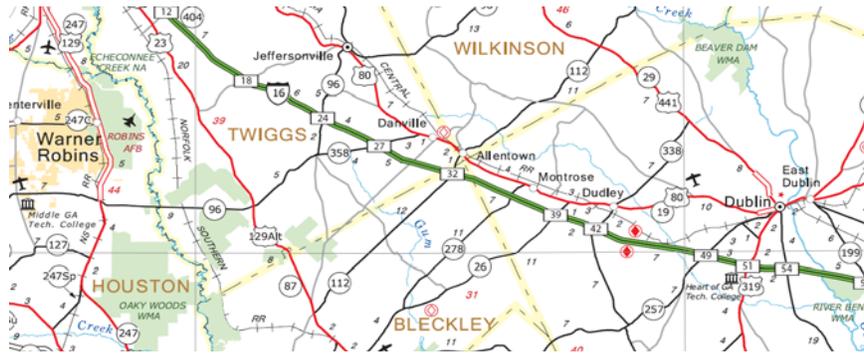


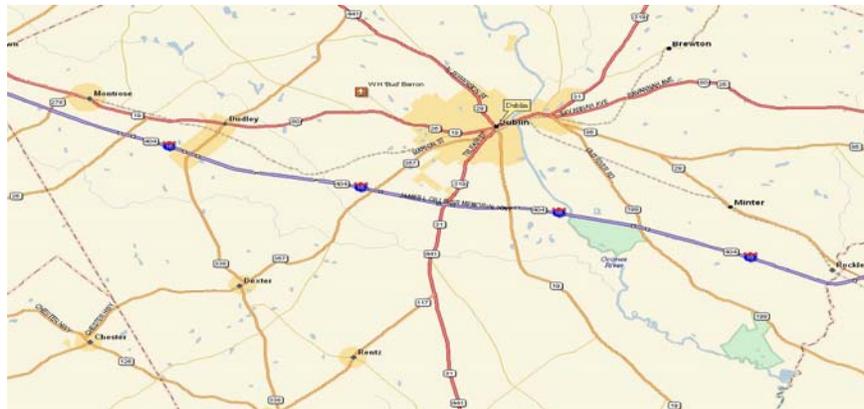
Value Engineering Study Report

**Georgia Department of Transportation
CSNHS-M003-00(3956) – P.I. No. M003956
and
CSNHS-M003-00(976) – P.I. No. M003976**

Laurens, Bleckley and Twiggs Counties



CSNHS-M003-00(976) Laurens, Bleckley, Twiggs



CSNHS-M003-00(956) Laurens



Value Engineering Team



Design Team



April 28, 2009



April 30, 2009

Ms. Lisa Myers
Design Review Engineer Manager/VE Coordinator
Georgia Department of Transportation-Engineering Services
One Georgia Center
600 W. Peachtree Street NW
Atlanta, GA 30308

RE: Submittal of the final Value Engineering Report I-16 Rehabilitation
Project Nos.: CSNHS-M003-00(956) – P.I. No. M003956
CSNHS-M003-00(976) – P.I. No. M003976
Laurens, Bleckley, Twiggs, and Treutlen Counties

This Value Engineering Study, which was performed on April 28, 2009 March 27, 2009, identified **15 alternatives** of which **10 are recommended for implementation**. We believe that these **ideas** may have a significant positive affect on the project.

We trust that you will find this report to be in proper order. It should be noted that the results of this workshop are volatile in that they can be overcome by the events that accompany the expeditious continuance of the design process. Accordingly, we encourage an equally expeditious implementation meeting to design the disposition of the contents of this report.

On behalf of our VE Team, we thank you very much for this opportunity to work with you and the hard working staff of the Georgia Department of Transportation.

Yours truly,

PBS&J

A handwritten signature in black ink that reads 'Les M. Thomas'.

Les M. Thomas, P.E., CVS-Life
VE Team Leader

A handwritten signature in black ink that reads 'Randy S. Thomas'.

