

# VALUE ENGINEERING TRAINING STUDY REPORT

Intersection Improvements - SR 35 / US 319

Project No. CSSTP-0007-00(183)

Colquitt / Tift Counties

PI No. 0007183

October 22, 2009

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OWNER:



Georgia Department of Transportation  
600 West Peachtree Street  
Atlanta, GA 30308  
(404.631.1770)

VALUE ENGINEERING  
INSTRUCTOR:



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3200 Town Point Drive NW, Suite 100  
Kennesaw, GA 30144  
(770.421.3400)

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## **EXECUTIVE SUMMARY**

## EXECUTIVE SUMMARY

# VALUE ENGINEERING TRAINING STUDY REPORT

Intersection Improvements – SR 35 / US 319

Project No. CSSTP-0007-00(183)  
PI No. 0007183

**October 22, 2009**

### Study Background

This report presents the results of a value engineering (VE) study for intersection improvements on SR 35 / US 319 from CR 89 / Indian Lake Drive in Colquitt County to SR 520 in Tift County. The study was conducted as part of a VE training session held for GDOT staff on October 5 to 9, 2009.

The gross length of the project is 22.4 miles including roadway improvements, bridges and bridge culverts. Accident history for the four year period from January, 2000 to December, 2003 shows a total of 199 accidents and 188 injuries with 4 fatalities. Rear end and angle type accidents were the predominant types. The injury rate exceeded the statewide average for principal arterials with 48% of the injuries attributed to high speed rear end accidents. The construction proposes to improve the safety and operations of the corridor by providing left and right turn lanes on both approaches at 44 locations/intersections. The estimated construction cost of the project is \$12,670,539, the R/W estimate is \$2,847,288, and reimbursable utilities are \$225,000 yielding a total project cost of \$15,742,827. On Monday, October 5, 2009, the design team gave an overview of the project to the VE team and on Friday, October 9, 2009, the VE Team presented their recommendations.

This report presents the VE Team's recommendations and all back-up information for consideration by the decision-makers. This **Executive Summary** includes a brief description of each recommendation. The **Study Identification** section contains information about the project and the team. The **Recommendations** section presents a more detailed description and support information about each recommendation. The **Appendix** includes a complete record of the Team's activities and findings as well as the worksheets developed during the information, creative and evaluation phases of the study. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

## VE-11

<b>DEVELOPMENT PHASE - EXECUTIVE SUMMARY</b>	
<b>Project:</b> CSSTP-0007-00(183)	<b>Team:</b> 6
<b>Location:</b> Colquitt/Tift Counties	<b>Date:</b> 10/05/09

This report summarizes the VE study performed on the safety project that upgrades 44 intersections in Colquitt/Tift Counties. The total project cost including pay items and right of way is \$16,874,893.

The project is located along 22 miles of US 319/ SR 35 between Tifton and Moultrie. The project includes addition of turn lanes, vertical alignment adjustments, guardrail upgrades and some drainage work.

### **Considerations:**

- Eight eligible historic properties are located along this project.
- 22 streams and 20 wetlands,
- potential habituated for several Threatened and Endangered species,
- several underground storage tanks,
- Several Environmental justice areas.

### **Results Obtained.**

The VE Team Generated 7 Recommendations. If all recommendations are implemented, the project costs could be reduced by \$2,300,000.

### **Recommended highlights:**

#### **A-3 Increase the thickness of the Graded Aggregate Base and reduce the thickness of the 25mm superpave.**

Replacing some 25 mm paving with GAB will reduce the overall cost of the pavement section.

*Potential Savings: \$276,837*

#### **A-10 Eliminate the 12.5 mm Overlay Quantity**

Eliminating the quantity for overlay would reduce the overall cost of the pavement section.

*Potential Saving: \$1,100,000*

#### **A-12 Reduce the paved shoulder width from 6-foot to 4-foot.**

Reducing the paved shoulder width would have no effect on the capacity or safety of the project but would reduce the overall cost of the pavement section.

*Potential Savings: \$625,000*

**B-1 Convert Right of Way to Easement**

Much of the Right of way being purchased is to allow room for small backslopes and to allow room for constructability. Once the project has been constructed, many of these areas may not be needed.

*Potential Savings is: \$175,000*

**E-11 - Stage project to construction 4 or 5 intersections at a time.**

As designed the erosion control will be installed, maintained and inspected at all 44 intersections at once, even though the contractor will only be working on 4 or 5 at a time. Installing BMP's in stages would allow for easier maintenance and inspection.

*Potential savings: Not calculated.*

**F-6 – Raise the Parapet of two headwalls instead of extending them.**

Raising the parapet would reduce the amount of materials required and would be easier to construct than a culvert extension.

