



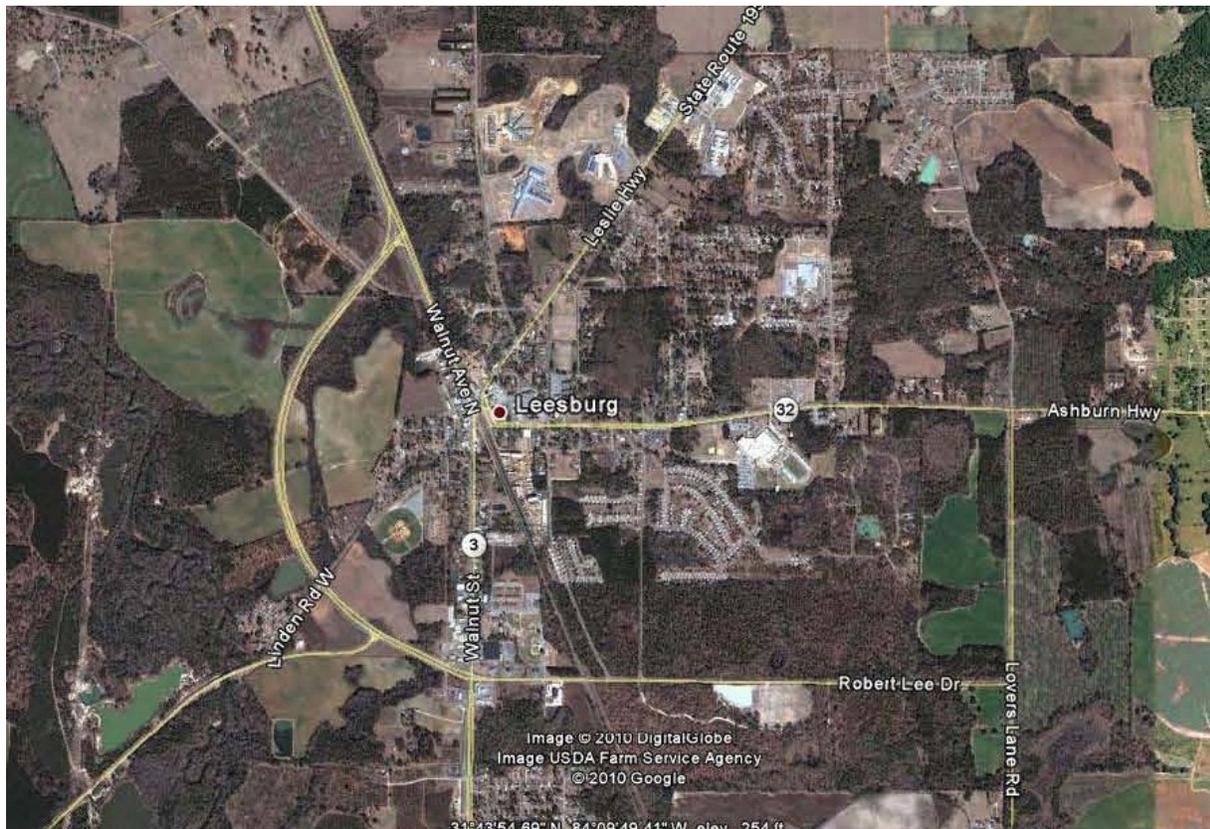
GEORGIA DEPARTMENT OF TRANSPORTATION

Leesburg North Bypass from SR 3/US 19 to SR 195

Lee County

STP00-0001-00(420) – P.I. No. 0001420

VALUE ENGINEERING REPORT



DECEMBER 2010

Submitted by:





December 14, 2010

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

RE: Value Engineering Report
STP00-0001000(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County

Dear Ms. Myers:

Please find enclosed two (2) hard copies and one (1) CD of our Value Engineering Report for the proposed Leesburg North Bypass project from SR 3/US 19 to SR 195 in Lee County. Using the Value Engineering “Job Plan” – Investigation, Analysis (*Function*), Speculation, Evaluation & Development, the VE Team identified:

Five (5) Alternatives recommended for improving the project value.

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.

Please contact me at 678-677-6420 should you have any questions regarding this submittal.

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

Yours truly,

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

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

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The subject of this Value Engineering study is the construction of a Leesburg North Bypass from SR3/US 19 to SR 195. The design for this project has been prepared by Stantec Consultants. The project's design is at the construction documents submittal stage.

1.2 PROJECT DESCRIPTION

The project STP00-0001-00(420) - PI No. : 0001420 consists of traffic new two lane roadway with 12 foot travel lanes and 6.5 foot paved shoulders. Turn lanes will be added at the intersections from SR 3/US 19 to SR 195. Side roads would be improved and realigned as needed. The project will include a grade separated crossing of the Norfolk and Southern Railroad and SR 3/US 19. Since the project is on a new location. The length of the project is 1.78 miles.



Figure 1-1: SR3/US 19 to Leslie Highway (SR 195)-North of Leesburg



Figure 1-2: Downtown Leesburg

The Value Engineering (VE) team followed the six step Value Engineering job plan as promulgated by SAVE International. Refer to Section 4.2 of this report for additional information on the VE process. The six step Job Plan includes the following:

Information Phase – during this phase of the VE Team’s work, the team received a briefing from the GDOT and the Stantec project manager. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team.

Function Analysis Phase – during this phase the VE Team determined the “**Functions**” of the project. This was accompanied by reviewing the project by asking the questions of “What is the project supposed to do?”, and “How is it supposed to accomplish this purpose?”. In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis which distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise. A FAST diagram was prepared highlighting the project’s required functions.

Creative Phase – The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

- Leesburg North Bypass Roadway
- Leesburg North Bypass Bridge/Railroad Crossing
- Reduction of downtown Leesburg traffic congestion

The brainstorming session identified seventeen (17) ideas, which are shown on pages 1-4 and 1-5.

Evaluation Phase – During this phase, the VE Team determines which of the creative ideas offer the best opportunity to improve the value of the project for further development. The first step is to determine the criteria that the ideas should be evaluated against. The VE Team reflected back on the project constraints and objectives shared with the team by the Owner’s representatives and the design team members and listed the following:

First Costs

Impact on existing utilities

Impact on traffic congestion in downtown Leesburg

Impact on wetlands

Impact on existing schools

Development Phase – During this phase, the VE Team developed each of the selected alternatives whose score was 4 or greater because of time constraints. If time permits, the team will develop additional recommendations. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant cost savings if implemented.

Recommendation Phase – During this phase the VE Team reviews the alternative ideas to confirm which ones are appropriate for the project, provide an opportunity for success and which will improve the value of the project if implemented.

Presentation Phase – the team made a presentation to the Georgia Department of Transportation on the last day of the workshop. This presentation was designed to express the intent and clarify each of the recommended alternatives. This report is intended to formalize those findings.

CREATIVE IDEA LISTING



PROJECT: Georgia Department of Transportation
 STP00-0001-00(420) – P.I. No. 0001420
 Leesburg North Bypass from SR 3/US 19 to SR 195
 Lee County

No.	IDEA DESCRIPTION	Rating
BRIDGE		
BR-1	Reduce the span of the bridge on the west end	4
BR-2	Reduce the span of the bridge on the east end	4
BR-3	Construct a two span bridge	4
BR-4	Use a BT-63 in-lieu of BT-74 on span two (Railroad span)	1
BR-5	Use a steam beam construction	1
BR-6	Eliminate east end span, reduce west end span, and provide a two span	4
BR-7	Eliminate east end span	4
Rating Scores: 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; OBS=Observation		

CREATIVE IDEA LISTING



PROJECT: Georgia Department of Transportation
 STP00-0001-00(420) – P.I. No. 0001420
 Leesburg North Bypass from SR 3/US 19 to SR 195
 Lee County

No.	IDEA DESCRIPTION	Rating
ROADWAY		
RD-1	Extend SR 3 Bypass to SR 195	3 See observations
RD-2	Use a trumpet interchange	2
RD-3	Lower west end of bridge	See BR-4 & 6
RD-4	Modify tie-in at SR 195	OBS
RD-5	Use 11' travel lanes in-lieu of 12' travel lanes	1
RD-6	Lower finish grade elevation of interchange	See BR 4 & 6
RD-7	Use 4' 0" paved shoulder instead of 6'6" shoulder	4
RD-8	Use 8'0" shoulder instead of 10'0" shoulder	2
RD-9	Acquire access rights to improve operations	OBS
RD-10	Construct a grade separated railroad crossing downtown in-lieu of northerly bypass	1

Rating Scores: 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;
 OBS=Observation

1.3 OBSERVATIONS

The VE team identified an alternative idea which was to extend the existing by-pass route more directly to the existing SR-195 alignment (RD-1). During the development phase, the team identified three alternate (1,2, 3) routes for accomplishing this idea. However, once each was defined, it was learned that the cost to construct would most likely significantly exceed the current design and impact many existing property owners. Therefore, these alternatives were dismissed. The VE Team believes that it could be helpful to the GDOT if these alternatives were presented herein for possible future decision making. Accordingly, the following:

Alternative Route Analysis (RD-1)

Following the initial presentation by the designer, the VE Team looked carefully at alternate routes that may be employed to satisfy the operational functions of the proposed project at the best value. The team devised three alternate routes for the bypass, and analyzed each on function and value with respect to the original idea presented by the designers. Three alternatives explored by the VE Team are presented below, with the relative strengths and weaknesses outlined. Ultimately, the three alternatives explored by the VE Team failed to yield an alternative that was superior in function or value to the original idea presented.

Alternate 1



The idea for Alternate 1 was to extend the existing SR 3 bypass eastward to tie into existing SR 195. This alternate would allow a much shorter segment required to be built than the original idea, and would shorten the proposed circuitous route considerably. The operational requirements for moving traffic from SR 195 as well as Smithville Lane to the south side of Leesburg were satisfied. This alternative was problematic in a number of ways. First, SR 3 Bypass is a four lane facility, so tying an existing four lane into an existing two lane facility at SR 195 would likely cause logical termini issues. Secondly, the cost

savings realized by shortening the route would be negated by the increased costs of construction of a four lane grade separated bridge over SR 3. Thirdly, the lack of distance between SR 3 and Smithville Lane would create a fairly severe vertical curve to achieve touchdown at Smithville Lane. The original concept contained minimal right of way costs due to the proposed construction in agricultural areas, and contained no damages or displacements. Alternative 1 would require significantly more right of way costs in terms of damages and displacements. The proximity of Alternative 1 to the school property on the east side of Smithville Lane would require care not to encroach for 4F issues. As a result of these findings, Alternate 1 is not recommended for further development by the VE Team.