Randy S. Thomas, CVS
Assistant Team Leader

Value Engineering Study Report

**Project No. CSNHS-M00-00(956) – P.I. No. M003956
and
Project No. CSNHS-M00-00(976) – P.I. No. M003976**

**Rehabilitation of I-16
Laurens, Bleckley, Twiggs and Treutlen Counties**

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Value Engineering Process
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Attendance Sheet
Creative Idea Listing and Evaluation Worksheet

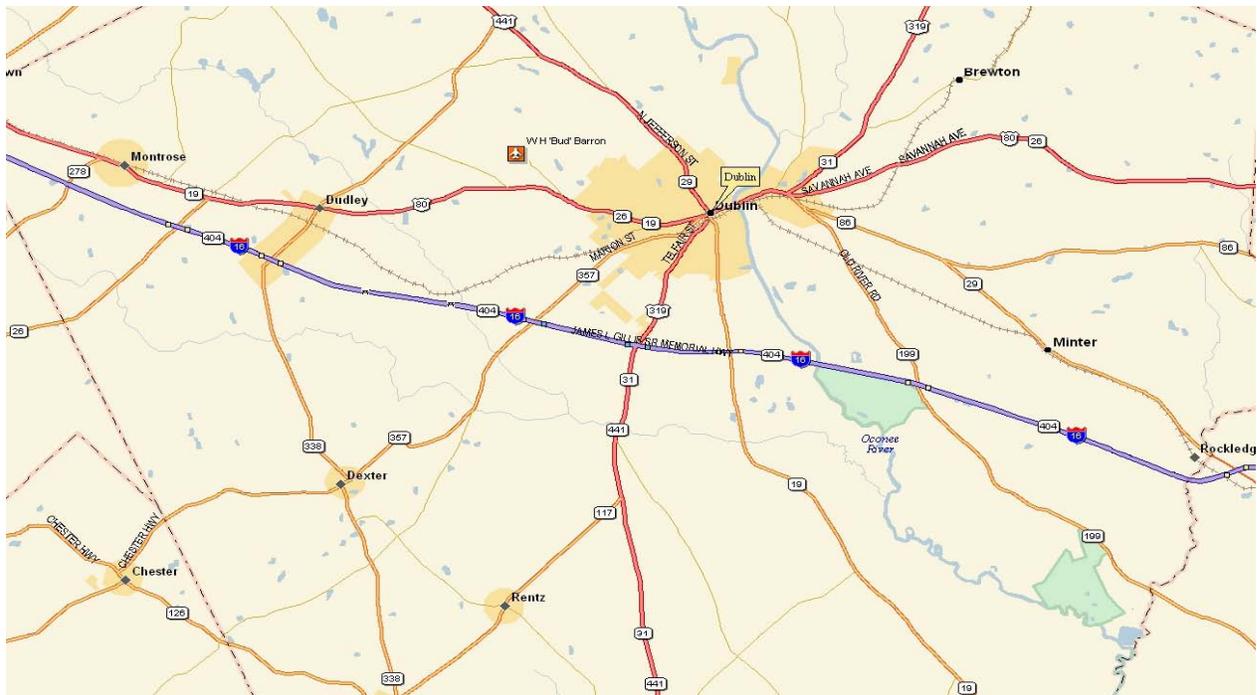
EXECUTIVE SUMMARY

PROJECT OVERVIEW

This report summarizes the analysis, conclusions, and recommendations by the PBS&J Value Engineering workshop team as they performed a Value Engineering Study on April 28, 2009 in Atlanta, at the office of the Georgia Department of Transportation. The subjects of the study were Projects CSNHS-M003-00(956) - P.I. No. M003956 and CSNHS-M003-00(976) – P.I. No. M003976. Both projects are rehabilitation projects of I-16.

PROJECT DESCRIPTION & LOCATION

CSNHS-M003-00(956) is located 92% within Laurens County and 8% within Treutlen County. The length of the project is 29.727 miles and present traffic is 17,380-22,280 vehicles per day.

