLCOMB BRIDGE TO
HAYNES BRIDGE ROAD



TS-6

KIMBALL BRIDGE ROAD TO
WINDWARD PARKWAY

REQUIRED:
- A PLAIN PC CONC PAV
- B ASPHALTIC CONCRE
- C GRADED AGGREGAT
- D CONCRETE BARRIER
- E 27" GLARE SCREEN (
- F LOW STRENGTH FIL



TS-9

WINDWARD PARKWAY TO
McFARLAND ROAD

REQUIRED:
- A PLAIN PC CONC PA
- B ASPHALTIC CONCI
- C GRADED AGGREG
- D CONCRETE BARRI
- E 27" GLARE SCREEN
- F LOW STRENGTH FI
- G GEOGRID

GA 400 -- TYPICAL SECTION/MEDIAN
VALUE ENGINEERING ALTERNATIVE NO. 2
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
MEDIAN/SIDE BARRIER	LF	$77.00	48900	$3,765,300		$0
CABLE BARRIER	LF	$20.50	0	$0	48900	$1,002,450
END ANCHORAGE SYSTEM (EVERY 10,000 FT)	EA	$2,900.00	0	$0	6	$17,400
MEDIAN PAVEMENT	SY	$79.60	303734	$24,177,226	202511	$16,119,876
GRASSING	AC	$1,000.00	0	$0	21	$20,914
DRAINAGE	LS	$3,281,600.00	1	$3,281,600	0%	$0
SUBTOTAL				**$31,224,126**		**$17,160,639**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)			0.0%	$0	0.0%	$0
TRAFFIC CONTROL/MOT			0.0%	$0	0.0%	$0
CONTINGENCY			10.0%	$0	10.0%	$1,716,064
GRAND TOTAL				**$31,224,126**		**$18,876,703**

POSSIBLE SAVINGS: $12,347,423

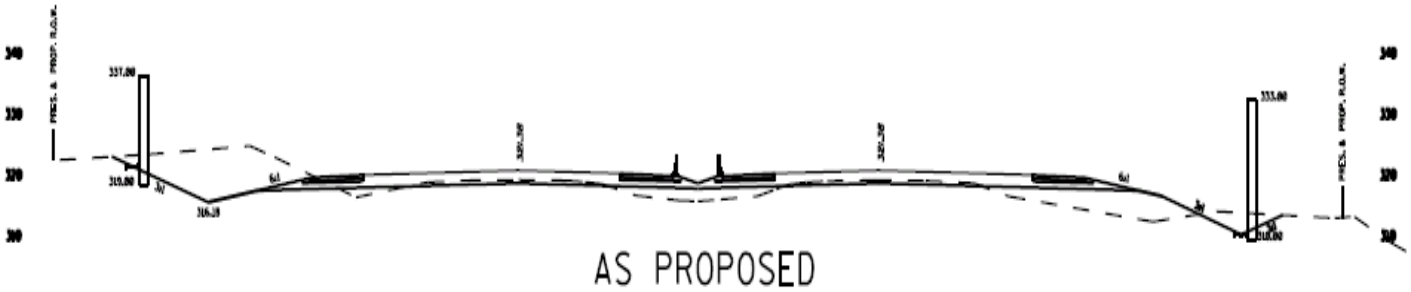
VII. DEVELOPMENT PHASE

C. NOISE WALLS

1. AS PROPOSED

This is an interim project with the ultimate typical configuration yet to be determined. Therefore, some of these noise walls are in jeopardy of being relocated in the ultimate configuration. Based on the Interstate Highway GA 400 Noise Study Report, dated March 2005 (revised March 29, 2005; noise abatement measures are warranted along approximately 11,093 linear feet of the proposed construction project from Holcomb Bridge Road to McFarland Road.

