VALUE ENGINEERING REPORT

SR 10 Passing Lanes
Oglethorpe and Wilkes Counties
STP00-0014-01(062); PI No. 222460
November 19, 2012

OWNER AND DESIGN TEAM:

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

VALUE ENGINEERING CONSULTANT:

AMEC Environment & Infrastructure, Inc.
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Disclaimer

This Value Engineering (VE) report presents recommendations for consideration by the design team for alternate methods of completing the current design that may be acceptable to both the design team and the owner. In most cases, each recommendation contains a cost estimate to help evaluate each recommendation on a cost effective basis including both capital and life cycle costs. These estimates are generated whenever possible using the design team's best estimate of cost and mark-ups for quantities and/or unit costs for items proposed to be changed. Using this method, a comparison can be made of the cost estimates for each item by evaluating the original design concept against the proposed change in the VE recommendation. The VE recommendation cost estimates are developed based on the information provided by the design team during the study. At this stage of design, and considering the limited time available for a VE study, the costs should be considered as order of magnitude costs only and do not reflect the final design estimated costs or actual construction costs. The difference in the original design concept and proposed VE recommendation reflects the potential cost change that may be considered by decision makers.

Finally, the VE recommendations and associated cost estimates are for consideration by only the design team and owner. The VE team does not make decisions as to which, if any, of the recommendations are incorporated into the project design. A decision to incorporate a VE recommendation is the responsibility of the design team. Also, the VE recommendations do not have to be accepted as presented in the VE study report. The recommendations should be considered a concept that can be improved and/or modified by the design team to result in a design modification that is acceptable to the design team, project sponsor, owner, and GDOT.

EXECUTIVE SUMMARY

Executive Summary

VALUE ENGINEERING STUDY

SR 10 Passing Lanes
PI No. 222460
November 5-8, 2012

1.1 Introduction

This report presents the results of a value engineering (VE) study conducted on the design for the proposed project to construct four passing lane sections on SR 10 in Oglethorpe and Wilkes Counties. This report presents the VE study 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 detailed description and support information about each recommendation. The Appendix includes a complete record of the Team's activities and findings. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

1.2 Project Description

The purpose of this project is to add four passing lane segments to SR 10 between the cities of Washington and Lexington in Oglethorpe and Wilkes Counties. The total length of the passing lane segments is 5.2 miles. The four passing lane segments will provide three, 12-foot travel lanes with 10-foot rural shoulders (6.5 feet paved). The project will also reconstruct the four roadway sections to meet current guidelines for horizontal and vertical alignments. Traffic will be maintained on a temporary detour road for Site #1 and by staging the traffic during construction for Sites #2, #3, and #4.

Major contract work items include roadway excavation, asphalt pavement and shoulders, drainage improvements / extensions, erosion control, and traffic marking. The total project cost including right-of-way (R/W) is estimated at $7.6 million. The study took place in November 5-8, 2012 at the Georgia Department of Transportation's (GDOT) Office in Atlanta, using a four person VE team.

1.3 Considerations / Constraints

The VE team was presented with several constraints to consider when developing their recommendations. The constraints were to not recommend any changes to the project

that would (1) increase the amount of R/W needed to construct the project, (2) require changes to the Environmental Documentation, and (3) have a negative impact on any Historical Properties or Wet Lands.

Current project status: The Project Concept Report has been approved. The preliminary engineering plans have been developed, the Categorical Exclusion for the project has been prepared, R/W plans have been approved but acquisition has not started. Construction is scheduled for December 2014.

1.4 Results Obtained

The VE team focused their efforts on the high cost items of the project. Through the use of functional analysis and "brain storming" techniques, the team generated 46 ideas with 30 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed nine independent recommendations and two alternative recommendations. Implementation of the nine independent recommendations has the potential to reduce the project cost by approximately $2.83 - $5.53 million. A detailed write-up of each recommendation is contained in the respective section of this report. A summary of the recommendations follows.

1.5 Recommendation Highlights

Idea A-1: Eliminate the shoulder widening on the opposite side of roadway from the proposed passing lane.

This recommendation eliminates the reconstruction of the existing shoulders on the non-passing lane side of the roadway. The purpose of this project is to reduce motorist delays by adding single direction passing lanes at four sites in-lieu-of widening the entire corridor. The widening and reconstruction of the non-passing lane shoulder is not necessary to construct the new passing lanes. Eliminating this work will reduce cost, reduce construction impacts, and accelerate completion of the project.

The total potential savings is $784,000.