*Potential Savings: \$17,200*

**K-1 – Eliminate Field Engineer's office:**

Use of nearby existing GDOT district office would eliminate the need for this office

*Potential Savings: \$73,914.78*

**VE-10**

<b>DEVELOPMENT PHASE - SUMMARY OF COST SAVINGS</b>						
<b>Project:</b> CSSTP-0007-00(183) PI # 0007183					<b>Team No.:</b> 6	
<b>Location:</b> Tift / Colquitt					<b>Date:</b> 10/08/2009	
<b>Idea No.</b>	<b>Creative Idea Description</b>	<b>Original Initial Cost</b>	<b>Proposed Initial Cost</b>	<b>Initial Cost Savings</b>	<b>Future Savings</b>	<b>Total Life Cycle Savings</b>
A-3	Increase the Graded Aggregate Base lift to 10 inches and reduce the 25mm superpave lift to 550 lb/sy.	\$3,047,000	\$2,770,562	\$276,837		
A-10	Eliminate the Overlay Quantity	\$1,100,000	\$0	\$1,100,000		
A-12	Reduce the paved shoulder width to 4 feet.	\$625,000	\$0	\$625,000		
B-1	Reduce required ROW by Utilizing Easement	\$2,847,300	\$2,672,300	\$175,000		
E-11	Change staged construction to allow phasing of erosion control	To prevent possible fines and reduce disturbed area				
F-6	Extend the parapet and wingwalls to function as a retaining wall and eliminate extension	\$19,000	\$1,800	\$17,200		
K-1	Eliminate Field Engineer's Office	\$74,000	\$0	\$74,000		

## STUDY IDENTIFICATION

**VE-1**

## **STUDY IDENTIFICATION**

<b>Project:</b> CSSTP-0007-00(183)	<b>Date:</b> 10/05/2009
<b>Location:</b> Colquitt/Tift Counties	

### **VE Team Members**

<b>Name:</b>	<b>Position:</b>	<b>Organization:</b>	<b>Telephone:</b>
Brad Ehrman	Road Design	GDOT	
Ernay Robinson	Project Manager	GDOT	
Chris Rudd	Road Design	GDOT	
Adam Smith	Project Manager	GDOT	
Kevin VanHouten	Project Manager	GDOT	

### **Project Description**

This project consists of improvements to 44 intersections on SR 35 / US 319 from CR 89 / Indian Lake Drive in Colquitt County to Sr 520 in Tift County.

## **VE RECOMMENDATIONS**

VE-9

DEVELOPMENT AND RECOMMENDATION PHASE			
Project: CSSTP-0007-00(183) PI # 0007183			
Idea No.: A-3	Sheet No.: 1 of 3	CREATIVE IDEA: Increase the thickness of the Graded Aggregate Base and reduce the thickness of the 25mm superpave.	
Comp By: KVH		Date: 10/08/2009	Checked By: BRE Date: 10/08/2009
<p><b>Original Concept:</b> Typical section depicts constructing 8 inches of Graded Aggregate Base, 660 lb/sy of 25 mm superpave, 220 lb/sy of 19mm superpave, 165 lb/sy of 12.5mm superpave.</p> <p><b>Proposed Change:</b> Increase the Graded Aggregate Base lift to 10 inches and reduce the 25mm superpave lift to 550 lb/sy.</p> <p><b>Justification:</b> Reducing the quantity of 25 mm superpave and increasing the quantity of GAB provides a cost savings.</p>			
LIFE CYCLE COST SUMMARY	INITIAL Project Cost	FUTURE Project Cost	TOTAL Present Worth Cost
<b>INITIAL COST: Original</b>	\$3,047,400		
<b>Proposed</b>	\$2,770,562		
<b>Savings</b>	\$276,837		
<b>FUTURE COST: Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$276,837</b>



**VE-9C****CALCULATIONS**

**Project:** CSSTP-0007-00(183) PI # 0007183

Idea No. : A-3  
Client:: GDOT  
Sheet 3 of 3

Unit weight of GAB assumed at 116 lb/cf  
Unit weight of asphalt assumed at 110 lb/sy

3 ft x 3 ft x 1 inch (0.0833 ft) = 0.75 cf in one square yard  
Therefore 0.75 cf/sy x 116 lb/cf = 87 lb/sy of GAB

$87 / 110 = 0.791$  or 79%

27000 tons of 25mm is equivalent to 660 lb/sy  
Therefore  $27000/6 = 4500$  tons of 25mm in one inch