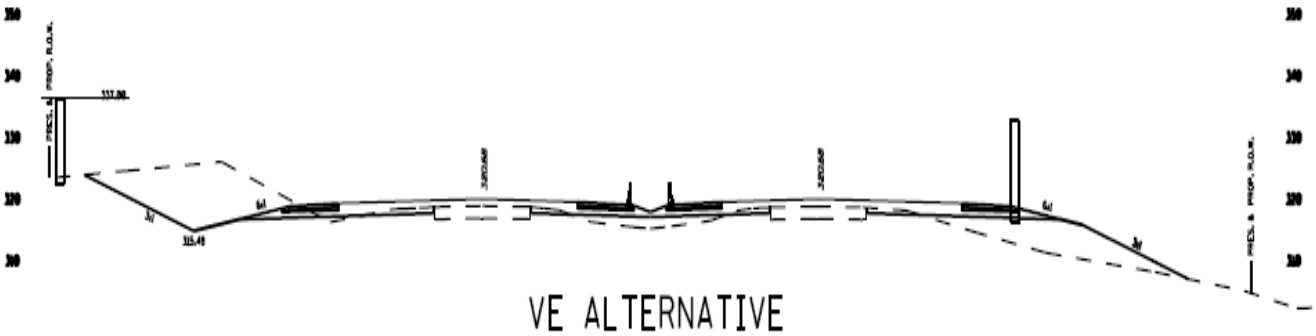
A noise wall ranges in height from 10 feet to 30 feet with an average height of 18 feet will be placed at or near the right of way.



C. NOISE WALLS

2. VALUE ENGINEERING ALTERNATIVE NO. 3

The VE Team recommends placing the noise walls at the shoulder line of the roadway in fill sections and at the right of way line in cut sections. Placing the walls at the shoulder line for the fill sections increases the "noise shadow" of the wall and raising the foundation elevation of the wall therefore provides a shorter wall for the same "noise shadow" for a wall placed toward the right of way line. In the cut section, the walls at the right of way will be shorter by virtue of being placed at a higher elevation. For estimating purposes the VE Team assumed an overall noise wall height reduction of 10 feet over the length of the project.



SR 400 -- NOISE WALL
VALUE ENGINEERING ALTERNATIVE NO. 3
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
NOISE WALLS	SF	$15.00	194462.0	$2,916,930	83532.0	$1,252,980
BARRIER	LF	$60.00	0.0	$0	11093.0	$665,580
SUBTOTAL				**$2,916,930**		**$1,918,560**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)			0.0%	$0	0.0%	$0
TRAFFIC CONTROL/MOT			0.0%	$0	0.0%	$0
CONTINGENCY			10.0%	$291,693	10.0%	$191,856
GRAND TOTAL				**$3,208,623**		**$2,110,416**

POSSIBLE SAVINGS: $1,098,207

VII. DEVELOPMENT PHASE

D. DESIGN COMMENTS

1. Underdrain including aggregate should be added in the median, at least in the low points, to remove any subsurface water.

2. Some of the existing roadway slabs are in need of repair. A quantity of slab replacement should be added to the project.

3. Especially for the above work, a *Special Provision* needs to be included in the contract for restrictions on lane closures.

4. A temporary additional outside lane on both sides of the roadway will be needed from Windard Parkway to McFarland Road to accommodate the construction. The cost for this additional construction also needs to be added.

5. Staging of the work needs to be included in the contract to allow for early opening of completed areas from north to the south on the northbound side and from south to north on the southbound side; i.e. reverse progression.

6. The quantities for grassing (45 acres) and clearing and grubbing (65 acres) seem to be excessively high due to the fact that the work on this project is primarily in the median.

7. Due to the interstate characteristics of GA 400, the Georgia Department of Transportation should consider continual milepost numbering and a corresponding numbering of the interchanges.

VIII. SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering Team that the following Value Engineering Alternatives be carried into the Project Development process for further development.

A. Pavement and Base

Recommendation No. 1:

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative matches the existing 10 inches of concrete pavement.

If this recommendation can be implemented, there is a possible savings of: **$3,109,081**

B. Typical Section/Median

Recommendation No. 2:

The Value Engineering Team recommends that Value Engineering Alternative No. 2 be implemented. This alternative uses cable with a grass median.

If this recommendation can be implemented, there is a possible savings of: **$12,347,423**

C. Noise Walls

Recommendation No. 3:

The Value Engineering Team recommends that Value Engineering Alternative No. 3 be implemented. This alternative places the noise walls at the shoulder point in the fill sections and at the right of way line in the cut sections.

If this recommendation can be implemented, there is a possible savings of: **$1,098,207.**