Idea A-2: Reduce the proposed shoulder widening alongside the new passing lane from 10 feet (6.5-ft paved) to 6 feet (2-ft paved).

This recommendation will reduce the width of the new shoulder adjacent to the passing lane from 10 feet to 6 feet and reduce the width of the paved portion of the shoulder from 6.5 feet to 2 feet. In accordance with AASHTO guidelines, a full shoulder is not as needed on a passing lane section as on a conventional two-lane highway because the vehicles likely to stop are few and there is little difficulty in passing a vehicle with only two wheels on the shoulder. Reducing the width of this paved shoulder will lower project cost, reduce construction impacts, and accelerate completion of the project.

The total <u>potential savings</u> is $475,000.

Idea A-3: Shorten the overall length of the project by constructing all four passing lane sites the same length as the shortest proposed passing lane site.

This recommendation would reduce the length of the passing lanes on Site 1, Site 3, and Site 4 to match the shorter length (3480 feet) of the passing lane on Site 2. This concept reduces the overall length of the passing lanes and the length of lane addition taper. These reduced lengths exceed the minimum recommended passing length of 0.5 mile found in the AASHTO guidelines. Reducing the length of the passing lanes will lower project cost, reduce construction impacts, and accelerate completion of the project.

The total <u>potential savings</u> is $2,500,000.

Idea A-3.1: <u>Alternative to Idea A-3</u> Shorten the overall length of the project by reducing the passing lane lengths in the longer Sites 1, 3, and 4 to 1-mile.

This recommendation would reduce the length of each passing lane at Site 1, Site 3, and Site 4 to 1-mile in length. The Site 2 passing lane would remain as originally designed. The three sites would be shortened by reducing the length of the passing lanes and the length of lane addition taper. These reduced lengths exceed the minimum recommended passing lengths found in the AASHTO guidelines. Reducing the length of the passing lanes will lower project cost, reduce construction impacts, and accelerate completion of the project.

The total <u>potential savings</u> is $1,000,000.

Idea A-11: Construct Site 1 as a new three-lane road on new alignment and eliminate the Detour Road.

This recommendation shifts the alignment of SR 10 in Site 1 approximately 40 feet west between Stations 121 and Station 158 and uses stage construction to build a new three-lane SR 10 roadway through the Salem Church Road intersection area. This concept also eliminates the need to construct the SR 10 detour road. Shifting the mainline alignment and using partial width construction and traffic shifts will eliminate the need for a SR 10 detour road. This concept requires a portion of the construction easement acquisition be acquired “in full” to construct the shifted new SR 10 roadway. It also requires the cul-de-sac closing of the Critter Crossing intersection with SR 10 to be relocated further down the road. Reconstructing the SR10 roadway on new alignment will simplify the construction staging, eliminate the need for the SR 10 detour road, and accelerate construction.

The total <u>potential savings</u> is $183,000.

Idea A-11.1: <u>Alternate to Idea A-11</u> Construct Site 1 as a new four-lane roadway on new alignment and eliminate the Detour Road and the Site 2 Passing Lane section.

This recommendation shifts the alignment of SR 10 in Site 1approximately 40 feet west between Stations 121 and Station 158 and uses stage construction to build a new four-lane SR 10 through the Salem Church Road intersection area. This concept also eliminates the need to construct the SR 10 detour road and eliminates the Site 2 passing lane section by constructing both passing lanes on the new four-lane roadway in Site 1.

This concept requires a portion of the construction easement acquisition be acquired "in full" to construct the shifted new SR 10 roadway. It also requires the cul-de-sac closing of the Critter Crossing intersection with SR 10 to be relocated further down the road. Reconstructing the SR10 roadway on new alignment will simplify the construction staging, eliminate the need for the SR 10 detour road, and accelerate construction.

The total <u>potential savings</u> is $1,201,000.

Idea A-16: Change the new roadway profile to a point profile in order to reduce the amount of asphalt leveling.

This recommendation revises the proposed vertical profile to a point profile based on existing road conditions. The best-fit point profile can be used to justify that the existing conditions meet desired 55 MPH design speed and will ease construction and reduce the amount of leveling.

The total <u>potential savings</u> is $86,000.

Idea A-21: Revise the roadway vertical profile through the Salem Church Road intersection area in Site 1 to reduce construction impacts, shorten the amount of SR 10 mainline roadway needing reconstruction, and shorten the detour work zone area.