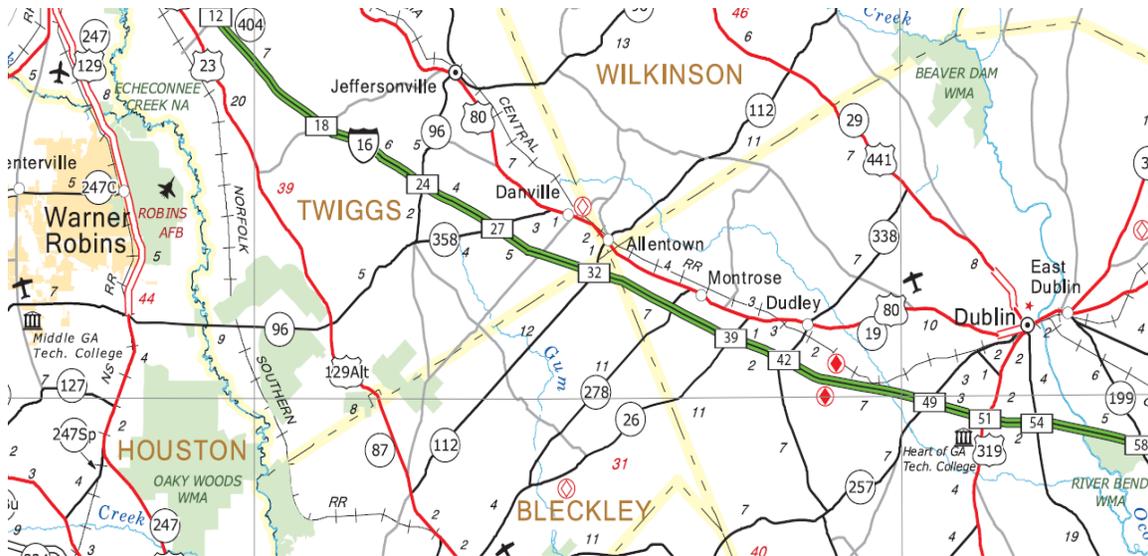


Begin Project
MP 29.727 – SR 29 Bridge
Treutlen County

End Project
MP 0.000 – SR 26 Bridge
Laurens County

The estimated construction cost for the project is \$100,504,152.49.

CSNHS-M003-00(976) is located 61% within Twiggs County, 14% within Bleckley County, and 2% within Laurens County. The length of the project is 15.708 miles. The present traffic count is 22,280 vehicles per day.



BEGIN PROJECT 1.16 Mi. WEST OF EB
OVER PASS (MP 38) LAURENS CO.

END PROJECT 1.88 Mi. EAST OF SR 278
OFF RAMP TO SR 96(MP 22) TWIGGS

CO.

The estimated construction cost for the project is \$42,738,413.46

PROJECT CONCERNS AND OBJECTIVES

Some of the information from the concept report and the designer's presentation indicated the following important points about the project:

- Comply with Standards
- Need to improve safety
- Re-establish rideability

CONCLUSIONS AND RECOMMENDATIONS

During the speculation phase the VE Team identified **15 alternatives** that appeared to hold potential for reducing the construction cost, improving the end product, and/or reducing the difficulty and time of project construction.

After the evaluation phase was completed, the team had selected **10 of the alternatives for final development**. These recommendations are presented in the **Study Results**.

Summary of Project Recommendations



PROJECT: Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens County CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley, Twiggs, Treutlen I-16 Rehabilitation		SHEET NO.: 1 of 1
IDEA NUMBER	DESCRIPTION OF RECOMMENDATION	
CONSTRUCTABILITY		
1	Consider using incentive/disincentive for project delivery to reduce contract time	
3	Always have 3 lanes open during hurricane evacuation season	
6	During the slab repair on inside lane, traffic will utilize 3' of outside shoulder – verify that existing shoulder is structurally adequate to withstand continuous traffic	
12	Provide means of routing storm water away from inside lane/base during periods when the outside lane and or outside shoulder have been removed in either super elevated or sag condition	
MATERIALS		
4	Use HES roller compacted concrete for inside shoulders to expedite construction sequencing	
5	Consider using pavement edge drains and/or under drains	
10	Reset and repair all guardrail and repave mowing strips	
13	Evaluate existing signage for replacement	
STAGING		
8	Stagger construction segments to improve safety	
15	Modify construction sequence to allow construction of inside shoulder and outside shoulder concurrently	

Value Analysis Project Recommendations



PROJECT: **Georgia Department of Transportation**
CSNHS-M003-00(956) – P.I. No. M003956 – Laurens
CSNHS-M003-00(976) – P.I. No. M003976 – Laurens,
Bleckley, Twiggs, Treutlen

ALTERNATIVE NO.:

1

DESCRIPTION: **Consider using incentive/disincentive for project**
delivery to reduce contract time.

SHEET NO.: **1 of 1**

Original Design:

The original design calls for liquidated damages in the amount of \$60,000/day (\$2,500/hr) for failure to complete all work in Stage I (120 days) and Stage II (240 days).

Alternative:

The alternative would consider using incentive/disincentive package to provide an incentive for early stage completion using a more aggressive schedule, while providing a disincentive for not meeting the more aggressive schedule.