So 4500 tons of 25 mm is equivalent to 3560 tons of GAB

**VE-9**

<b>DEVELOPMENT AND RECOMMENDATION PHASE</b>			
<b>Project:</b>			
<b>Idea No.:</b> A-10	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Eliminate the 12.5 mm Overlay Quantity	
Comp By: RCR    Date: 10/08/09                      Checked By: BRE Date:10/08/09			
<b>Original Concept:</b>			
The original design overlays the mainline with 12.5 mm superpave.			
<b>Proposed Change:</b>			
The proposed design would eliminate the 12.5 mm superpave overlay.			
<b>Justification:</b>			
The existing pavement condition may not warrant overlay at this time. In addition, a future maintenance project would essential duplicate much of the work associated with this quantity.			
<b>LIFE CYCLE COST SUMMARY</b>	<b>INITIAL Project Cost</b>	<b>FUTURE Project Cost</b>	<b>TOTAL Present Worth Cost</b>
<b>INITIAL COST: Original</b>	\$1,100,000		
<b>Proposed</b>	\$0		
<b>Savings</b>	\$1,100,000		
<b>FUTURE COST: Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			\$1,100,000



**VE-9C****CALCULATIONS****Project:** CSSTP-0007-00(183)

Idea No. : A-10

Client:: GDOT

Sheet 3 of 3

Assume Area of Overlay is the area of 25 mm subtracted from the 12.5 mm area

Area of 12.5 mm Pavement

$$35,000 \text{ TN} \times 2000 \text{ lb/TN} / 165 \text{ lb/sy} = 424,242 \text{ SY}$$

Area of 25 mm Pavement

$$27,000 \text{ TN} \times 2000 \text{ lb/TN} / 220 \text{ lb/sy} = 245,455 \text{ SY}$$

Area of Overlay:

$$424,242 \text{ SY} - 245,455 \text{ SY} = 178,787 \text{ SY}$$

Amount of 12.55 mm for Overlay

$$178,787 \text{ SY} \times 165 \text{ LB/SY} / 2000 \text{ LB/TN} = 14,750 \text{ TN}$$

VE-9

<b>DEVELOPMENT AND RECOMMENDATION PHASE</b>			
<b>Project: CSSTP-0007-00(183) PI # 0007183</b>			
<b>Idea No.:</b> A-12	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Decrease the paved shoulder width from 6 ft to 4 ft	
Comp By: KVH	Date: 10/08/2009	Checked By:	Date: 10/08/2009
<p><b>Original Concept:</b> Typical section depicts constructing 8 inches of Graded Aggregate Base, 660 lb/sy of 25 mm superpave, 220 lb/sy of 19mm superpave, 165 lb/sy of 12.5mm superpave for a 6 foot paved shoulder</p> <p><b>Proposed Change:</b> Decrease the paved shoulder width from 6 feet to 4 feet</p> <p><b>Justification:</b> Reducing the paved shoulder width from 6 feet to 4 feet provides a cost savings by eliminating a substantial quantity of GAB as well as asphalt paving without lowering the safety or performance of the roadway.</p>			
<b>LIFE CYCLE COST SUMMARY</b>	<b>INITIAL Project Cost</b>	<b>FUTURE Project Cost</b>	<b>TOTAL Present Worth Cost</b>
<b>INITIAL COST: Original</b>	\$ 6,949,900		
<b>Proposed</b>	\$ 6,324,409		
<b>Savings</b>	\$625,491		
<b>FUTURE COST: Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$625,491</b>



## VE-9C

### CALCULATIONS

**Project:** CSSTP-0007-00(183) PI # 0007183

Idea No. : A-12

Client:: GDOT

Sheet 3 of 3

The percentage of the total pavement quantities (including GAB, 12.5mm, 19mm, 25mm, Bituminous Tack) that is 6 foot paved shoulder = 42%

Total width of pavement widening = 28ft  
Total width of paved shoulder (6ft.) = 12 ft  
Therefore  $12/28 = 42\%$

Total width of pavement widening = 24ft  
Total width of paved shoulder (4ft.) = 8 ft  
Therefore  $8/24 = 33\%$

So  $42\% - 33\% = 9\%$  savings by reducing to a 4 foot paved shoulder





## VE-9C

### CALCULATIONS

**Project:** CSSTP-0007-00(183)

Idea No. : B-1  
Client:: GDOT  
Sheet 3 of 3

#### **Current Proposed**

Commercial R/W: 0.55 ac @ \$100,000/acre  
Small Residential R/W: 4.4 ac @ \$12,000/acre  
Large Residential R/W: 1.65 acres @ \$6,000/acre  
Agricultural R/W: 4.4 acres @ \$3,500/acre

NOTE: With improvements, relocations, damages, court costs and contingencies, total **\$2,847,300**. Market Appreciation is not included.