Alternate 2



The idea behind Alternate 2 was to split the proposed bypass, and create half of the original movement. This idea would improve Smithville Lane, and create a bypass between Smithville Lane and SR 3. The movement would allow school traffic to disperse via Smithville Lane, utilize the bypass to cross the railroad, and access the residential areas on the south end of Leesburg. The problems encountered by the VE Team in this alternative include:

-This alternative does not account for SB traffic on SR 195. As was discussed in the initial presentation, the primary ingress/egress for school traffic is SR 195. This alternative does not appear to be functionally equivalent to the original idea in terms of operational sufficiency.

-The right of way costs for improving Smithville Lane would be substantially higher due to the residential concentration, resulting in displacements. Additional widening to the east side of Smithville Lane would encroach on existing school property, and would likely trigger a 4F process. After review of these issues, the VE team decided that further development of this alternative was not warranted.

Alternate 3



The idea for Alternate 3 is to construct an extension of SR 3 bypass to Smithville Lane, improve Smithville Lane to the northern edge of the school property, and construct the remainder of the bypass northeast to tie into existing SR 195. This alternative addresses the SR 195 traffic that was omitted in Alternate 2, and partially combines the SR 3 bypass extension found in Alternate 1. However, this alternative suffers from the shortcomings found in both Alternates 1 and 2. Extension of the SR 3 bypass results in logical termini issues from four lanes of traffic being forced into two lanes. Additional costs will be borne by constructing a four lane grade separated bridge across existing SR 3 and the railroad. Right of way costs will be greater than the original alternative for significant improvements on Smithville Lane. After review of these issues, the VE Team did not further develop Alternate 3.

The VE Team noted that it might improve the project operation if GDOT acquired the access rights along the west side of SR-3/ US- 19

1.4 CONCLUSIONS AND RECOMMENDATIONS

The VE Team identified, developed, and recommends ***five design alternatives*** for implementation to improve the value of the project as shown on the following page:

SUMMARY OF ALTERNATIVES



PROJECT: Georgia Department of Transportation
 STP00-0001-00(420) – P.I. No. 0001420
 Leesburg North Bypass from SR 3/US 19 to SR 195
 Lee County

Alternative Number	Description of alternatives	Initial cost savings
BRIDGE		
BR-1	Reduce the span of the bridge on the west end	\$164,232
BR-2	Reduce the span of the bridge at the east end	\$ 116,300
BR-6	Eliminate east end span, reduce west end span, and provide a two span bridge	\$424,607
BR-7	Eliminate east end span	\$238,622
ROADWAY		
RD-7	Use 4' 0" paved shoulder instead of 6'6" shoulder	\$152,425

2 STUDY RESULTS

2.1 INTRODUCTION

This section includes the study results presented in the form of fully developed value engineering alternatives that include: descriptions of the original design; description of the alternative design; opportunities and risks; technical discussions; sketches; calculations; and a cost estimate of the impact of the alternative.

It should be noted that the estimated cost/savings calculated for these alternatives are very preliminary and are only presented to indicate a probable magnitude of cost impact on the project.

Also, these alternatives are "stand alone" ideas. In some cases they may be "added" to another alternative, or in other cases they may present a different method of constructing the same elements and are therefore not additive. A summary is provided in Section 1-4 - Summary of Alternatives.

Therefore the users of this report are asked to consider these alternatives and design suggestions as a smorgasbord of choices for selection and use as appropriate as the project progresses.

2.2 COST CALCULATIONS

The cost calculations are intended only as an indicator to the approximate results that might be expected from implementation of the alternatives. They should be helpful in making clear choices as to the pursuit of individual alternatives.

2.3 ALTERNATIVES AND DESIGN SUGGESTIONS

Following are the *five design alternatives* for implementation to improve the value of the project:

2.3.1 ALTERNATIVE NUMBER BR - 1

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-1
DESCRIPTION:	Reduce Span Length at Bridge West End	SHEET NO.:	1 of 5

Original Design:

The original design proposes the construction of a 336’ bridge spanning US 19/SR 3, carrying two lanes with 8’ outside shoulders for a width of 43.25’. The 3 span arrangement includes: 1 @ 105.0, BT-54; 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II. The West end abutment is an MSE Walled abutment and the East end abutment has an end roll.

Alternative:

The alternative design proposes reducing the West end span by 45’ thus reducing the overall bridge length to 291’.

Opportunities:

- Cost savings
- Reduction in construction time

Risks:

- Minimal redesign required

Technical Discussion:

The MSE Walled abutment on the West end of the bridge can be shifted Eastward by 45’ thus reducing Span 1 to 60’. Roadway pipe can be utilized under the bridge envelope along US 19/SR 3 in lieu of the proposed roadway ditch.

See the following pages for calculations of cost savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 193,793	\$ 0	\$ 193,793
ALTERNATIVE	\$ 29,560	\$ 0	\$ 29,560
SAVINGS	\$ 164,232	\$ 0	\$ 164,232

ILLUSTRATIONS

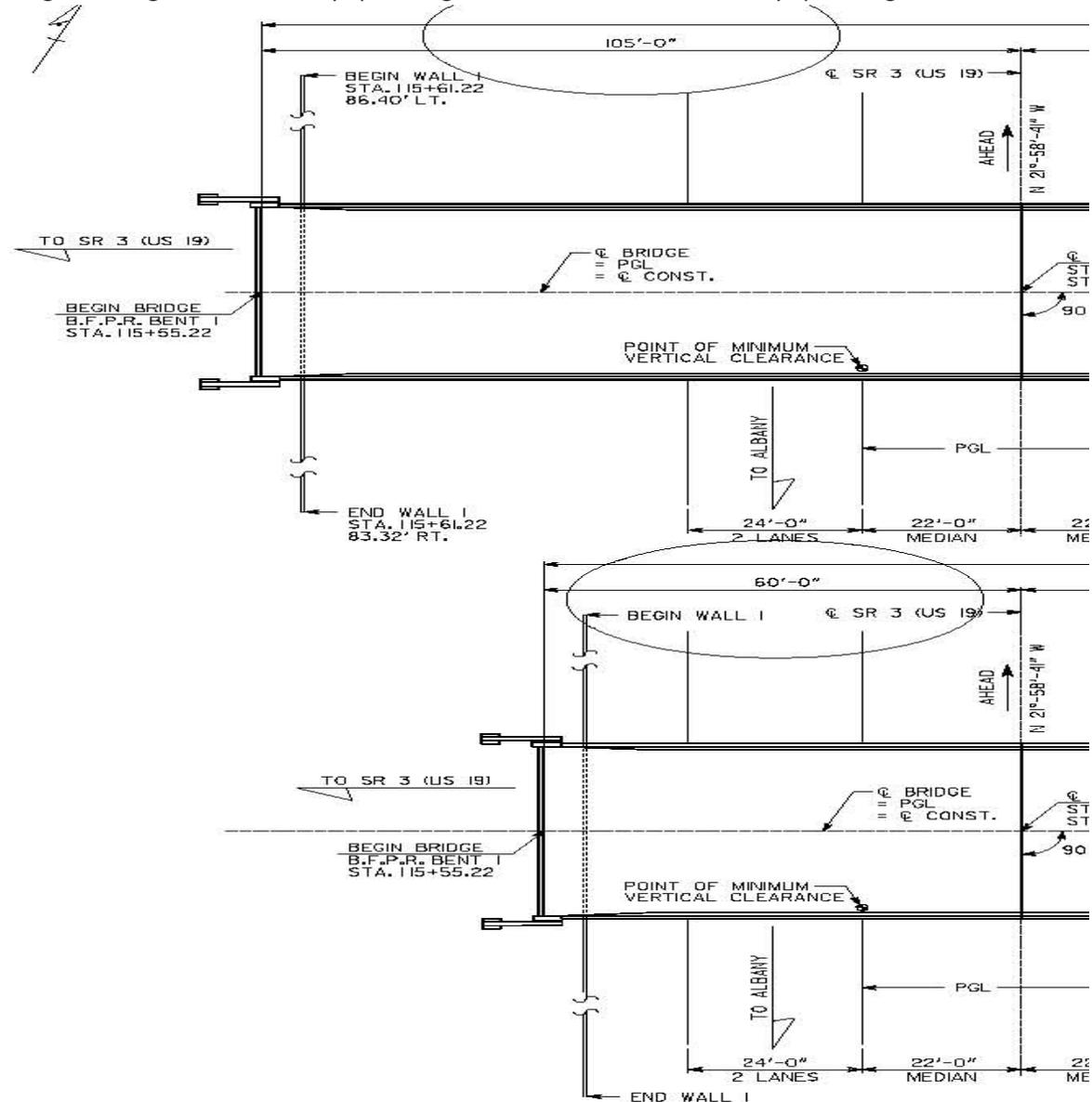
PROJECT: **Georgia Department of Transportation
STP00-0001-00(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County**

