

**VALUE ENGINEERING STUDY
OF
STP-IM-022-1(26) & IM-000-00(523) (SR 16/I-75)
PI NUMBER: 332520 & 0000523**

**ATLANTA, GEORGIA
MARCH 3, 2004**

**Prepared by:
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In Association With:

Georgia Department of Transportation

**VALUE ENGINEERING STUDY
TEAM LEADER**

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Date: _____

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I. INTRODUCTION

GENERAL

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 week of March 3, 2004.

VALUE ENGINEERING 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/Development
4. Report Preparation

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

- Construction Cost
- Maintenance Cost
- Constructability
- Ease of Construction
- Construction time
- Impact to Traffic

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 the final plans and specifications.

A. CONSTRUCTABILITY

RECOMMENDATION NUMBER 1- I-75/SR 16 INTERCHANGE BRIDGE

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative shortens the bridge and uses MSE walls with vertical abutments.

If this recommendation can be implemented, there is a possible **\$191,989**.

RECOMMENDATION NUMBER 2- I-75/SR 16 INTERCHANGE BRIDGE

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative uses method 4 for concrete barrier

RECOMMENDATION NUMBER 3- CABIN CREEK BRIDGE

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative revises the bridge plan sheets to clarify that the high water elevations include the addition of backwater

RECOMMENDATION NUMBER 4- CABIN CREEK BRIDGE

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative mills asphalt off the existing bridge and resurfaces it with concrete

RECOMMENDATION NUMBER 5- INTERCHANGE RAMPS

The Value Engineering Team recommends that the Value Engineering Alternative be implemented. This alternative uses parallel ramps rather than tapers

RECOMMENDATION NUMBER 6- DRAINAGE

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative insures that extension of drainage structure at approximate station does not create backwater on adjacent landowner

RECOMMENDATION NUMBER 7- DRAINAGE

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative eliminates the proposed extension of drainage structure at approximate station 374 and replaces it with a new continuous structure

RECOMMENDATION NUMBER 8- DRAINAGE

The Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This alternative insures that all paved ditches meet the department's grade percentage for paving

RECOMMENDATION NUMBER 9- DRAINAGE

The Value Engineering Team recommends that Value Engineering Alternative Number 4 be implemented. This alternative provides for a detail for a Type "B" crossover

B. STAGE CONSTRUCTION

RECOMMENDATION NUMBER 10- DRAINAGE

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative provides for temporary drainage structures inside existing ramps during construction

RECOMMENDATION NUMBER 11- PAVEMENT

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative provides for a left turn lane at the truck turnaround

C. CONTRACTOR WORK HOURS

RECOMMENDATION NUMBER 12-CONTRACTOR WORK HOURS

The Value Engineering Team recommends that the Value Engineering Alternative be implemented. This alternative provides for restricted work hours at the I-75 interchange and on the crossroad

D. OTHER

RECOMMENDATION NUMBER 13- OTHER

The Value Engineering Team also recommends that the following other Value Engineering Alternatives be implemented:

1. The quantity of aggregate surface course should be increased to 5000 tons due to construction time for this project.
2. The *Special Provision* for the project field office needs to include that the parking area is to be graveled and maintained if the existing area is not paved.
3. A *Special Provision* needs to be included to require the use of alternate materials for bridge striping rather than using the thermoplastic set up in the project.
4. Signal plans for at least 3 if not 4 intersections are not included in the project. These plans need to be added.
5. With the concurrence of the Federal Highway Administration representative and GADOT personnel, it is recommended that this project be used as a pilot project for a new striping / rumble strip idea. The outside lane needs to be paved to a width of 14' without a break in the cross slope. The rumble strips will then be placed in their standard location. However, the edge line strip will be placed on the inner edge of the rumble strip. This is an effort to provide better retro-reflectivity of the edge line.
6. A *Special Provision* or line item needs to be included in the project to address the original cross sections. The plans were developed using aerial photography provided by GADOT. Due to dense tree growth along this corridor, there is concern that the original cross sections may have been adversely affected. The recommended item is to include the requirement that the contractor certify the original cross sections.
7. A special note needs to be added stating that any disturbed markings on I-75 must be replaced in-kind.
 - GADOT anticipates that SR 16 will be widened in the future to the east of I-75. The plans as proposed will taper into the existing two-lane section. It is recommended that a "square-off" point be constructed to allow easy tie-in with any future construction.