#### **VE Recommendation:**

A significant amount of the R/W is for slopes. A lot of the ditches have 4:1 backslopes. By increasing the backslope of some of the ditches and by setting the R/W at the clear zone and performing the rest of the work on easement, the required R/W could be reduced.

Assuming the required R/W could be reduced by 25% in the residential areas only AND Easement sells for ½ the cost of R/W

#### **New Proposed:**

Small Residential R/W: 3.3 acres @ \$12,000/acre = \$39,600  
Large Residential R/W: 1.24 acres @ \$6,000/acre = \$7,440  
Agricultural R/W: 3.3 acres @ \$3,500/acre = \$11,550

With improvements, damages, court costs, and contingencies, the total estimates R/W Cost would become app. **\$2,672,300**

**SAVINGS: +/- \$175,000**

**NOTE: If the permanent easement is negotiated to temporary during acquisition, the cost savings would be substantially more. In this case, there would be future maintenance savings as well.**

VE-9

<b>DEVELOPMENT AND RECOMMENDATION PHASE</b>			
<b>Project: CSSTP-0007-00(183)</b>			
<b>Idea No.:</b> E-11	<b>Sheet No.:</b> 1 of 1	<b>CREATIVE IDEA:</b> Stage project to construction 4 or 5 intersections at a time.	
Comp By: BRE    Date: 10/08/09		Checked By:    Date:	
<p><b>Original Concept:</b> As currently drawn, BMPs are to be installed on all 44 intersections in one stage.</p> <p><b>Proposed Change:</b> Revise the staging and ESPCP to install and maintain BMP's at 4 or 5 intersections per stage.</p> <p><b>Justification:</b> It is unlikely that GDOT will allow the contractor to perform work on more than 4 or 5 intersections at one time on this project. If other areas have not been cleared and grubbed, there will be little benefit to install and maintain BMP's outside of the active work area.</p> <p>Additionally if BMP's are installed along the entire project as currently drawn, the ESPCP plan will require the WECS, GDOT and EPD to perform inspections along the entire 22 mile corridor even though the work will be confined to a handful of intersections at any given time.</p> <p>Phasing the work in the staging and erosion control plans will reduce the time required to perform the inspections and it will allow more time to focus inspections on the active work area.</p>			
LIFE CYCLE COST SUMMARY	INITIAL Project Cost	FUTURE Project Cost	TOTAL Present Worth Cost
<b>INITIAL COST:</b> Original			
Proposed			
Savings			
<b>FUTURE COST:</b> Savings			
<b>TOTAL PRESENT WORTH SAVINGS</b>			

VE-9

<b>DEVELOPMENT AND RECOMMENDATION PHASE</b>			
<b>Project: CSSTP-0007-00(183)</b>			
<b>Idea No.:</b> F-6	<b>Sheet No.:</b> 1 of 4	<b>CREATIVE IDEA:</b> Extend the Parapet of Box Culverts CD1 and CD 15 up to meet the fill slope instead of lengthening the culvert	
Comp By: RCR		Date: 10/08/09	Checked By: BRE Date:10/08/09
<b>Original Concept:</b>  The original box culvert cross sections for CD 1 and CD 15 show extending each side of the box culverts out approximately 6 feet to meet the new limits of the fill slope.			
<b>Proposed Change:</b>  The proposed design would eliminate the extra length of box culvert and extend only the parapet up to the fill slope.			
<b>Justification:</b>  Raising the parapet would reduce the amount of materials needed and would be easier to construct than a culvert extension.			
<b>LIFE CYCLE COST SUMMARY</b>	<b>INITIAL Project Cost</b>	<b>FUTURE Project Cost</b>	<b>TOTAL Present Worth Cost</b>
<b>INITIAL COST: Original</b>	\$19,000		
<b>Proposed</b>	\$1,800		
<b>Savings</b>	\$17,200		
<b>FUTURE COST: Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$17,200</b>



## CALCULATIONS

**Project:** CSSTP-0007-00(183)

Idea No. : F-6  
Client: GDOT  
Sheet 3 of 4

### CD1 (6x3 box culvert):

#### Steel

6 ft x 63.1 lb/lf x 2 sides x 2 barrels = 1514.4 lbs

#### Concrete

6 ft x 0.54 cy/lf x 2 sides x 2 barrels = 12.96 cy

### CD15 (4x3 box culvert):

Eliminate approximately six feet of barrel length on either side of roadway.