ALTERNATIVE NO.:
BR-1

DESCRIPTION: **Reduce Span Length at Bridge West End**

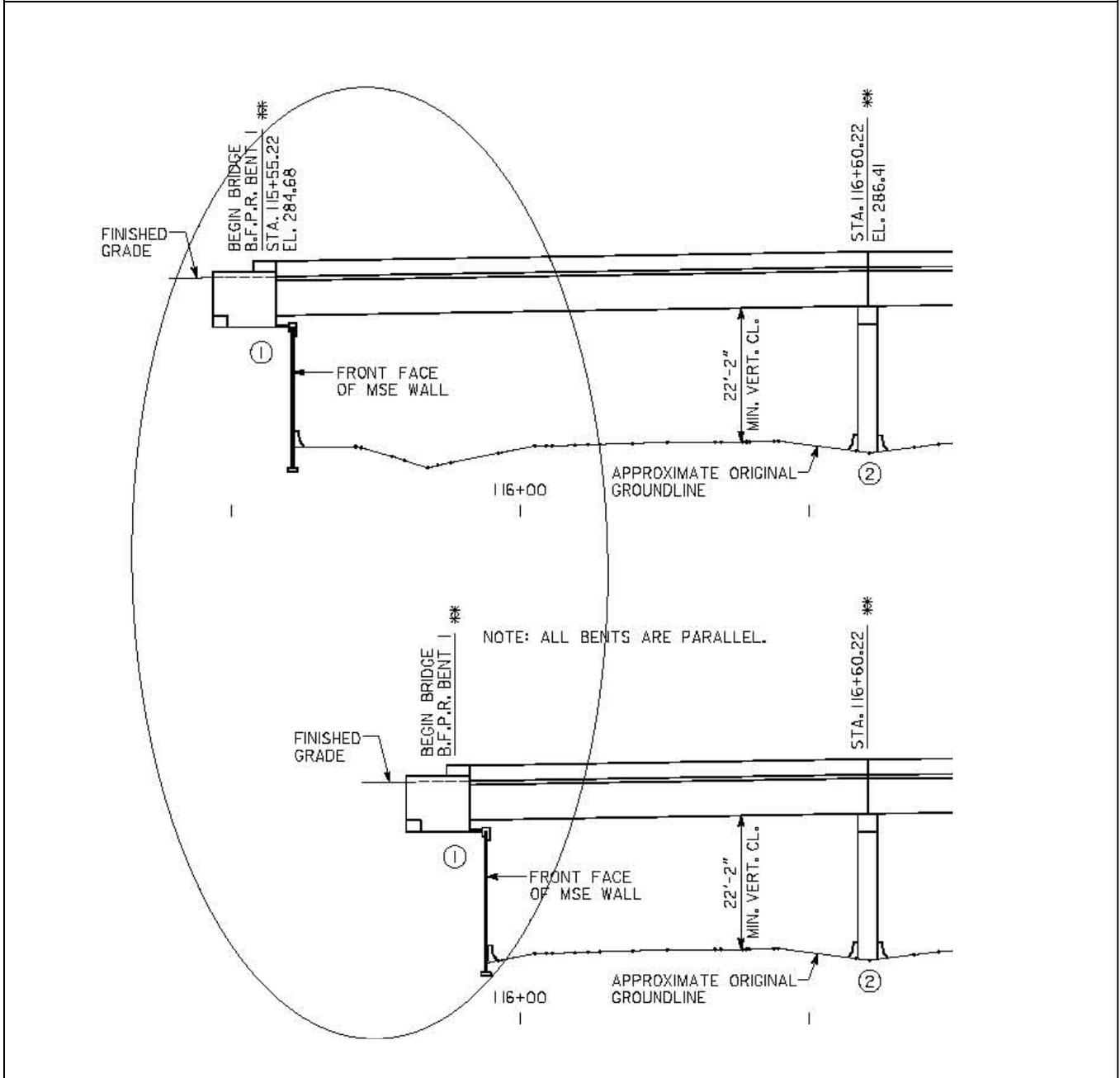
SHEET NO.: **2 of 5**

Original Design - 105' westerly span length - Alternative - 60' westerly span length - see elev. next pg



ILLUSTRATIONS

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-1
DESCRIPTION:	Reduce Span Length at Bridge West End	SHEET NO.:	3 of 5



Calculations

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.: BR-1
DESCRIPTION:	Reduce Span Length at Bridge West End	SHEET NO.: 4 of 5
<p>Note:</p> <ol style="list-style-type: none"> 1) The current design was in the preliminary stage at the time of the study. 2) Reduction from current design = savings for alternative. 3) Construction cost of bridge used is \$90/SF 4) Average Paving Cost assumed = \$75 / SY. <p><u>Current Design (3 Spans – 336’ Long – 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II).</u></p> <p><u>Alternative Design (3 Spans – 291’ Long – 1 @ 60.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II):</u></p> <p>Reduction in Bridge Area = $1 \times 43.25' \times 45.0' = 1957.5 \text{ SF}$</p> <p>Additional Asphalt Paving Area required = $1957.5 / 9 = 217.5 \text{ SY (approx.)}$</p> <p>Additional Guardrail required = $2 * (45.0') = 90 \text{ LF (approx.)}$</p> <p>Additional Backfill Required = $(1800 \text{ SF} \times 45' / 27) = 3,000 \text{ CY (approx.)}$</p> <p>NOTE: A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components and realize greater cost savings than that shown in this study.</p>		

2.3.2 ALTERNATIVE NUMBER BR-2

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-2
DESCRIPTION:	Reduce Span Length at Bridge East End	SHEET NO.:	1 of 5

Original Design:

The original design proposes the construction of a 336’ bridge spanning US 19/SR 3, carrying two lanes with 8’ outside shoulders for a width of 43.25’. The 3 span arrangement includes: 1 @ 105.0, BT-54; 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II. The West end abutment is an MSE Walled abutment and the East end abutment has an end roll.

Alternative:

The alternative design proposes reducing the east end span by 45’ by providing an MSE wall at approximately the Railroad R/W in-lieu-of the end roll, thus reducing the overall bridge length to 291’.

Opportunities:

- Cost savings
- Reduction in construction time
- Improved aesthetics by matching west end of the bridge

Risks:

- Minimal redesign required

Technical Discussion:

An MSE walled abutment can be provided on the east end of the bridge in-lieu of the end roll. The end bridge can be shifted to approximately the location of the Railroad R/W thus reducing Span 3 to 40’. Pipe can be utilized under the bridge envelope parallel to the Railroad in-lieu-of open ditch.

See the following pages for calculations of cost savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 206,718	\$ 0	\$ 206,718
ALTERNATIVE	\$ 90,418	\$ 0	\$ 90,418
SAVINGS	\$ 116,300	\$ 0	\$ 116,300

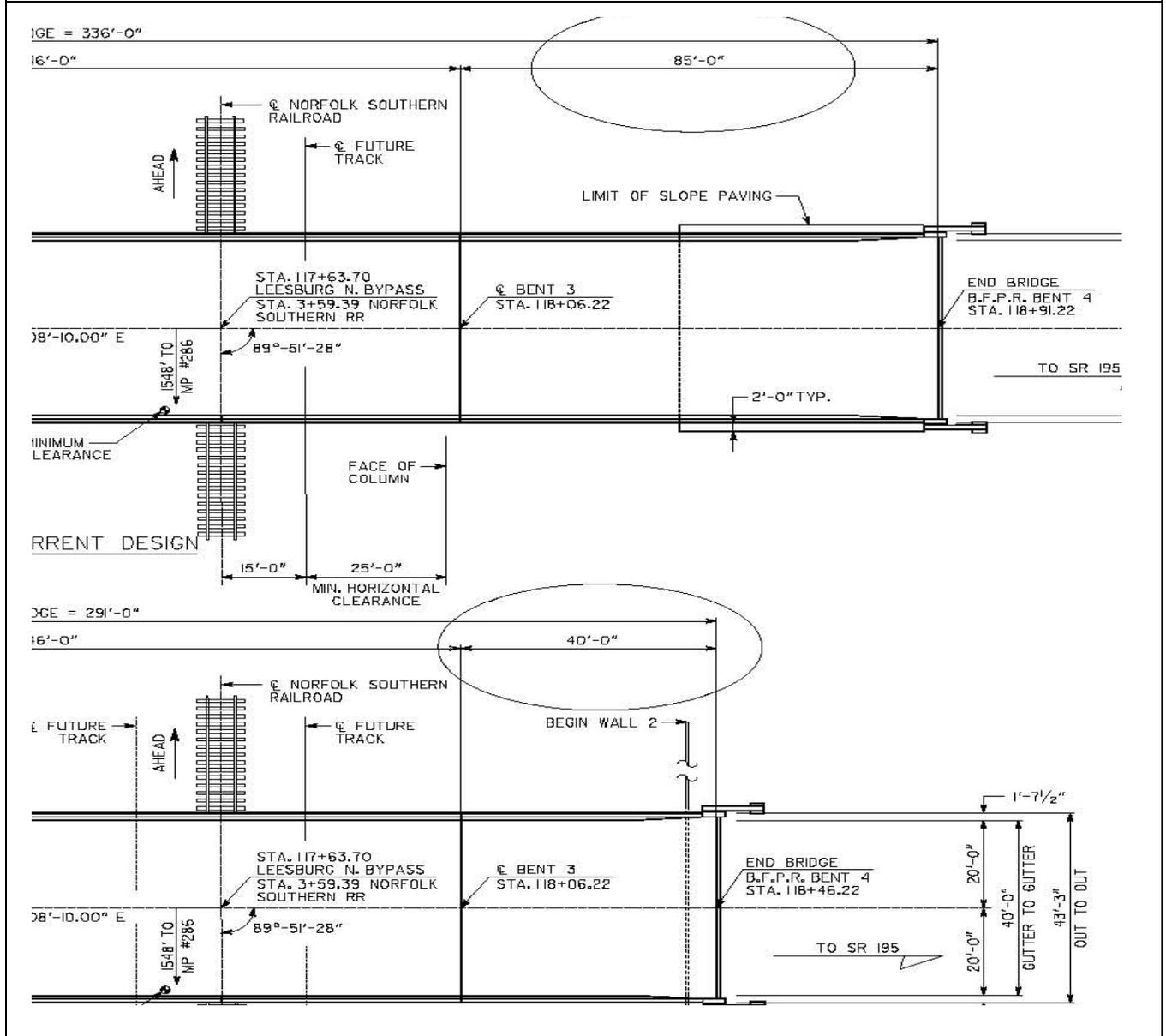
ILLUSTRATIONS

PROJECT: **Georgia Department of Transportation
STP00-0001-00(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County**