II. LOCATION OF PROJECT

MAP

III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry	Ventry Engineering	Team Leader	850/627-3900
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Richard Marshall	GADOT	GO Construction	404-656-5306
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Thomas Fambro	GADOT	Traffic Safety & Design	404-635-8159
Vince Wilson	GADOT	Bridge Design	404-656-5302
Jack Muirhead	GADOT	Bridge Design	404-656-5197
David Painter	FHWA	Area Engineer	404-562-3658
Lisa Myers	GADOT	Engineering Services	404-651-7468

PROJECT DESCRIPTION

Project STP-IM-022-1(26) consists of the widening of SR 16 beginning at Rehoboth Road in Griffin in Spalding County to I-75 in Butts County for a project length of 8.07 miles. A new bridge will be constructed for the westbound lanes over Cabin Creek.

Project IM-0000-00(523) consists of rehabilitation and reconstruction of the I-75 and SR 16 interchange in Butts County. New interchange ramps and a new SR 16 bridge over I-75 are included.

IV. INVESTIGATION PHASE

**STP-IM-022-1(26) & IM-000-00(523) (SR 16/I-75)
 VALUE ENGINEERING STUDY BRIEFING
 MARCH 3, 2004**

NAME	AFFILIATION	PHONE
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Jack Muirhead	GA DOT	404-656-5197
David Painter	FHWA	404-562-3658
Lisa Myers	GA DOT	404-651-7468

INVESTIGATION

The following areas have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

- A. CONSTRUCTABILITY
- B. STAGE CONSTRUCTION
- C. CONTRACTOR WORK HOURS

V. SPECULATION PHASE

SPECULATION

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

A. CONSTRUCTABILITY

1. I-75/SR 16 Interchange Bridge
 - Shorten bridge and use MSE walls with vertical abutments
 - Use method 4 for concrete barrier
2. Cabin Creek Bridge
 - Add a note to bridge plan sheets that will clarify that the high water elevations include the addition of backwater
 - Mill asphalt off the existing bridge and resurface with concrete
3. Interchange Ramps
 - Use parallel ramps rather than tapers
4. Drainage
 - Insure that extension of drainage structure at approximate station
 - does not create backwater on adjacent landowner
 - Eliminate proposed extension of drainage structure at approximate station 374 and replace it with a new continuous structure
 - Insure that all pave ditches meet the departments grade percentage for paving
 - Provide detail for Type “B” crossover

B. STAGE CONSTRUCTION

1. Drainage
 - Provide for temporary drainage structures inside existing ramps during construction
2. Pavement
 - Provide for a left turn lane at the truck turnaround

C. CONTRACTOR WORK HOURS

- Provide for restricted work hours at the I-75 interchange and on the crossroad

VI. EVALUATION/DEVELOPMENT PHASE

VI.(A) ALTERNATIVES

ALTERNATIVES

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

A. CONSTRUCTABILITY

1. I-75/SR 16 Interchange Bridge
 - Value Engineering Alternative Number 1 - Shorten bridge and use MSE walls with vertical abutments
 - Value Engineering Alternative Number 2 - Use method 4 for concrete barrier
2. Cabin Creek Bridge
 - Value Engineering Alternative Number 1 - Revise the bridge plan sheets to clarify that the high water elevations include the addition of backwater
 - Value Engineering Alternative Number 2 - Mill asphalt off the existing bridge and resurface with concrete
3. Interchange Ramps
 - Value Engineering Alternative - Use parallel ramps rather than tapers
4. Drainage
 - Value Engineering Alternative Number 1 - Insure that extension of drainage structure at approximate station does not create backwater on adjacent landowner
 - Value Engineering Alternative Number 2 - Eliminate proposed extension of drainage structure at approximate station 374 and replace it with a new continuous structure
 - Value Engineering Alternative Number 3 - Insure that all paved ditches meet the department's grade percentage for paving
 - Value Engineering Alternative Number 4 - Provide detail for Type "B" crossover

B. STAGE CONSTRUCTION

1. Drainage
 - Value Engineering Alternative Number 1 - Provide for temporary drainage structures inside existing ramps during construction
2. Pavement
 - Value Engineering Alternative Number 2 - Provide for a left turn lane at the truck turnaround

C. CONTRACTOR WORK HOURS

Value Engineering Alternative - Provide for restricted work hours at the I-75 interchange and on the crossroad

VI.(B) ADVANTAGES AND DISADVANTAGES

EVALUATION/DEVELOPMENT

The following Advantages and Disadvantages as well as other pertinent information was developed for the Value Engineering Alternatives previously generated during the speculation phase.

A. CONSTRUCTABILITY

1. I-75/SR 16 Interchange Bridge

Value Engineering Alternative Number 1, Option Number 1

The overhead bridge on this project is four span. The center spans are over the roadway, while the end spans are over the bridge end rolls and slope paving.

The recommendation of this study is to replace the end spans using MSE walls and fill. The roadway approach would be lengthened to tie in to the shorter bridge. A cost comparison was completed (see attached), indicating that \$191,989 could be saved.