Opportunities:

- Reduction in construction time
- Reduction in MOT costs
- Reduces work zone exposure for motorists and contractors

Risks:

- Potential increase in construction costs

Technical Discussion:

The alternative proposes an incentive/disincentive approach to the project, opting for a more aggressive schedule of 100 days for Stage 1, and 210 days for Stage II to achieve a reduction in construction time and lane closures. The alternative proposes keeping most of the terms in Special Provision 108 intact; allowing a \$60,000 incentive for each day that all work is fully completed ahead of schedule in each respective stage. A \$60,000 disincentive would be applied for each day over the time allotted in each stage if all work is not completed. This approach would allow the project schedule to be reduced by 50 days overall, having the effect of reducing MOT costs, reducing lane closures, and minimizing work zone exposure to the travelling public. The incidental liquidated damages provisions contained in Special Provision 108 regarding resetting guardrail, failure to reopen ramp closures, and failure to place/change detour messages would remain intact and not be affected by the inclusion of an incentive/disincentive approach. The proposal of time reductions and incentive/disincentive amounts included in the alternative are for illustrative purposes, and may require adjustment to optimize this benefit should it be implemented.

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley, Twiggs, Treutlen	ALTERNATIVE NO.: 3
DESCRIPTION:	Always have three lanes open during hurricane evacuation season	SHEET NO.: 1 of 1
Original Design: <p>The original design does not address evacuation routes during hurricane season.</p>		
Alternative: <p>The alternative would require that three traffic lanes are open for hurricane evacuation during hurricane season.</p>		
Opportunities:		
<ul style="list-style-type: none">• Ensure safe evacuation during hurricanes		
Risks:		
<ul style="list-style-type: none">• Slower evacuation in the event of a hurricane		
Technical Discussion: <p>In the event of a hurricane hitting the east coast of Georgia, it is imperative that sufficient evacuation routes are provided. By ensuring three traffic lanes are open in a westerly direction away from coastal evacuation areas at all times during the hurricane season, would ensure adequate safe evacuation in the event of mandatory hurricane evacuations.</p>		

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Beckley, Twiggs, Treutlen	ALTERNATIVE NO.: 4
DESCRIPTION:	Use HES Roller Compacted Concrete for Inside Shoulders	SHEET NO.: 1 of 1

Original Design:

The original design calls for conventional strength roller compacted concrete.

Alternative:

The alternative would reduce the construction duration of Stage 1 and subsequently the overall project duration.

Opportunities:

- Reduce Stage 1 duration
- Reduce overall construction time
- Provide additional flexibility in Stage 2

Risks:

- Increased inside shoulder costs

Technical Discussion:

In Stage 1, existing 4 ft. wide (inside) asphalt shoulders are being removed and replaced with an 8 ft. wide RCC pavement. The inside shoulder reconstruction is for the full length of the project. In addition, only damaged or failing slabs in Lane No. 1 are being replaced. In accordance with the Specifications, Full Depth Slab Replacement is performed using 24 hour accelerated strength concrete. Although quantities are provided in the contract for full depth replacement, areas where this work will be performed appear to be as directed by the Engineer.

By accelerating construction of the inside shoulders, more opportunities are created for shifting traffic to the inside to perform full replacement of Lane 2 and the outside shoulder. In addition, having completed inside shoulder available to receive traffic could allow opportunities for construction of inside and outside shoulders concurrently (See Alternative No. 15).

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley, Twiggs	ALTERNATIVE NO.:	5
DESCRIPTION:	Consider using pavement edge drains and/or underdrains	SHEET NO.:	1 of 1

Original Design:

The original design does not appear to construct pavement edge drains and/or underdrains at any point throughout the project.

Alternative:

The alternative would construct pavement edge drain and/or underdrain in locations throughout the project.

Opportunities:

- Greater protection for subgrade and base from moisture.
- Longer pavement service life cycle.

Risks:

- Moderate design impacts
- Additional project costs
- Requires alteration to construction staging.

Technical Discussion:

The alternative proposes an analysis to determine if pavement edge drain/underdrain would be desired on the project. One of the major contributors to base and subgrade failure is water infiltration to these areas over time, resulting in base failure and pumping. Superelevated areas and sag curves tend to fare worse than other areas due to holding water. The alternative proposes that a mechanism for minimizing moisture infiltration into the base and subgrade would increase the life cycle of the pavement to be constructed. The additional costs incurred to construct the pavement edge drain/underdrain would likely be offset by lower life cycle maintenance costs. The drain features would require alterations to staging plans between the construction of the outside lane and outside shoulder to construct the pipe envelope and frangible backfill required. It is noted that the base reconstruction is proposed for the outside lane only, with spot slab reconstruction only in the inside lane. It may be a beneficial analysis for the designer to consider pavement edge drain in conjunction with the inside shoulder rehabilitation to drain the existing inside lane and to keep future moisture from being held in place in the absence of drainage improvements.