#### Steel

6 ft x 50.48 lb/lf x 2 sides x 2 barrels = 1212 lbs

#### Concrete

6 ft x 0.355 cy/lf x 2 sides x 2 barrels = 8.6 cy

**VE-9C**

**CALCULATIONS**

**Project:** CSSTP-0007-00(183)

Idea No. : F-6  
Client:: GDOT  
Sheet 4 of 4

To Raise the Parapet:

Assume about a third of the quantity for the wingwalls.

**CD1 (6x3 culvert)**

Steel

$$210 \text{ LBS} / 3 = 70 \text{ LBS}$$

Concrete

$$8.68 \text{ cy} / 3 = 2.90 \text{ cy}$$

**CD15 (4x3 culvert)**

Steel

$$352 \text{ LBS} / 3 = 117 \text{ LBS}$$

Concrete

$$12.33 \text{ cy} / 3 = 4.11 \text{ cy}$$





**APPENDIX**

VE-2

**INFORMATION PHASE - SOURCES**  
**Approving/Authorizing Persons**

<b>Name:</b>	<b>Position:</b>	<b>Telephone:</b>
Derrick Cameron	Traffic Design Manager	404-635-8153
Michael R Mosely	Consultant	770-933-0280
Charity Belford	Engineer - TMC	404-635-8153

**Personal Contacts**

<b>Name:</b>	<b>Telephone:</b>	<b>Notes:</b>

**Documents/Abstracts**

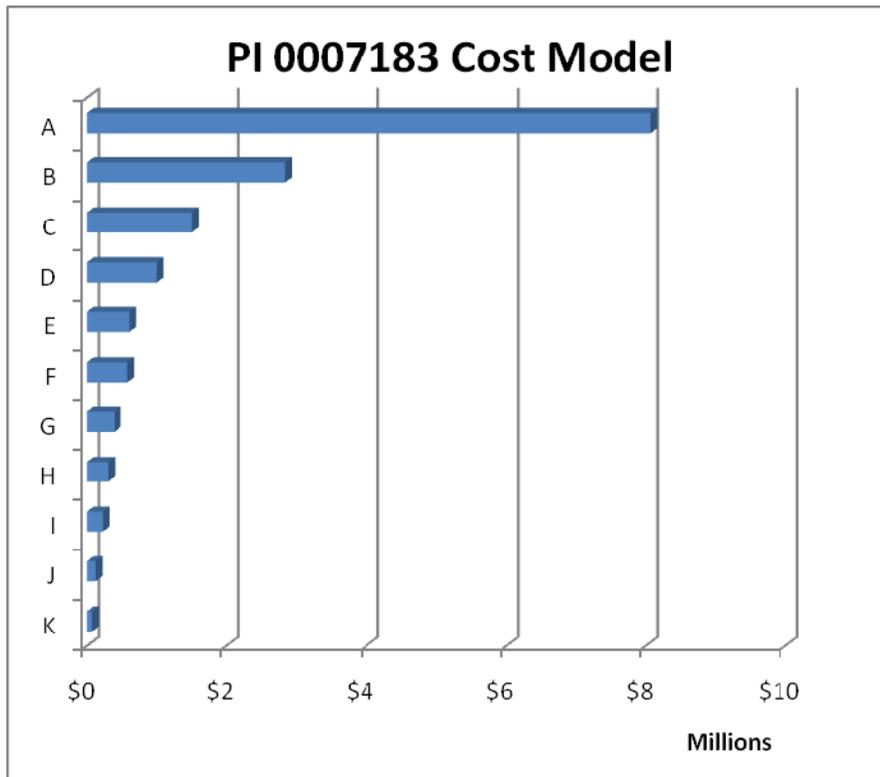
<b>Reference:</b>	<b>Notes:</b>
Concept Report	
Traffic Study	
Cost Estimate	
Set of plans	
Roll Plot	

VE-3

**INFORMATION PHASE - COST MODEL**

Project Name

Item	Description	\$ Amount	% of Total Project
A	Pavement	\$8,070,226.80	51.3%
B	Right of Way	\$2,847,288.00	18.1%
C	Traffic Control	\$1,500,000.00	9.5%
<b>80% Cost Line</b>			
D	Earthwork	\$1,001,789.20	6.4%
E	Erosion Control	\$616,288.01	3.9%
F	Drainage	\$586,895.00	3.7%
G	Guardrail	\$394,233.45	2.5%
H	Signing & Marking	\$302,236.84	1.9%
I	Utilities	\$225,000.00	1.4%
J	Culverts	\$124,955.31	0.8%
K	Engineer's Office	\$73,914.48	0.4%
	<b>TOTAL</b>	<b>\$15,742,827.09</b>	<b>100%</b>