Value Engineering Alternative Number 1 - Shorten bridge and use MSE walls with vertical abutments

Advantages

- Less construction time
- Less construction cost
- Less future maintenance

Disadvantages

- Plans revision

Conclusion

Carry forward for further evaluation

Value Engineering Alternative Number 1, Option Number 2

The area between the travel lanes and the center bent and between the travel lanes and the slope paving is unpaved. Due to the width of the overpass bridge, a vegetative ground cover is impossible to obtain. If Value Engineering Alternative Option Number 1 cannot be implemented, it is recommended that this area receive 4" of concrete paving. This could be an extension of the slope paving quantities.

Insert

**VALUE ENGINEERING ALTERNATIVE NUMBER 1, OPTION NUMBER 1
I-75 / SR 16 BRIDGE TYPICAL BRIDGE
COST COMPARISON**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
BRIDGE	SF	\$58.00	27375.0	\$1,587,750	18800.0	\$1,090,400
MSE WALLS	SF	\$45.00		\$0	6400.0	\$288,000
ROADWAY	SY	\$33.00		\$0	1055.0	\$34,815
SUBTOTAL				\$1,587,750		\$1,413,215
E & C			10.0%	\$158,775	10.0%	\$141,322
GRAND TOTAL				\$1,746,525		\$1,554,537

**POSSIBLE
SAVINGS
\$191,989**

A. CONSTRUCTABILITY

1. I-75/SR 16 Interchange Bridge

Value Engineering Alternative Number 2

The first stage of the SR 16 bridge construction proposes to complete approximately 43' of the new bridge. Traffic will then be shifted to this stage to complete the remainder of the bridge. There will be two 12' travel lanes, two 6' shoulders, bridge barrier and temporary concrete median barrier placed on this first stage. The remaining width behind the temporary concrete median barrier is less than six feet. It is therefore recommended that Method 4 be the pay item for the temporary concrete median barrier used on the bridge.

Value Engineering Alternative Number 2 - Use method number 4 for the temporary concrete barrier on the bridge.

Advantages

- Meets FHWA requirement
- Restrains concrete barrier

Disadvantages

- May not have connection that meets requirements

Conclusion

Carry forward for further evaluation

A. CONSTRUCTABILITY

2. Cabin Creek Bridge

Value Engineering Alternative Number 1

The Plan and Elevation sheet for the SR 16 WB Bridge over Cabin Creek has the standard notation for the 50, 100, and 500-year flood levels. The 100-year flood elevation, as shown, is on the bridge beams. The 500-year flood level, as shown, almost overtops the bridge rail. This concerned the Value Engineering Study Team and we felt that it should be addressed. A representative of the GADOT's hydraulic section described to the team that these levels included backwater effects and the levels were actually almost 3' below the bridge beams. If that explanation is correct, the design now appeared to be satisfactory. It is however, recommended that either these elevations be revised or that a note be placed on the bridge plans explaining that the flood elevations shown include other factors. This would make the plans more credible and would be more defensible in potential litigation.

Value Engineering Alternative Number 1 – Revise the bridge plan sheets to clarify that the high water elevations include the addition of backwater

Advantages

- Less confusion as to the height of beams above high water

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

Value Engineering Alternative Number 2

The existing SR 16 EB Bridge had been resurfaced with asphaltic concrete at least twice. It is recommended that this asphalt be removed and that a concrete overlay be placed on the original deck surface. This overlay is to match the original crown line with the high point being in the center of the bridge. The plans need to be revised to include a note that the approach paving is to match this typical section rather than the normal typical section for a tangent roadway. An acceptable length of the roadway would require milling to provide a proper tie-in.

Value Engineering Alternative Number 2-Mill asphalt off the existing bridge and resurface with concrete

Advantages

- Milling of asphalt and adding back concrete would be less weight than not milling and overlaying with additional asphalt

Disadvantages

- Somewhat longer construction time

Conclusion

Carry forward for further evaluation

A. CONSTRUCTABILITY

3. Interchange Ramps

Value Engineering Alternative

Currently, SR 16 could be considered a rural area with low traffic volumes. With the reconstruction of the I-75 interchange and the four-laning of SR 16 toward Griffin, this is going to soon change. There is already expected that this interchange area is going to experience tremendous growth. It is therefore recommended that the I-75 exit ramps to SR 16 be constructed as parallel exit ramps rather than the standard tapered exit ramps. If the growth indeed occurs, the parallel ramps will provide more storage capacity. Also, the lengthening of the ramps can be much more easily accomplished and at less cost in the future by using parallel ramps.