ALTERNATIVE NO.:
BR-2

DESCRIPTION: **Reduce Span Length at Bridge East End**

SHEET NO.: **2 of 5**



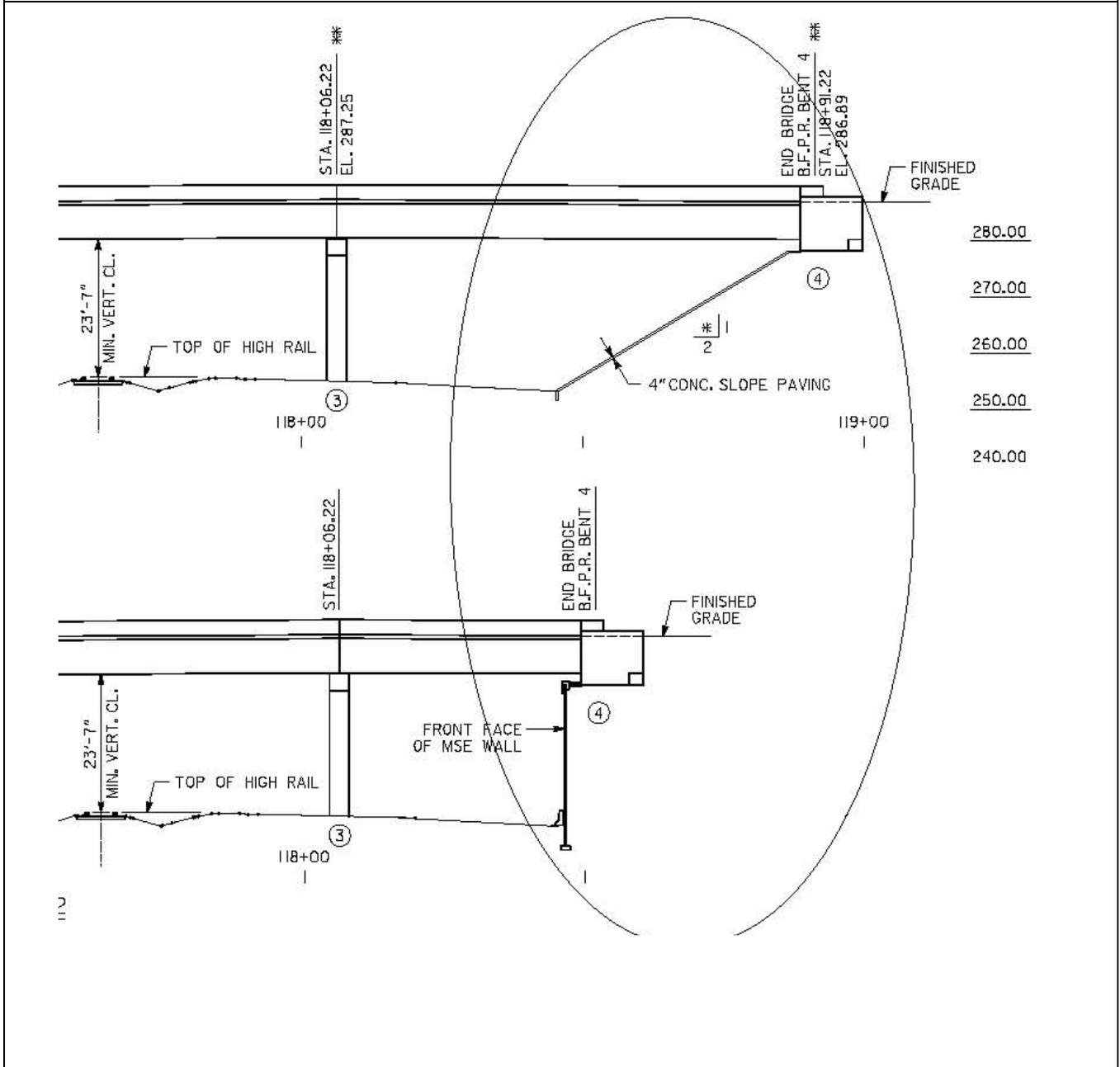
ILLUSTRATIONS

PROJECT: **Georgia Department of Transportation
STP00-0001-00(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County**

ALTERNATIVE NO.:
BR-2

DESCRIPTION: **Reduce Span Length at Bridge East End**

SHEET NO.: **3 of 5**



Calculations

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.: BR-2
DESCRIPTION:	Reduce Span Length at Bridge East End	SHEET NO.: 4 of 5

Note:

- 5) The current design was in the preliminary stage at the time of the study.
- 6) Reduction from current design = savings for alternative.
- 7) Construction cost of bridge used is \$90/SF
- 8) Average paving cost assumed = \$75 / SY.

Current Design (3 Spans – 336’ Long – 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II).

Alternative Design (3 Spans – 291’ Long – 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 40.0’, Type I Mod):

Reduction in Bridge Area = $1 \times 43.25' \times 45.0' = 1957.5 \text{ SF}$

Additional Asphalt Paving Area required = $1957.5 / 9 = 217.5 \text{ SY (approx.)}$

Additional Guardrail required = $2 * (45.0') = 90 \text{ LF (approx.)}$

Additional Backfill Required = $(1800 \text{ SF} \times 45' / 27) = 3,000 \text{ CY (approx.)}$

Additional MSE Wall Required (95' long, assume average ht. = 20') = $0.5 \times 130' \times 20' = 1300 \text{ SF (approx.)}$

Additional Coping Required = 95 LF (approx.)

Reduction in sloped paving = $(50' \times 45' / 9) = 250 \text{ SY (approx.)}$

NOTE:

A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components and realize greater cost savings than that shown in this study.

2.3.3 ALTERNATIVE NUMBER BR-6

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-6
DESCRIPTION:	Eliminate East End Span, Reduce West End Span and Provide a Two Span Bridge	SHEET NO.:	1 of 5

Original Design:

The original design proposes the construction of a 336’ bridge spanning US 19/SR 3, carrying two lanes with 8’ outside shoulders for a width of 43.25’. The 3 span arrangement includes 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II. The west end abutment is MSE walled and the east end abutment has an end roll.

Alternative:

The alternative design proposes reducing the West end span by shifting the abutment East by 45’ and eliminating the 85’ east end span by providing an MSE walled abutment at approximately the location of bent 3 of the current design, thus reducing the overall bridge length to 206’.

Opportunities:

- Cost savings
- Reduction in construction time
- Improved aesthetics with symmetry in elevation
- Potential to lower profile grade

Risks:

- Minimal redesign required

Technical Discussion:

The MSE walled abutment on the west end of the bridge can be shifted eastward by 45’ thus reducing span 1 to 60’. An MSE walled abutment can be provided at approximately the location of bent 3 and eliminating Span 3 of the current design. Pipe can be utilized under the bridge envelope parallel to US 19/SR 3 on one side and the railroad on the other side in-lieu-of open ditches. This configuration will provide adequate horizontal clearance to accommodate the existing track, two future tracks and a service road.

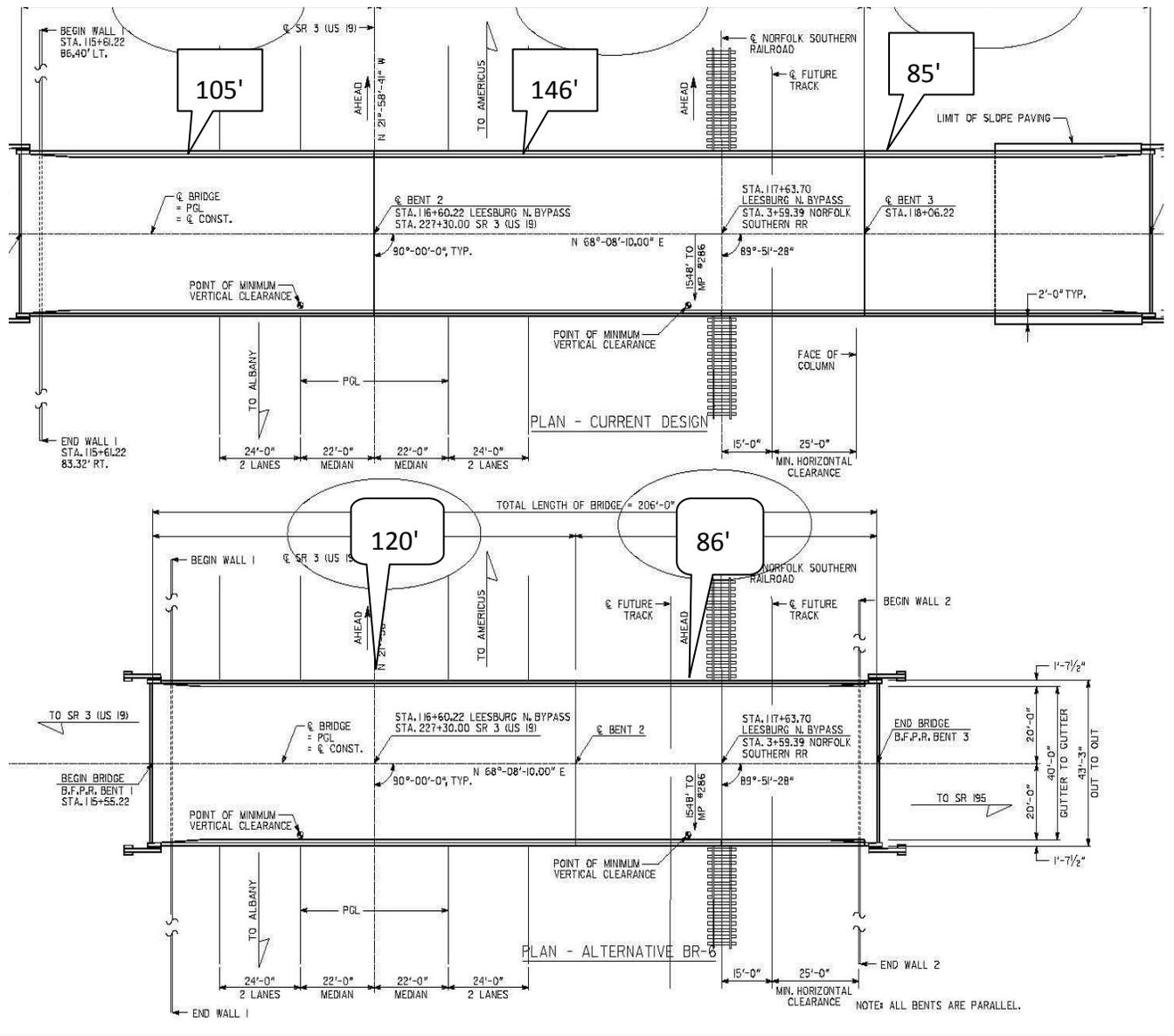
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 570,666	\$ 0	\$ 570,666
ALTERNATIVE	\$ 146,060	\$ 0	\$ 146,060
SAVINGS	\$ 424,607	\$ 0	\$ 424,607

ILLUSTRATIONS

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-6
DESCRIPTION:	Eliminate East End Span, Reduce West End Span and Provide a Two Span Bridge	SHEET NO.:	2 of 5

Current 3 spans - 105', 146', 85'