VE-4

**INFORMATION PHASE – FUNCTION ANALYSIS**

**Project:** CSSTP-0007-00(183)

**Project Function:** Improve Turning Movements and Enhance Safety

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	Worth	Comments
A	Pavement	Provide	Surface	\$8,070,000	\$6,860,000	Reduce Structure
		Carries	Traffic			
		Prevents	Rutting			
B	Right of Way	Provide	Space	\$2,847,000	\$2,000,000	Reduce R/W; Use Esmt
		Sets	Limits			
		Provide	Buffer			
		Identify	Ownership			
C	Traffic Control	Conveys	Message	\$1,500,000	\$1,000,000	Reduce staging at Grade changes
		Minimize	Impacts			
D	Earthwork	Enhance	Safety	\$1,002,000	\$750,000	Reduce Grade Changes
		Supports	Roadway			
E	Erosion Control	Prevent	Erosion	\$616,000	\$500,000	Use Wood Fiber Mulch; Phased NOTs
		Minimizes	Pollution			
F	Drainage	Enhances	Safety	\$587,000	\$587,000	No Change

## INFORMATION PHASE – FUNCTION ANALYSIS

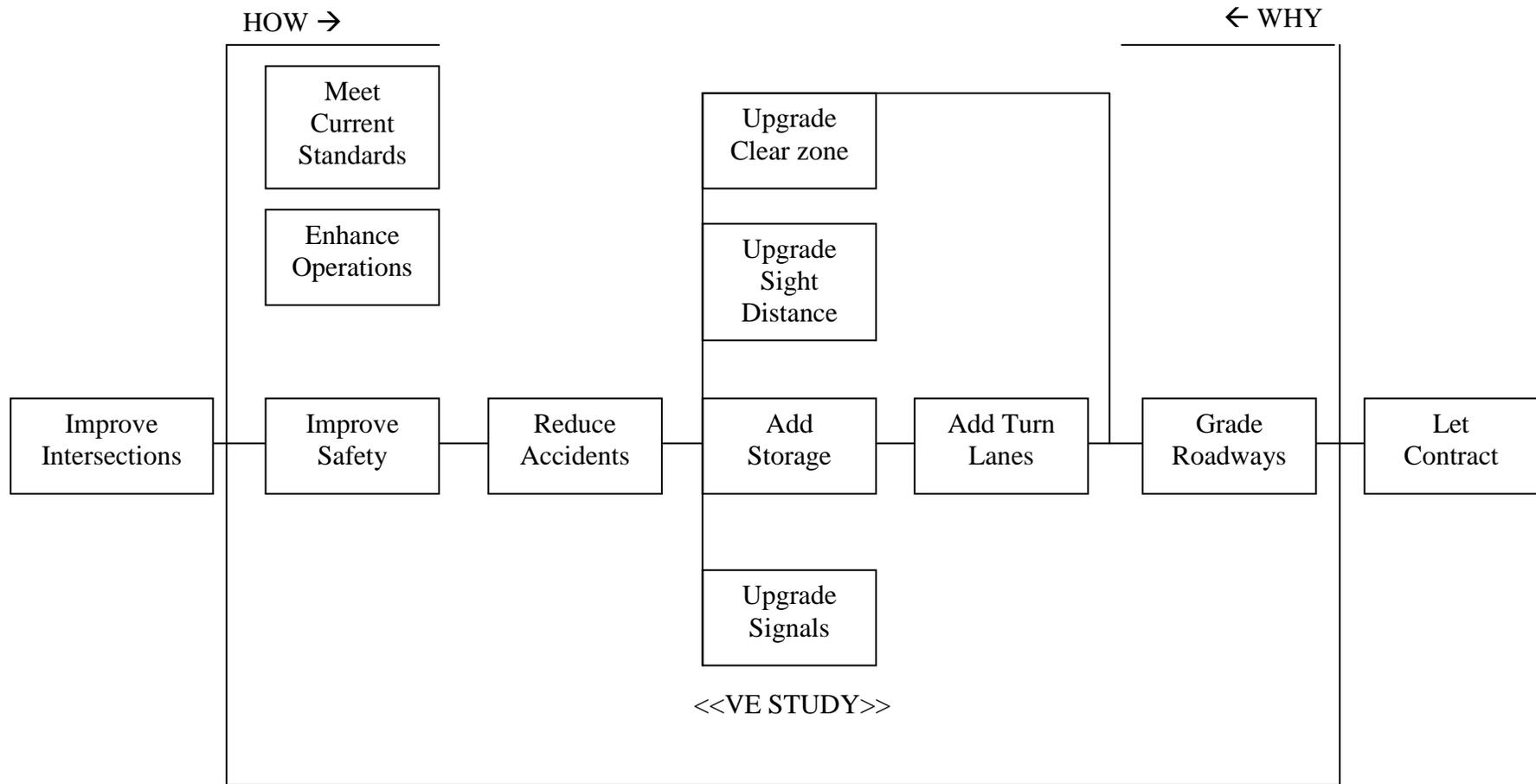
**Project:** CSSTP-0007-00(183)