Value Engineering Alternative - Use parallel ramps rather than tapers

Advantages

- Provide for additional stacking area off the interstate
- FHWA would like to begin using parallel ramp lanes

Disadvantages

- Additional cost of extra pavement

Conclusion

Carry forward for further evaluation

A. CONSTRUCTABILITY

4. Drainage

Value Engineering Alternative Number 1

Drainage Structure # 45 is an existing 42” reinforced concrete pipe. The plans propose to extend this pipe approximately 25’ on the inlet end and on a 9.16% grade. The new inlet elevation is 2.28’ higher than the existing. As shown on the plans this is a pond or at least a very wet area as it currently exists. Raising the inlet elevation by more than 2’ could adversely impact property upstream. It is recommended that a survey be completed that would make sure there are no adverse effects to this drainage area. Further, it is recommended that a quantity of granular embankment be added to the project to aid in the installation of this pipe extension.

Value Engineering Alternative Number 1 - Insure that extension of drainage structure Number 45 does not create backwater on adjacent landowner or impact existing pond

Advantages

- Could avoid a conflict with adjacent land owners

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

Value Engineering Alternative Number 2

Drainage Structure # 78 is an existing 36” reinforced concrete pipe. The plans propose to extend this pipe by 121.07’ on the inlet end and by 47.79’ on the outlet end. Both of these extensions are skewed to the original line of pipe. It is recommended that this drainage structure be replaced with a new line of jacked and bored pipe on a straight line and on a constant grade. This would result in a drainage structure that will be much easier to maintain and will provide better flow characteristics.

Value Engineering Alternative Number 2 - Eliminate proposed extension of drainage structure at approximate station 374 and replace it with a new continuous structure

Advantages

- A new structure would eliminate the proposed double skew in the existing structure
- Less future maintenance
- Easier construction

Disadvantages

- Additional cost of all new structure

Conclusion

Carry forward for further evaluation

A. CONSTRUCTABILITY

4. Drainage

Value Engineering Alternative Number 3

The total quantity of ditch paving proposed for this project is not yet included in the summary of quantities. However, an examination of the plans would indicate that this quantity is abnormally large for a project in this terrain. It is therefore recommended that consideration be given to the use of perma mat or rip rap in ditches with lesser flow volumes and shorter lengths. The rip rap especially would more naturally blend with its surroundings.

Value Engineering Alternative Number 3- Insure that all paved ditches meet the departments percentage of grade requirement for paving

Advantages

- May eliminate some paved ditches
- May be less construction cost
- Less construction time

Disadvantages

- Revision of plans

Conclusion

Carry forward for further evaluation

Value Engineering Alternative Number 4

The nose point of a Type “B” crossover presents a drainage problem on construction due to the narrowing of the median width. A detail needs to be included in the plans to address additional areas that need to be concreted. A shift in the location of the median box also needs to be shown, dependent upon the profile grade at the crossover.

Value Engineering Alternative Number 4 - Provide detail for Type “B” crossover

Advantages

- Insures proper drainage

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

B. STAGE CONSTRUCTION

1. Drainage

The reconstruction of the I-75 interchange with SR 16 includes the reconstruction of the ramps. There is proposed to be a significant grade difference between the existing ramps and the proposed ramps on the east side of the interstate. It is recommended that temporary drainage structures be included in the project to address this problem.

Value Engineering Alternative - Provide for temporary drainage structures inside existing ramps during construction

Advantages

- Eliminates drainage problems during construction

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

2. Pavement

The proposed staging includes a truck/vehicle turn-a-round on the north side of SR 16 near Station # 600+00. It is recommended that the typical section be revised to require that the entire area right of Station 595+00 between the existing pavement and the Stage 1 pavement be paved during Stage 1. This area is proposed to be almost entirely in a curb & gutter area with median paving. By having this area paved during Stage 1, a striping detail needs to be added to introduce a left turn lane eastbound during the construction. The area between Station 595+00 and the nose point of the as proposed would then need a new typical section to indicate that this area will have median paving doveled and poured on top of this paved area.

Value Engineering Alternative - Provide for a left turn lane at the truck turnaround

Advantages

- Moves trucks from through lanes
- May only require additional striping

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

C. CONTRACTOR WORK HOURS

Lane Closures

Value Engineering Alternative

The contract for the study project needs to include a *Special Provision* governing work hours for lane closures as follows:

- I-75

Single lane closures:

Monday, Tuesday, Wednesday & Thursday 10:00PM – 6:00AM

Friday & Saturday 12:00PM – 8:00AM

Sunday 12:00PM – 5:00AM

Double lane closures:

As described above with the exception that the end time is 5:00AM for all days.

No lane closures:

Holidays, special events and other days as know to GADOT and not discussed in this study.

- SR 16

Lane closures on SR 16 cannot occur between the hours of 6:00 AM to 9:00AM and from 4:00PM to 6:00PM daily.

Value Engineering Alternative - Provide for restricted work hours at the I-75 interchange and on the crossroad

Advantages

- Less impact to I-75 traffic
- Less impact to crossroad traffic

Disadvantages

- Less convient for contractor

Conclusion

Carry forward for further evaluation