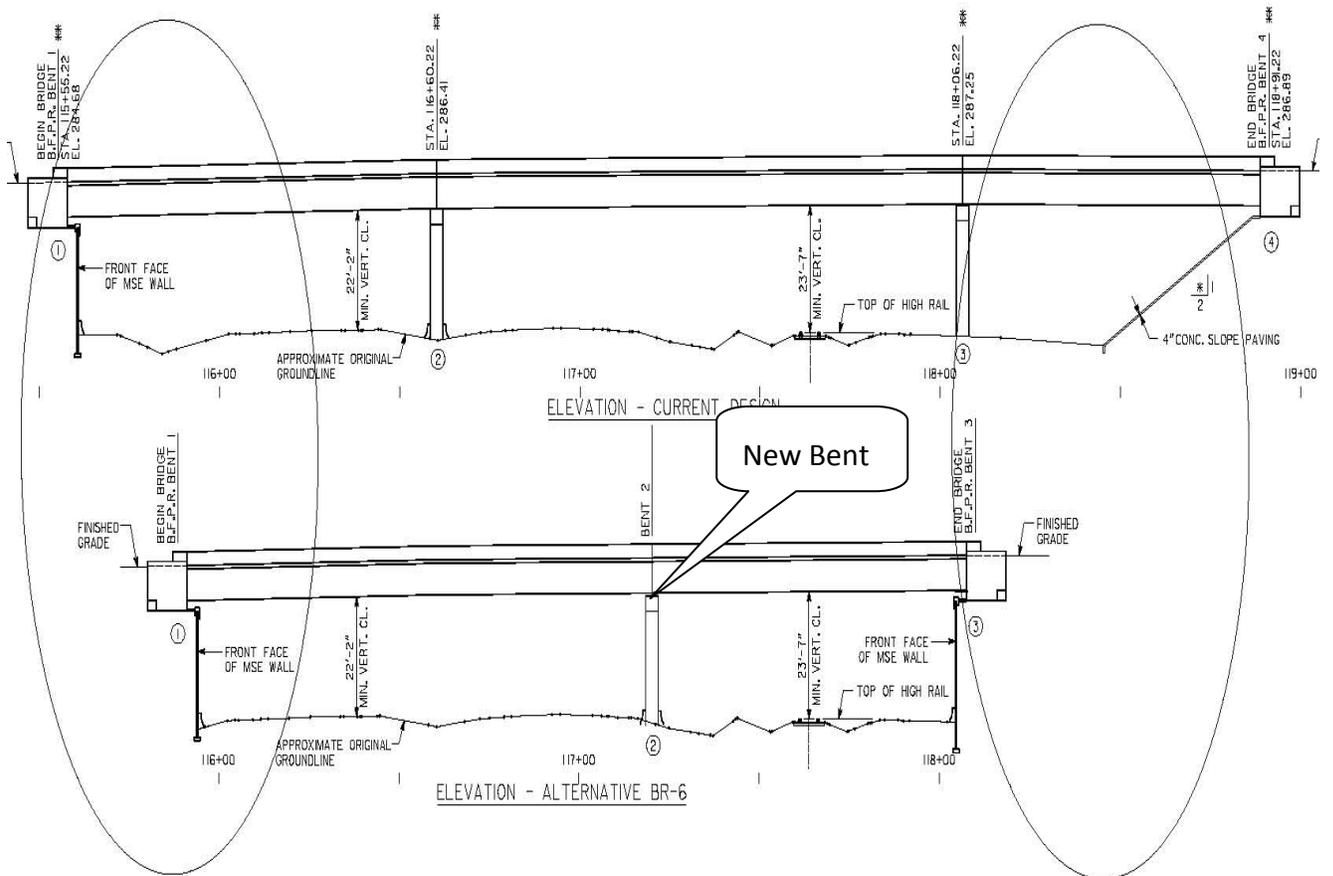
Alternative Design: 2 Spans - 120', 86'



ILLUSTRATIONS

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-6
DESCRIPTION:	Eliminate East End Span, Reduce West End Span and Provide a Two Span Bridge	SHEET NO.:	3 of 5

Elevation Drawing showing reducing the two ends spans, constructing a bent between the highway and the railroad allowing the use of just two spans:



Calculations

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.: BR-6
DESCRIPTION:	Eliminate East End Span, Reduce West End Span and Provide a Two Span Bridge	SHEET NO.: 4 of 5

Note:

- 9) The current design was in the preliminary stage at the time of the study.
- 10) Reduction from current design = savings for alternative.
- 11) Construction cost of bridge used is \$90/SF
- 12) Average paving cost assumed = \$75 / SY.

Current Design (3 Spans – 336’ Long – 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II).

Alternative Design (2 Spans – 206’ Long – 2 @ 103.0, BT-54):

Reduction in Bridge Area = $(1 \times 43.25' \times 85.0') + (1 \times 43.25' \times 45.0') = 5633.75 \text{ SF}$

Additional Asphalt Paving Area required = $3676.25 / 9 + 1957.5 / 9 = 626 \text{ SY (approx.)}$

Additional Guardrail required = $2 * (85.0') + 2 * (45.0') = 260 \text{ LF (approx.)}$

Additional Backfill Required = $(1800 \text{ SF} \times 85' / 27) + (1800 \text{ SF} \times 45' / 27) = 8,666 \text{ CY (approx.)}$

Additional MSE Wall Required (95' long, assume average ht. = 20') = $0.5 \times 130' \times 20' = 1300 \text{ SF (approx.)}$

Additional Coping Required = 95 LF (approx.)

Reduction in sloped paving = $(50' \times 45' / 9) = 250 \text{ SY (approx.)}$

NOTE:

A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components and realize greater cost savings than that shown in this study.

2.3.4 ALTERNATIVE NUMBER BR-7

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-7
DESCRIPTION:	Eliminate East End Span	SHEET NO.:	1 of 5

Original Design:

The original design proposes the construction of a 336’ bridge spanning US 19/SR 3, carrying two lanes with 8’ outside shoulders for a width of 43.25’. The 3 span arrangement includes 1 @ 105.0, BT-54, 1 @ 146.0’, BT-74, and 1 @ 85.0’, Type II. The west end abutment is MSE walled and the east end abutment has an end roll.

Alternative:

The alternative design proposes eliminating the 85’ east end span by providing an MSE walled abutment at approximately the location of bent 3 of the current design, thus reducing the overall bridge length to 257’.

Opportunities:

- Cost savings
- Reduction in construction time
- Improved aesthetics by matching west end of the bridge

Risks:

- Minimal redesign required

Technical Discussion:

An MSE walled abutment can be provided at approximately the location of bent 3 and eliminating span 3 of the current design. Pipe can be utilized under the bridge envelope parallel to the railroad in-lieu-of open ditch. This configuration will provide adequate horizontal clearance to accommodate the existing track, two future tracks, and a service road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 351,183	\$ 0	\$ 351,183
ALTERNATIVE	\$ 112,561	\$ 0	\$ 112,561
SAVINGS	\$ 238,622	\$ 0	\$ 238,622

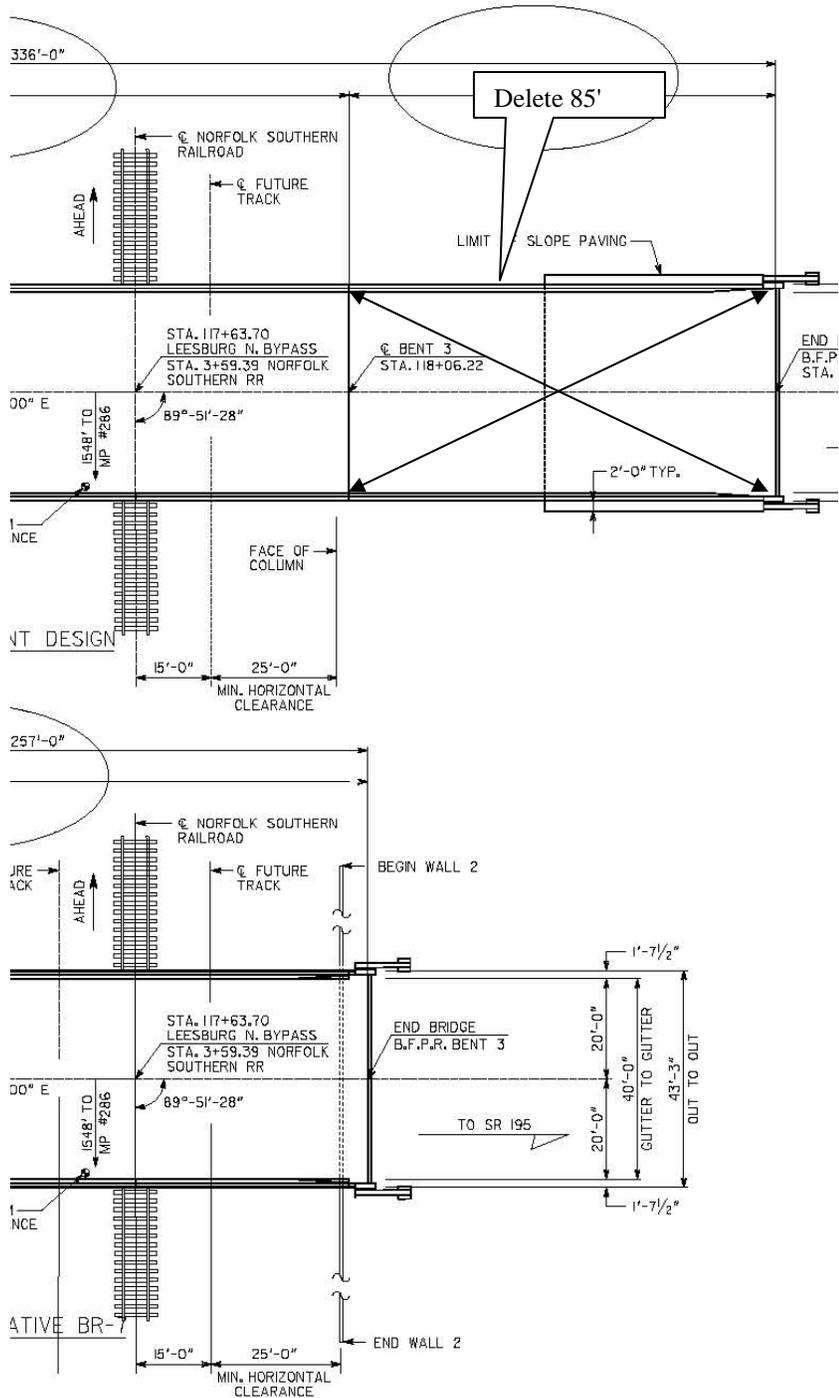
Illustrations

PROJECT: **Georgia Department of Transportation
STP00-0001-00(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County**