**Project Function:** Improve Turning Movements and Enhance Safety

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	Worth	Comments
		Controls	Water			
G	Guardrail	Mitigates	Danger	\$394,000	\$350,000	Retain Some GR
		Deflects	Objects			
H	Signing and Marking	Convey	Information	\$302,000	\$290,000	Remove Some Signs
		Separate	Traffic			
I	Utilities	Provide	Service	\$225,000	\$225,000	No Change
		Relocate	Facilities			
J	Culverts	Convey	Water	\$125,000	\$100,000	Shorten Some Culverts
		Provide	Crossing			
K	Engineer's Office	Provide	Work Space	\$74,000	\$0	Use District Office

VE-5

### INVESTIGATION PHASE - FAST DIAGRAM US 319 / SR 35 Intersection Improvements Basic Function: Improve Safety



**VE-6 & 7**

<b>CREATIVE PHASE</b> Creative Idea Listing		<b>JUDGMENT PHASE</b> Idea Evaluation	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
A	Pavement Structure		
A-1	Use Soil Cement	Reduces Pavement Thickness; Can be used in place of GAB; low cost; durable; Moderately complicated for construction	3
A-3	Increase the Depth of GAB	Allows the 25 mm layer to be reduced; 25 mm can be placed in one lift;	7
A-4	Use Lime Stabilizer	Low cost; moderate constructability; not easily constructed in small areas; production problems may occur for smaller projects	3
A-5	Use Open Graded Course	High cost; reduces water spray; expensive;	7
A-6	Use Superpave	Less expensive; causes more spray; easily constructed;	9
A-7	Use Stone Matrix Asphalt	No longer used; high cost; production problems may occur	2
A-8	Use Porous European Mix	High cost; reduces water spray; very expensive	4
A-9	Use Concrete	High cost; durable; wouldn't settle with the roadway; joint issues between asphalt and concrete;	4
A-10	Eliminate Overlay	Low cost;	8

<b>CREATIVE PHASE</b> Creative Idea Listing		<b>JUDGMENT PHASE</b> Idea Evaluation	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
A-11	Correct the cross Slope	High cost; would add to the overall cost of the project;	7
A-12	Reduce the paved width of the shoulders	Low cost; no real capacity effect; no safety effect	8
B	Right of Way		
B-1	Use Easement	Cheaper, less impactful, no maintenance after CST if Temporary,	9
B-2	Eliminate R/W	No Cost, No maintenance, No impacts, may require measures on CST to achieve	8
B-3	Buffers	Could be deeded to DOT for little or no cost, however, could be considered green space and present environmental impacts	4
B-4	Use Walls to Minimize Right of Way	Reduces impacts, reduces R/W, High Cost, must maintain, could present problems with utility relocations	7
B-5	Use V-Gutter Instead of Ditches	Reduces R/W, serves as drainage, moderate cost, some maintenance	7
C	Traffic Control		

<b>CREATIVE PHASE</b> Creative Idea Listing		<b>JUDGMENT PHASE</b> Idea Evaluation	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
C-1	Use Striping	Cheap, effective, universally accepted, can be done multiple times easily, fairly low maintenance, quick, not as visible as other methods, not as respected by motorists	9
C-2	Use Temporary Barrier	Effective, fairly easy to assemble and relocate, readily available, can serve as a hazard, requires space, moderately expensive	5
C-3	Use Barrels	Cheap, readily available, easy to install and transport, moderately effective, minimal crash hazard, not suitable for all situations	8
C-4	Public Information	Quick, easy, gets buy-in, attendance important, hard change habits	7
C-5	Use Signage	Cheap, easy, effective, universal, requires maintenance, works best in conjunction with other items	7
D	Earthwork		
D-1	Reduce Speed Design	May interfere with LOS for corridor; may violate driver expectation; allow the retention of current grade; reduce the amount of clear zone needed;	7