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley, Twiggs, Treutlen	ALTERNATIVE NO.:	6
DESCRIPTION:	Verify that existing outside shoulder is structurally adequate to accommodate Stage 1 traffic	SHEET NO.:	1 of 1

Original Design:

The original design calls for full depth replacement of Lane 1, which requires shifting traffic to the existing outside shoulder.

Alternative:

Verify the structural adequacy of the existing outside pavement in areas where traffic will need to be shifted to the shoulder.

Opportunities:

- Minimizes potential for failed shoulders on interstate
- Improves safety

Risks:

- Delays letting

Technical Discussion:

In Stage 1, damaged or failing slabs in Lane No. 1 are being replaced. To accomplish this work, barrels would need to be placed in Lane 2 and traffic shifted 3 ft. onto the outside shoulder. Even under a short duration, heavy truck traffic could compromise the integrity of the shoulder. To minimize the risk, the team recommends performing cores of the shoulder and determining it's adequate for accommodating traffic during the construction of Stage 1.

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley, Twiggs, Treutlen	ALTERNATIVE NO.:	8
DESCRIPTION:	Stagger construction segments to improve safety	SHEET NO.:	1 of 1

Original Design:

The original design places no restrictions on the spacing of eastbound and westbound work zones with respect to each other.

Alternative:

The alternative would propose restricting the work zones in Phase 3 - M003976 or Stage 2- M003956 (construction of the outside lane and shoulder) from overlapping.

Opportunities:

- Improve safety by increasing the median width between opposing directions of travel
- Reduce the potential for workers crossing the active lanes of travel

Risks:

- Limiting the areas in which the contractor can work

Technical Discussion:

By staggering the eastbound and westbound work zones in Phase 3 - M003976 or Stage 2- M003956 (construction of the outside lane and shoulder) it will prevent opposing lanes from both traveling on the inside shoulder in the same area. It will also reduce the potential for workers and equipment from illicitly crossing the active lanes of travel between adjacent work zones.

Value Analysis Project Recommendations



PROJECT: **Georgia Department of Transportation**
CSNHS-M003-00(956) – P.I. No. M003956 – Laurens
CSNHS-M003-00(976) – P.I. No. M003976 – Laurens,
Bleckley, Twiggs, Treutlen

ALTERNATIVE NO.:
10

DESCRIPTION: **Reset and repair all guardrails and repave mowing strips** SHEET NO.: **1 of 1**

Original Design:

The original design calls for the removal and replacement of the existing guard rail end sections, and retaining the existing guardrail and mowing strip by saw cutting the shoulder pavement.

Alternative:

The alternative would that instead of trying to salvage the existing guard rail in place, that the existing guard rails and mowing strips be totally removed and the guardrail reset with new pavement and upgraded terminal end sections.

Opportunities:

- Reduce future maintenance
- Simplify construction

Risks:

- May increase cost

Technical Discussion:

Although it appears to save total project cost, the proposed method to salvage the existing guard rails may actually increase the project life cycle cost due to potentially increased future maintenance costs which could result due to maintaining older guard rails and deteriorating asphalt paving left under the guard rails.

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Beckley, Twiggs, Treutlen	ALTERNATIVE NO.: 12
DESCRIPTION:	Provide means of routing storm water away from inside lane/base during periods when the outside lane and or outside shoulder have been removed in either super elevated or sag condition	SHEET NO.: 1 of 1

Original Design:

The original design calls for the removal of existing pavement and or shoulders on super elevated portions and or sag portions of the project

Alternative:

The alternative would be to require that a means for routing any storm water runoff, which may collect in the voids created by the removal of existing roadway or shoulders.

Opportunities:

- Reduce possible future maintenance costs
- Reduce construction time

Risks:

- none

Technical Discussion:

On super elevated portions and or sag portions of the project, it is recommended that a means for routing the storm water runoff, which may collect in the voids created by the removal of existing roadway or shoulders. This would protect the existing pavement/base which will remain from being deteriorated. This condition, if not addressed, may lead to an increase in probably of base and sub base failure in the future.