ALTERNATIVE NO.:
BR-7

DESCRIPTION: **Eliminate East End Span**

SHEET NO.: **2** of **5**



ILLUSTRATIONS

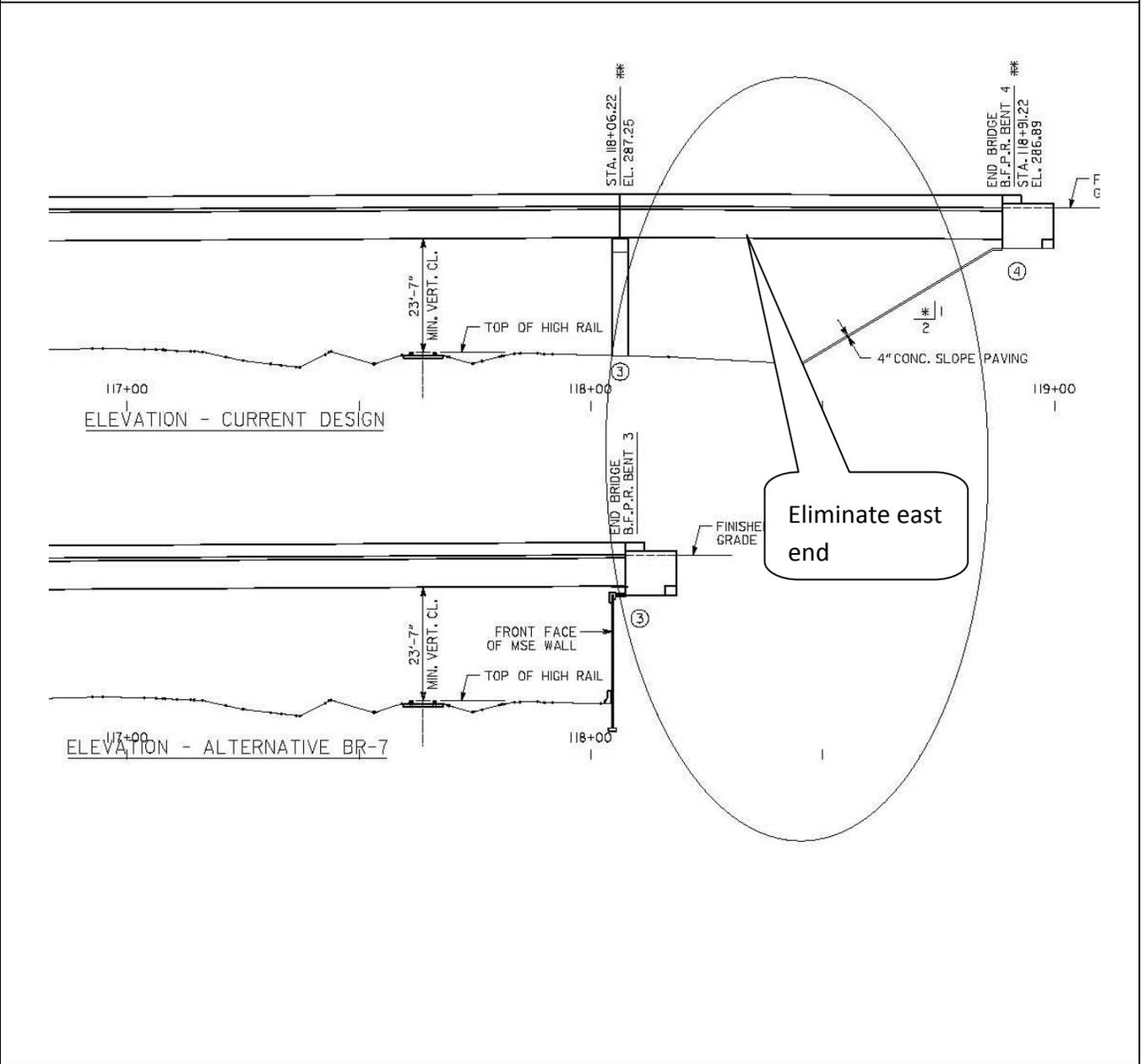
PROJECT: **Georgia Department of Transportation
STP00-0001-00(420) – P.I. No. 0001420
Leesburg North Bypass from SR 3/US 19 to SR 195
Lee County**

ALTERNATIVE NO.:

BR-7

DESCRIPTION: **Eliminate East End Span**

SHEET NO.: **3 of 5**



Calculations

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	BR-7
DESCRIPTION:	Eliminate East End Span	SHEET NO.:	4 of 5

Note:

- 13) The current design was in the preliminary stage at the time of the study.
- 14) Reduction from current design = savings for alternative.
- 15) Construction cost of bridge used is \$90/SF
- 16) Average paving cost assumed = \$75 / SY.

Current Design (3 Spans – 336' Long – 1 @ 105.0, BT-54, 1 @ 146.0', BT-74, and 1 @ 85.0', Type II).

Alternative Design (2 Spans – 257' Long – 1 @ 105.0, BT-54, 1 @ 152.0', BT-74):

Reduction in Bridge Area = $1 \times 43.25' \times 79.0' = 3416.75 \text{ SF}$

Additional Asphalt Paving Area required = $3416.75 / 9 = 379.5 \text{ SY}$ (approx.)

Additional Guardrail required = $2 * (79.0') = 158 \text{ LF}$ (approx.)

Additional Backfill Required = $(1800 \text{ SF} \times 79' / 27) = 5,267 \text{ CY}$ (approx.)

Additional MSE Wall Required (95' long, assume average ht. = 20') = $0.5 \times 130' \times 20' = 1300 \text{ SF}$ (approx.)

Additional Coping Required = 95 LF (approx.)

Reduction in sloped paving = $(50' \times 45' / 9) = 250 \text{ SY}$ (approx.)

NOTE:

A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components and realize greater cost savings than that shown in this study.

Cost Worksheet

PROJECT:		Georgia Department of Transportation				ALTERNATIVE NO.:		
		STP00-0001-00(420) – P.I. No. 0001420				BR-7		
		Leesburg North Bypass from SR 3/US 19 to Lee County						
DESCRIPTION:		Eliminate East End Span				SHEET NO.:		5 of 5
CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE			
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL	
Bridge	SF	3,417	\$ 90.00	\$ 307,508	0	\$ 90.00	\$ -	
Asphalt Paving	SY	0	\$ 75.00	\$ -	379.5	\$ 75.00	\$ 28,463	
Guardrail	LF	0	\$ 17.34	\$ -	158	\$ 17.34	\$ 2,740	
Backfill	CY	0	\$ 3.00	\$ -	5,267	\$ 3.00	\$ 15,801	
MSE Wall (20' Avg Height)	SF	0	\$ 40.00	\$ -	1,300	\$ 40.00	\$ 52,000	
Coping	LF	0	\$ 35.00	\$ -	95	\$ 35.00	\$ 3,325	
4" Sloped Paving	SY	250	\$ 47.00	\$ 11,750	0	\$ 47.00	\$ -	
Note: Reduction from current design = savings for alternative								
Assume \$90 per SF of Bridge								
Sub-total					\$ 319,258			
Const Mark-up	10.00%				\$ 31,926			
TOTAL					\$ 351,183			
Estimated Savings:							\$238,622	

2.3.5 ALTERNATIVE NUMBER RD-7

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:	RD-7
DESCRIPTION:	Use a 4’ paved shoulder in lieu of 6’-6”	SHEET NO.:	1 of 4

Original Design:

The original design proposes constructing paved shoulders at a width of 6.5’.

Alternative:

The alternative design proposes constructing the paved shoulders at a width of 4’.

Opportunities:

- Reduction in pavement costs

Risks:

- Minimal redesign effort

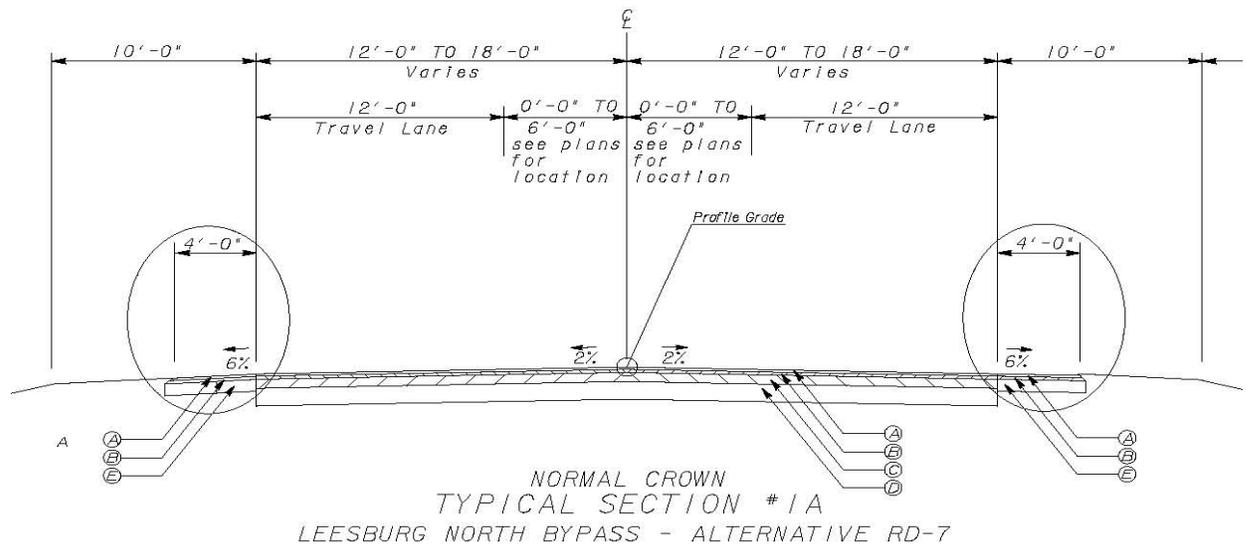
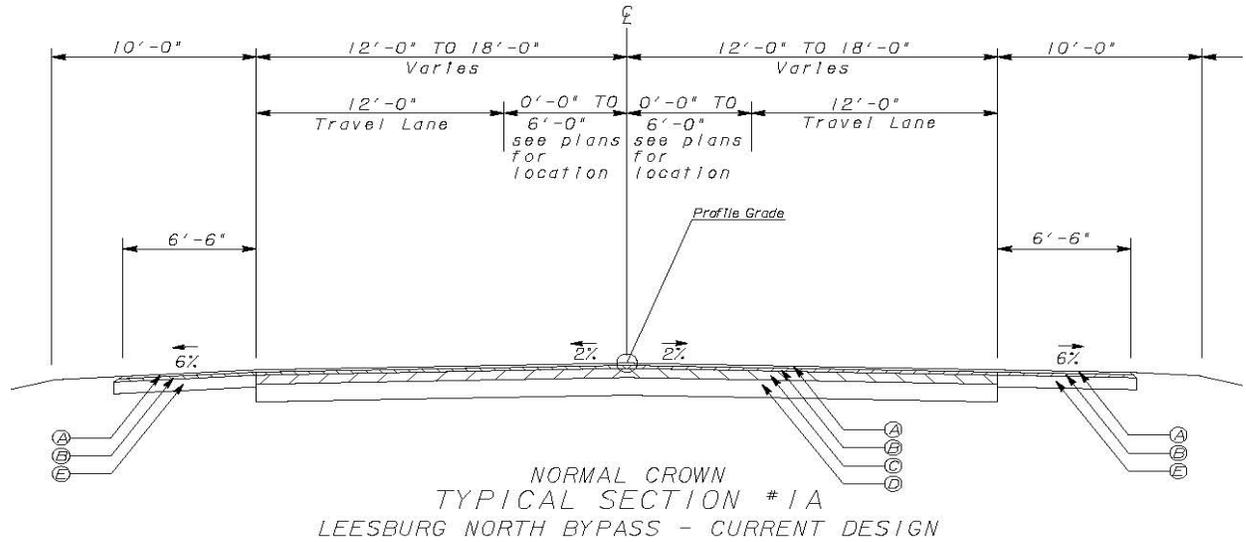
Technical Discussion:

Paving the full width of the useable shoulder is always most desirable, however in some instances such as low ADT this might not be the most practical choice. The proposed design has a projected traffic volume (6,700 ADT –year 2035). AASHSTO Policy on Geometric Design of Highways and Streets would require a minimum of an 8’-0” useable shoulder with at least 2’-0’ being paved. The proposed roadway is not on the proposed bike plan so providing the 6’-6” width for a minimum bikeable shoulder with scoring is not necessary. It should also be noted that the apparent high truck volume (15%) is primarily due to the school buses entering and exiting the school property.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,818,760	\$ 0	\$ 1,818,760
ALTERNATIVE	\$ 1,666,335	\$ 0	\$ 1,666,335
SAVINGS	\$ 152,425	\$ 0	\$ 152,425

ILLUSTRATIONS

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.:
		RD-7
DESCRIPTION:	Use a 4' paved shoulder in lieu of 6'-6"	SHEET NO.: 2 of 4



Calculations

PROJECT:	Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.: RD-7
DESCRIPTION:	Use a 4' paved shoulder in lieu of 6'-6"	SHEET NO.: 3 of 4
<p><u>Assumptions:</u></p> <p>Project length=1.716 miles x 5,280=9,060LF x 2 sides=18,120LF shoulder impacted by alternate.</p> <p>18,120LF x 2.5' reduction in width/9=Potential reduction in area=5033 SY</p> <p>Assumed shoulder build-up-</p> <ul style="list-style-type: none"> -880 LB/SY GAB -330 LB/SY 25mm Superpave -220 LB/SY 19mm Superpave -165 LB/SY 12.5mm Superpave <p>5033 SY x 880/2000= 2214 tons saved</p> <p>5033 SY x 330/2000=830 tons saved</p> <p>5033 SY x 220/2000=554 tons saved</p> <p>5033 SY x 165/2000=415 tons saved</p>		

Cost Worksheet

PROJECT: Georgia Department of Transportation STP00-0001-00(420) – P.I. No. 0001420 Leesburg North Bypass from SR 3/US 19 to SR 195 Lee County	ALTERNATIVE NO.: RD-7
DESCRIPTION: Use a 4' paved shoulder in lieu of 6'-6"	SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
12.5 mm Superpave	TN	4,180	\$ 64.06	\$ 267,771	3,765	\$ 64.06	\$ 241,186
19.0 mm Superpave	TN	5,570	\$ 59.24	\$ 329,967	5016	\$ 59.24	\$ 297,148
25.0 mm Superpave	TN	11,140	\$ 56.22	\$ 626,291	10310	\$ 56.22	\$ 579,628
GAB	TN	29,250	\$ 14.68	\$ 429,390	27036	\$ 14.68	\$ 396,888
Sub-total				\$ 1,653,418			\$ 1,514,850
Const Mark-up 10.00%				\$ 165,342			\$ 151,485
TOTAL				\$ 1,818,760			\$ 1,666,335
Estimated Savings:							\$152,425



3 PROJECT DESCRIPTION

The project STP00-0001-00(420)- PI No. : 0001420 consist of a new two lane roadway with 12 foot travel lanes and 6.5 foot paved shoulders. Turn lanes will be added at the intersections from SR 3/US 19 to SR 195. Side roads would be improved and realigned as needed. The project will include a grade separated crossing of the Norfolk and Southern Railroad and SR 3/US 19. The project is on a new location. The length of the project is 1.78 miles.

3.1 NEED AND PURPOSE

Congestion in downtown Leesburg is the driving force to create a northerly bypass. The existing situation requires all traffic including school buses, to travel through downtown Leesburg or along local streets to reach destinations south of town or to access US 19/SR 3. Traffic and school buses have to cross an at-grade railroad crossing located at the signalized US 19/SR 32/ SR 195 and 4th Street intersection in downtown. The level of service for some movements through the intersection are already approaching LOS F. The bus traffic must stop at the railroad crossing even if given a green light at the traffic signal causing further delays and congestion.

The proposed Leesburg North Bypass would improve the transportation network by diverting traffic from downtown Leesburg and improve conditions at the railroad crossing by providing a grade-separated crossing at the Norfolk-Southern tracks.

3.2 KICK-OFF PRESENTATION BY STANTEC

Steve Bitney, PE and Maureen Nerenbaum, PE from Stantec made a presentation to the VE Team on Tuesday morning of the VE Study as part of the information phase. They described the project and its constraints. Discussion included the environmental permitting status and needs of the project.

4 VALUE ENGINEERING PROCESS

4.1 WORK SHOP TEAM

PBS&J's Value Engineering (VE) team performed a VE study November 30-December 3, 2010 in the offices of Georgia Department of Transportation, Atlanta, Georgia. The team followed the SAVE International's six-step Value Engineering job plan as outlined in this section. The VE Study team consisted of the following members:

Les Thomas, P.E., CVS	Team Leader
Luke Clarke, P.E., AVS	Team Highway Design Engineer
Ramesh Kalvakaalva, P.E., AVS	Team Structural Engineer
Kevin Martin, Esq., AVS	Team Construction Specialist
Randy Thomas, CVS	Assistant Team Leader

4.2 SIX-STEP VALUE ENGINEERING JOB PLAN

The VE team followed the SAVE International's Six-step Value Engineering job plan:

- Information Phase
- Function Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

Information Phase— during this phase of the VE Team's work, the team received a briefing from the GDOT staff members and their design team, Stantec. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team.

Function Analysis Phase— during this phase the VE Team determined the "**Functions**" of the project. This was accompanied by reviewing the project by asking the questions such as: "*What is the project supposed to do?*", and "*How is it supposed to accomplish this purpose?*". In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis that distinguishes a Value Engineering effort from a potentially damaging cost-cutting exercise. A Functional Analysis System Technique (FAST) diagram was prepared highlighting the projects required functions.

Creative Phase — The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

Roadway alignment

Bridge

Congestion in downtown Leesburg

The brainstorming session identified seventeen (17) ideas. See page 1-7 for listing.

Evaluation Phase— Once the VE team identified the creative ideas, it was necessary to decide which alternatives should be carried forward. This is the work of the Evaluation or Judgment phase. The VE team reflected back on the project constraints and objectives shared with the team by the Owner’s representatives and the design team members. This guidance emerged on the first day of the study at the kick-off meeting. From that guidance, the team was able to select ideas that they believed would improve the project by a matrix process. The VE team used the following values as measures of whether or not an alternative had enough merit to be carried forward in the VE process:

First Costs

Permit-ability

Constructability

Reliability

Operating Costs

Development Phase— During this phase, the VE team developed each of the selected alternatives whose score was 4 or higher because of time constraints. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant savings if implemented (see the tabbed section titled **Study Results**).

Presentation Phase— As noted earlier, the team made an informal “out-briefing” on the last day of the workshop. This presentation was designed to inform the Owners and the Designers of the initial findings of the VE study. This written report is intended to formalize those findings.

The following is a flow chart that represents the work done prior to, during and after the VE workshop is completed on site:

Source: SAVE International

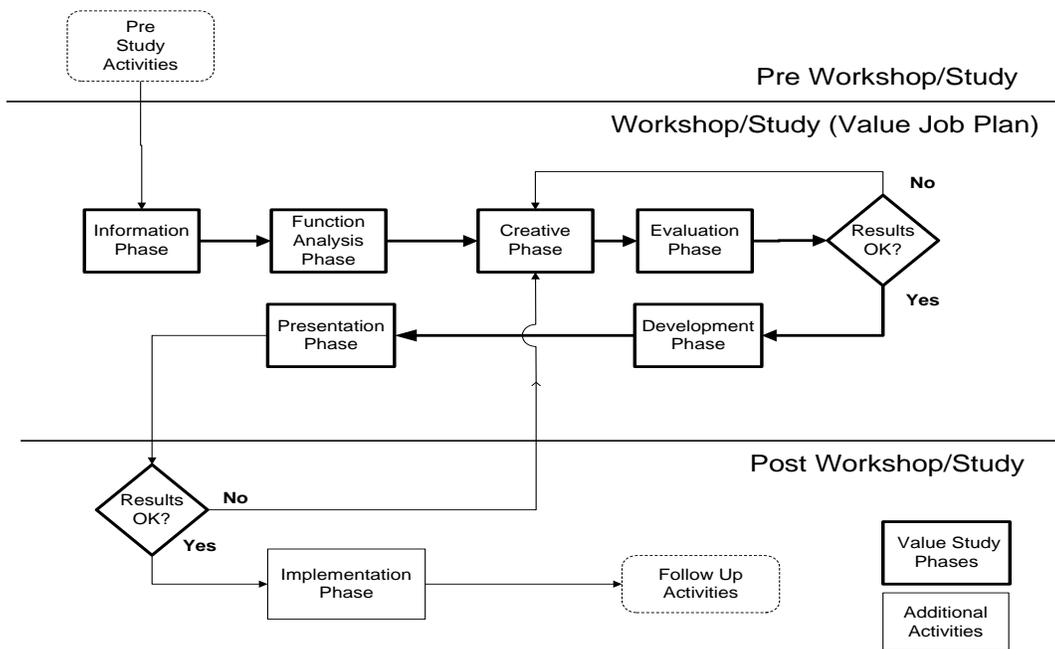


Figure 4-1 – Value Engineering Job Plan

4.3 VE WORKSHOP AGENDA

VALUE ENGINEERING STUDY AGENDA

Leesburg North Bypass

Lee County

November 30-December 3, 2010

Pre-Workshop Activities VE team leader organizes study, coordinates with the Owner and Designer to attain the project objectives and materials necessary. The VE team receives and reviews all project documents. The team develops a Pareto chart and/or cost model for the project.