<b>CREATIVE PHASE</b> Creative Idea Listing		<b>JUDGMENT PHASE</b> Idea Evaluation	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
D-2	Add Lighting	Expensive to install; expensive to maintain; may help with sight distance on sub standard sag curve; requires local government to accept maintenance responsibilities	5
D-3	Decrease Slopes	May allow a lesser quantity for guardrail; may increase the amount of earthwork;	8
D-5	Use Barrier Wall to Hold Back Fills	Expensive; less safe; reduces right of way; reduces earthwork;	7
D-6	Use Guardrail and Increase Slopes	Less safe; reduces the needed right of way; reduces needed earthwork; moderately expensive;	8
E	Erosion Control		
E-1	Increase Rip Rap	Maximizes erosion stabilization during construction; not expensive;	6
E-2	Use Wall to Minimize Impacts	Expensive; may minimize right of way;	7
E-3	Enhance Grassing	Special Provision 700 should cover the required grassing;	2
E-4	Enhance Sodding	Speeds up stabilization time; high cost;	4
E-5	Reduce the Limits of Clearing and Grubbing	May limit right of way;	8

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E-6	Change Slopes	May increase the amount of right of way required;	5
E-7	Change Grades	May require a design exception; may reduce the amount of earthwork needed	5
E-8	Use Slope Paving	May not be needed on this project	2
E-9	Enhance Landscaping	Speeds up stabilization time; moderately expensive;	4
E-10	Use PAM	High cost; may interfere with other erosion control items; already allowed for in grassing	3
E-11	Use Wood Fiber Mulch	Permanent stabilization; can NOT the area once its covered; reduce man-hours for erosion control;	7
E-12	Enhance Mulch	Not permanent; reduces sediment load on silt fence;	6
E-13	Use Slope Matting	More permanent stabilization than mulch;	4
F	Drainage		
F-1	Minimize the amount of Pipe	Cuts cost, could speed up CST, reduces maintenance, could increase erosion, could increase R/W	7

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<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
F-2	Use Curb Instead of Pipe	Cheaper than curb and pipe, requires spillways, concrete paving	3
F-3	Use Ditches	Cheep, effective, easy maintenance, requires grassing or lining, may introduce additional erosion control, could increase R/W	7
F-4	Use V-Gutter	Can reduce R/W, Can reduce impacts, requires inlets and maintenance	8
F-5	Use Longitudinal System	May reduce R/W, may reduce erosion, effective, moderate cost, takes longer to CST than a ditch, can introduce maintenance issues	7
F-6	Raise the parapets on Box culverts to meet fill	May reduce R/W; low cost; easy to construct	8
G	Guardrail		
G-1	Use Barrier Wall Instead of Guardrail	More of a hazard, less maintenance, more difficult to CST than guardrail	2
G-2	Use Barrels	Cheep, doesn't provide permanent protection	3
G-3	Reduce the Design Speed	Reduces the clear zone, adds safety to the roadway, very inexpensive, not always appropriate, public resistance	6

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G-4	Increase the Clear Zone	Provides safety, eliminates guardrail and maintenance, aesthetics, increases R/W cost, may increase impacts	7
G-5	Lengthen Culverts to Outside the Clear Zone	Eliminates guardrail, flattens slopes, reduces maintenance, introduces possible environmental impacts, relatively expensive, more time consuming	7
G-6	Eliminate Obstacles	Most effective, permanent fix, not always possible, could result in higher costs and additional R/W	9
G-7	Relocate Obstacles	Very effective, permanent fix, sometimes very expensive depending on object, may add to R/W Costs, not always possible	8
G-8	Flatten Slopes	Cheap on CST, reduces need for protection devices, increases safety, easier to maintain, requires more R/W at times, may increase impacts, additional Earthwork	7
G-9	Use Safety End Sections	Adds safety, prevents relocation out of Clear Zone, easy to CST, Cheaper than guardrail, prevents extending pipes	9
H	Signing And Marking		

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H-1	Reduce the number of signs	Reduces cost, eliminates redundancy, removes obstructions, reduces roadside clutter and driver confusion	9
I	Utilities		
I-1	Reduce the Conflicts	May prevent costly relocation, reduce CST Time, not always possible, may require additional R/W	9
I-2	Minimize the Footprint of Roadway	Reducing footprint of road saves money, relieves the requirement to relocate utilities, reduces impacts on property owners, increases public approval	7
I-3	Put Utilities in the Slope	Keeps utility cost down by removing the need to purchase their own easement, Follows GA law to place utilities on ROW, not always an option, can have constructability issues.	6
I-4	Allow the Utilities under the Pavement	Eliminates need to relocate, can present maintenance issues in the future, only preferable with certain utilities (ie power, telephone)	7
J	Culverts		

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J-1	Replace with Pipe	may not pertain to any culverts – just extensions;	5
K	Field Engineer's Office		
K-1	Use the District Office	No separate field office; low cost	8