To assist in the prevention of this condition, it is recommended that a “note” be included in the construction documents as follows:

“Note: The contractor shall minimize the time that the existing subbase or subgrade is exposed. The contractor shall provide a temporary protection as directed by the engineer.”

Value Analysis Project Recommendations



PROJECT: **Georgia Department of Transportation**
CSNHS-M003-00(956) – P.I. No. M003956 – Laurens
CSNHS-M003-00(976) – P.I. No. M003976 – Laurens,
Bleckley, Twiggs, Treutlen

ALTERNATIVE NO.:
13

DESCRIPTION: **Evaluate existing signage for replacement**

SHEET NO.: **1 of 1**

Original Design:

The original design does not address upgrading/replacing existing signage.

Alternative:

The alternative would evaluate existing signage for replacement.

Opportunities:

- Improve safety
- Improve routing directions

Risks:

- Increase project cost

Technical Discussion:

Evaluate existing signage to ensure structures meet current structural design requirements; evaluate current signage replacing deteriorated signage and adding additional signage as needed to improve safety/directional information to the general public.

Value Analysis Project Recommendations



PROJECT:	Georgia Department of Transportation CSNHS-M003-00(956) – P.I. No. M003956 – Laurens CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Beckley, Twiggs, Treutlen	ALTERNATIVE NO.:	15
DESCRIPTION:	Modify construction sequence to allow construction of the inside shoulder and outside shoulder concurrently	SHEET NO.:	1 of 1

Original Design:

The original design calls for completing all the inside lane rehabilitation and inside shoulder replacement before beginning work on the outside shoulder and lane replacement.

Alternative:

The alternative would allow the construction of the outside shoulder and lane work to be conducted concurrently and follow some distance behind the inside lane rehabilitation and inside shoulder replacement.

Opportunities:

- Shorten the project duration
- May reduce project costs

Risks:

- Would require changes in liquidated damages structure
- May require more lane shifts

Technical Discussion:

By allowing the work on the outside and the inside to be done concurrently it will shorten the total duration of the project and allow more of the project to be under construction at any given time. It will require a more detailed description of the construction sequence and more specific restrictions on the areas of allowable work.

VALUE ENGINEERING PROCESS

The Value Engineering team followed the seven step Value Engineering job plan as promulgated by SAVE International. This seven step job plan includes the following:

- Investigative
- Analysis
- Speculation
- Evaluation
- Development
- Recommendation
- VE Report

VALUE ENGINEERING STUDY AGENDA
for
Georgia Department of Transportation
CSNHS-M003-00(956) – P.I. No. M003956
Laurens County
CSNHS-M003-00(976) – P.I. No. M003976
Laurens, Beckley, Twiggs, Treutlen Counties
I-16 Rehabilitation

April 28, 2009

Pre-Workshop Activities

VE Team Leader organizes study, coordinates with the Owner and Designer about the project objectives and materials. The VE Team receives and reviews all project documents.

8:30-9:00 Project Overview (Information Phase)

- Introduction of participants
- Presentation of the project by GDOT
 - Current Construction Completion Schedule
 - Project Cost Estimate and Budget Constraints
- Discussion, questions and answers
- Overview of the VE Process and Agenda – Workshop goals & project goals

9:00-10:00 VE Team reviews project (Information Phase)

- Review GDOT's presentation
- Review Cost Estimate
- Review plans

10:00-10:30 Function Analysis Phase

- Identify basic and secondary functions
- Complete Function Matrix/FAST Diagram

10:30-11:30 Creative Phase

- Brainstorming of alternative ideas

11:30-12:30 Evaluation Phase

- Establish criteria for evaluation
- Rank ideas
- Identify “best” ideas for development
- Identify a “champion” for each idea to be developed

1:30-5:00 Development Phase

- Develop alternative ideas with assessment of original design and write up new alternatives including:
 - Opportunities & risks
 - Illustrations
 - Calculations
 - Cost worksheets

Post-Workshop Activities

Team Leader prepares and writes report. Team members review report. Then the report is published and delivered to client.