Day One

- 9:00-10:30** Design Team Presentation (Information Phase)
 Introduction of participants, owner, designer, and VE team members
 Presentation of the project by the design engineer including:
 History and background
 Design Criteria and Constraints
 Special needs
 Current Construction Completion Schedule
 Project Cost Estimate if available and Budget Constraints
 Owner Presentation – special requirements, definition of life-cycle period and interest rate for life-cycle costs
 Review VE Pareto chart/cost model
 Discussion, questions and answers
 Overview of the VE process and agenda – Workshop goals and project goals
- 10:30-12:00** VE Team reviews project (Information Phase)
 Review design team’s presentation
 Review agenda and goals of the study
- 1:00-2:30** Function Analysis Phase
 Analyze Cost Model – Pareto
 Identify basic and secondary functions
 Complete Function Matrix/FAST diagram
- 2:30-5:00** Creative Phase
 Brainstorming of alternative ideas

VALUE ENGINEERING STUDY AGENDA

Leesburg North Bypass

Lee County

November 30-December 3, 2010

Day Two

- 8:00-10:00** Evaluation Phase
Establish criteria for evaluation
Rank ideas
Identify “best” ideas for development
Identify those ideas that will become design suggestions
Identify a “champion” for each idea to be developed
- 10:00-5:00** Development Phase
Develop alternative ideas design suggestions with assessment of original design and write up new alternatives including:
Opportunities and risks
Illustrations
Calculations
Cost worksheets
Life-cycle cost analysis

Day Three

- 8:00-5:00** Development Phase
Continue developing alternative ideas
Continue developing design suggestions
Prepare for presentation to Owners and Designers

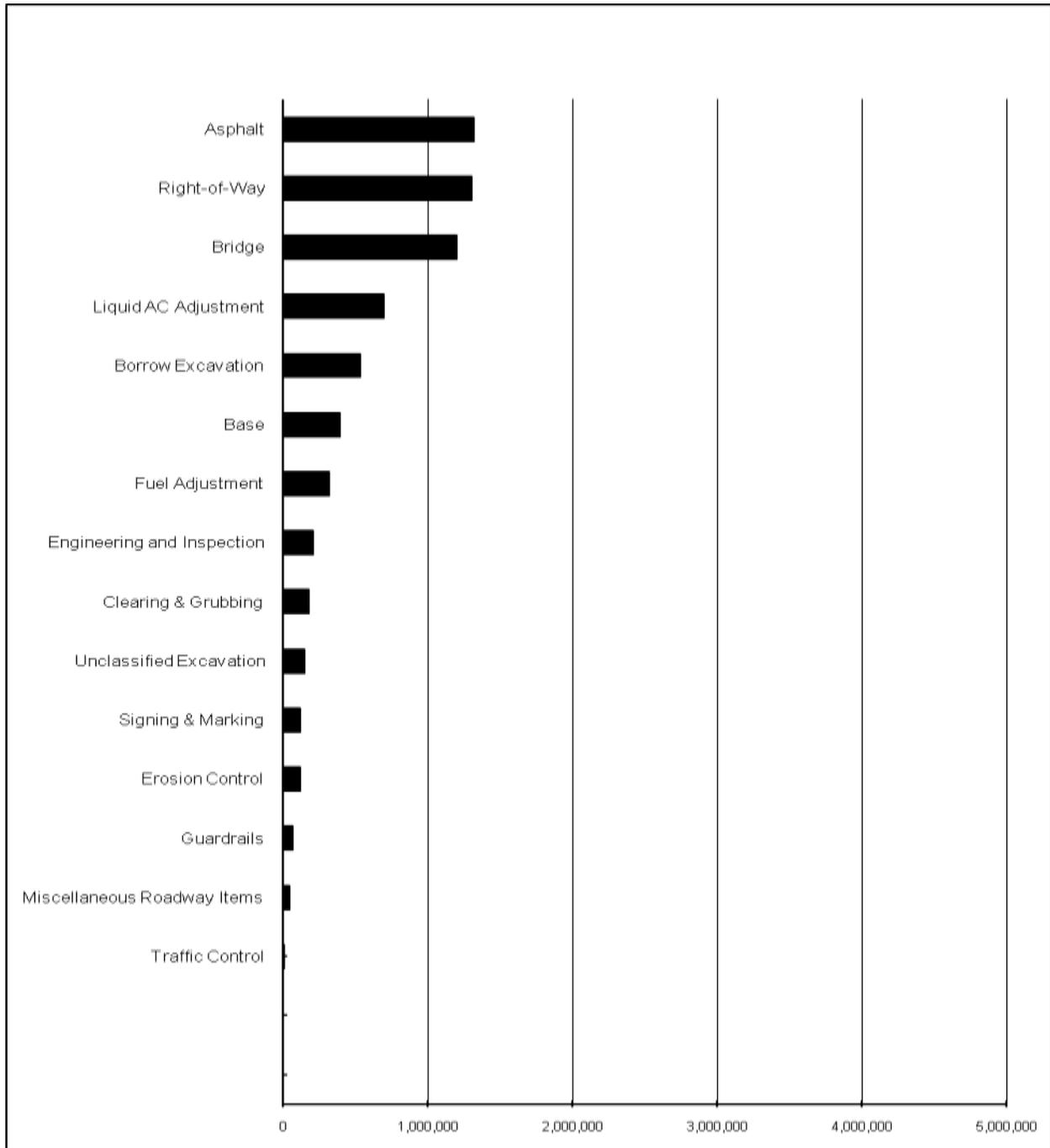
Day Four

- 8:00-9:00** Prepare presentation
9:00-10:00 VE team presentation

4.4 CONSTRUCTION CAPITAL COST ESTIMATE

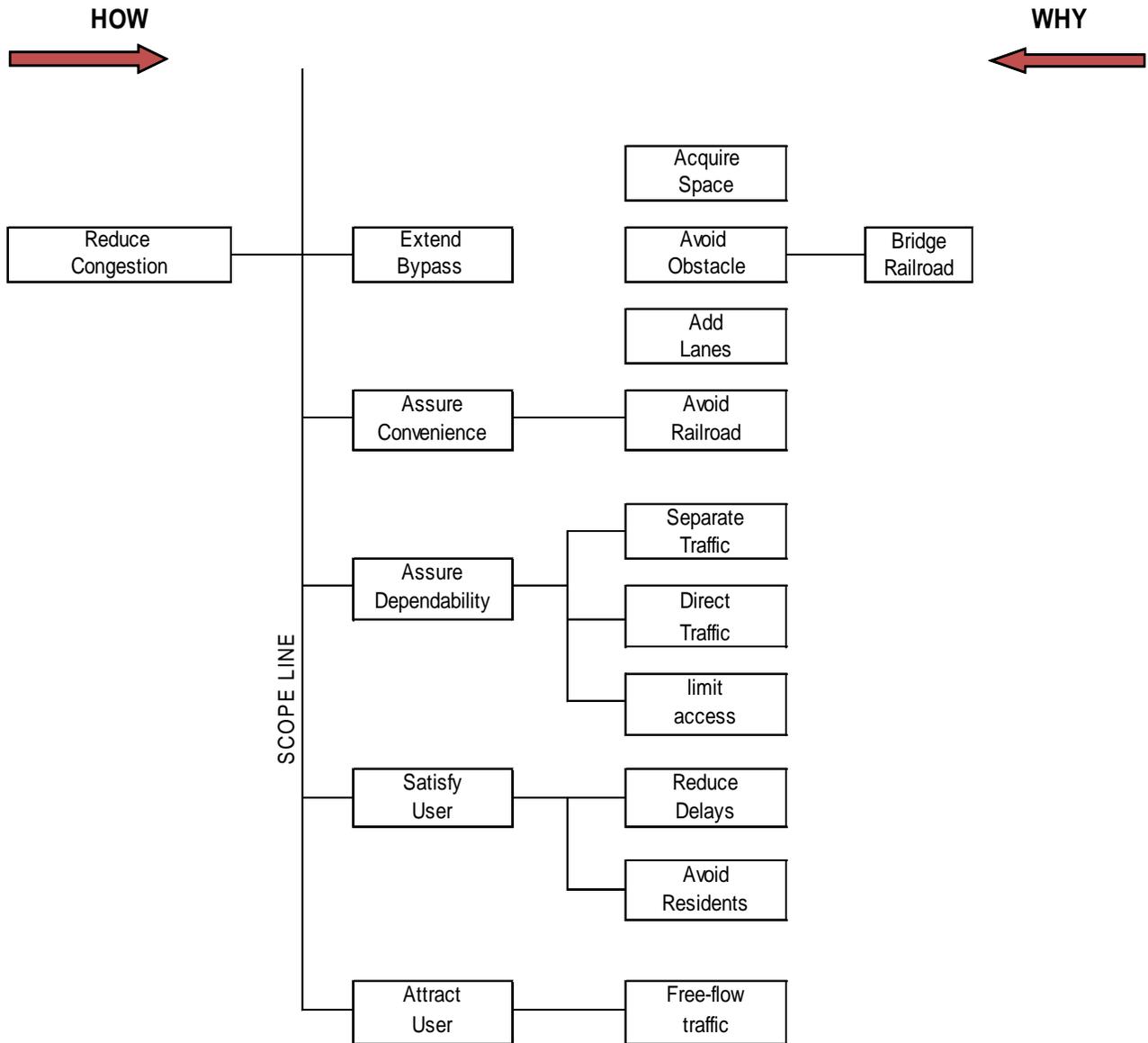
The VE Team was provided with a construction cost estimate dated August 30, 2010. A estimate of the right of way acquisition cost was also given to the team . The team used this information to concentrate its efforts towards the area of the project having the least Value.

4.5 PARETO CHARTS



4.6 FUNCTIONAL ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM

FUNCTIONAL ANALYSIS SYSTEMS TECHNIQUE (FAST)
Leesburg North Bypass from SR 3/US 19 to SR 195
 Project No. STP00-0001-00(420) – P.I. No. 0001420
 Georgia Department of Transportation
 Lee County



4.7 ATTENDANCE SHEET FOR DESIGNERS AND VE TEAM PRESENTATIONS

DESIGNER PRESENTATION



MEETING PARTICIPANTS

Georgia Department of Transportation		November 30, 2010	
STP00-0001-00(420) - P.I. No. 0001420			
Leesburg North Bypass from SR 3/US 19 to SR 195			
Lee County			
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Van Mason	 GDOT-Traffic Engineer	vmason@dot.ga.gov	229-386-3435



VE Team PRESENTATION



MEETING PARTICIPANTS

Georgia Department of Transportation			December 3, 2010	
STP00-0001-00(420) - P.I. No. 0001420				
Leesburg North Bypass from SR 3/US 19 to SR 195				
Lee County				
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Steve Bitney	Stantec Consulting	steve.bitney@stantec.com	770-813-0882	
Maureen Nerenbaum	Stantec Consulting	maureen.nerenbaum@stantec.com	770-813-0882	
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Bill Duvall	GDOT-Bridge Design	bduvall@dot.ga.gov	404-631-1883	