(FAST DIAGRAM)

Georgia Department of Transportation

Project No. CSNHS-M003-00(956) - P.I. No. M003956

and

Project No. CSNHS-M003-00(976) - P.I. No. M003976

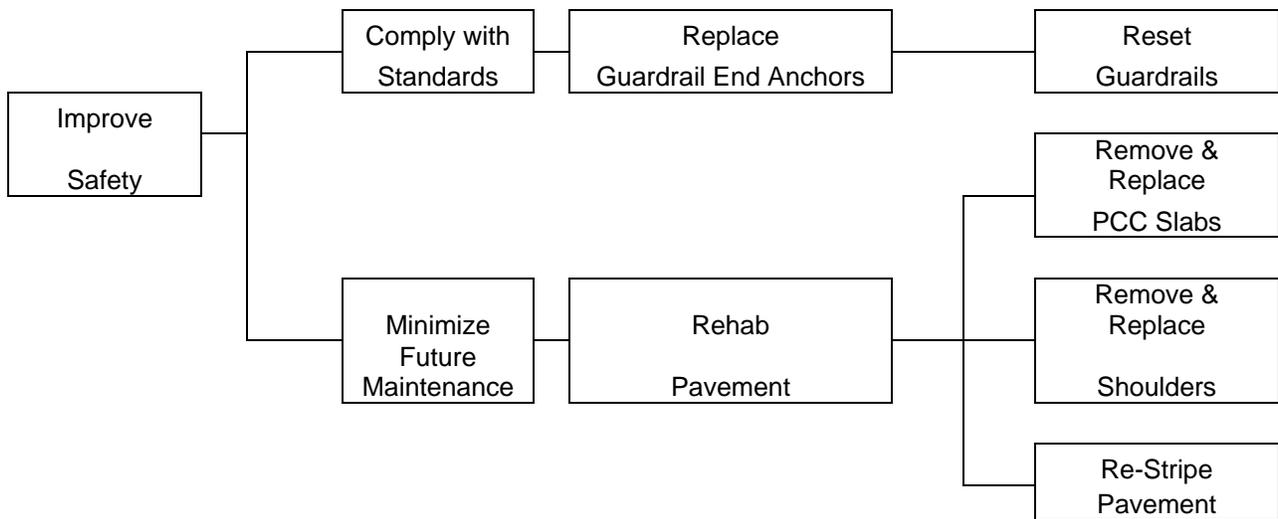
I-95 Rehabilitation Savannah

Laurens, Bleckley, Twiggs, Treutlen Counties

HOW



WHY





VE Value Engineering Study

MEETING PARTICIPANTS

Georgia Department of Transportation		April 28, 2009	
CSNHS-M003-00(956) - P.I. No. M003956 - Laurens			
CSNHS-M003-00(976) - P.I. No. M003976 - Beckley, Laurens, Twiggs, Treutlen			
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CREATIVE IDEA LISTING



PROJECT: **Georgia Department of Transportation**
CSNHS-M003-00(956) – P.I. No. M003956 – Laurens
CSNHS-M003-00(976) – P.I. No. M003976 – Laurens, Bleckley,
Twiggs, Treutlen
I-16 Rehabilitation

SHEET NO.: **1** of **1**

NO.	IDEA DESCRIPTION	RATING
1	Consider using incentive/disincentive for project delivery to reduce contract time	5
2	Construct outside lane and shoulder first to keep two lanes open when rehabbing inside lanes	1
3	Always have 3 lanes open during hurricane evacuation season	5
4	Use HES roller compacted concrete for inside shoulders to expedite construction sequencing	4
5	Consider using pavement edge drains and/or under drains	5
6	During the slab repair on inside lane, traffic will utilize 3' of outside shoulder – verify that existing shoulder is structurally adequate to withstand continuous traffic	4
7	Level outside shoulder to remove rumble strips	OB
8	Stagger construction segments to improve safety	4
9	Define in the plans the known sections of the inside lanes to be replaced	2
10	Reset and repair all guardrail and repave mowing strips	5
11	Consider using an on-site concrete batch plant	OB
12	Provide means of routing storm water away from inside lane/base during periods when the outside lane and or outside shoulder have been removed in either super elevated or sag condition	3
13	Evaluate existing signage for replacement	4
14	Correct mainline typical section drawing to reflect 9' roller compacted concrete shoulder instead of 10' (M003956)	OB
15	Modify construction sequence to allow construction of inside shoulder and outside shoulder concurrently	4

Rating: 1→2 = Not to be Developed; 3 = Varying Degrees of Development Potential;
 4→5 = Most likely to be Developed; DS = Design Suggestion; ABD = Already Being Done; OB= Observation