This recommendation redesigns the roadway vertical profile through the Salem Church Road intersection area for a design speed of 55 MPH using minimum K values (115) for the crest and sag vertical curves. Using the minimum K values for a 55 MPH design will shorten the SR 10 reconstruction limits through the deficient vertical profile area in the Salem Church Road area. The VE concept will shorten the SR 10 reconstruction limits by approximately 1,050 feet, shorten the length of the detour road, and reduce the amount of the construction easement required. In addition, the VE vertical profile at the Salem Church Road intersection will be approximately 2 feet lower than the original profile allowing for an easier and more readily constructible tie-in.

The total <u>potential savings</u> is $266,000.

Idea A-24: Close Salem Church Road to traffic during the construction of Site 1 and detour traffic.

This recommendation closes Salem Church Road and detours traffic along Paradise Hogan Road, Arbor Place Road, and Critters Crossing Road to access SR 10 at the T-intersection at Station 112. Detouring of Salem Church Road traffic will simplify construction of the new Salem Church Road tie-in since it will be approximately 8 feet higher than the existing elevation. Constructing this approach under traffic would require the utilization of flagmen during work hours and the safeguarding of the traveling public going through the area during non-work hours.

The total <u>potential savings</u> is $24,000.

Idea B-4: Remove guardrail & flatten slopes in four areas.

This recommendation would flatten the roadway side slopes at four locations to allow for the removal of the proposed guardrail. Removal of guardrail will reduce cost of project and reduce future maintenance costs.

The total <u>potential savings</u> is $41,000.

Idea G-1: Replace all existing cross drainage structures throughout the project.

This recommendation would replace the existing concrete cross drainage pipes the original design leaves in-place. Since the majority of the cross drainage pipes (mostly metal) are already being replaced, this provides a good opportunity to also replace the few remaining (11) concrete drainage pipes at the same time. Replacing all cross drainage pipes at the same time will provide a completely new drainage system for the reconstructed / widened roadway sites and could potentially reduce the number of field change orders.

The total <u>potential increase</u> is $(28,000).

SR 10 Passing Lanes

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS
	RECOMMENDATIONS					
A-1	Eliminate the Shoulder Widening on the opposite side of roadway from the proposed passing lane.	$784,000	$0	$784,000	N/A	$784,000
A-2	Reduce the proposed Shoulder Widening alongside the new passing lane from 10 feet (6.5-ft paved) to 6 feet (2-ft paved).	$475,000	$0	$475,000	N/A	$475,000
A-3	Shorten the overall project length by constructing all four passing lane sites the same length as the shortest proposed passing lane site.	$7,600,000	$5,100,000	$2,500,000	N/A	$2,500,000
A-3.1	**Alternative to Idea A-3** Shorten the overall project length by reducing the passing lane lengths in the longer Sites 1, 3, and 4 to 1-mile.	$7,600,000	$6,600,000	$1,000,000	N/A	$1,000,000
A-11	Construct Site 1 as a new three-lane road on new alignment and eliminate the Detour Road.	$341,000	$158,000	$183,000	N/A	$183,000
A-11.1	**Alternate to Idea A-11** Construct Site 1 as a new four-lane roadway on new alignment and eliminate the Detour Road and the Site 2 Passing Lane section.	$1,680,000	$479,000	$1,201,000	N/A	$1,201,000
A-16	Change the new roadway profile to a point profile in order to reduce the amount of asphalt leveling.	$258,000	$172,000	$86,000	N/A	$86,000

SR 10 Passing Lanes

SUMMARY OF POTENTIAL COST SAVINGS (Continuation)

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS
	RECOMMENDATIONS					
A-21	Revise the roadway vertical profile in Site 1 to reduce construction impacts, shorten the amount of SR 10 mainline roadway needing reconstruction, and shorten the detour work zone.	$338,000	$72,000	$266,000	N/A	$266,000
A-24	Close Salem Church Road to traffic during the construction of Site 1 and detour traffic.	$30,000	$6,000	$24,000	N/A	$24,000
B-4	Remove guardrail & flatten slopes in four areas.	$49,000	$8,000	$41,000	N/A	$41,000
G-1	Replace all existing cross drainage structures throughout the project.	$0	($28,000)	($28,000)	N/A	($28,000)

STUDY IDENTIFICATION

Study Identification

Project: SR 10 Passing Lanes	**Date:** November 5-8, 2012
Location: Oglethorpe and Wilkes Counties	

2.1 VE Team Members

Name:	Title:	Organization:	Telephone:
George Obaranec, PE, CVS	Design Engineer	AMEC	770-421-3400
Greg Grant, PE, VMP	Structures Engineer	RS & H	678-528-7229
Steve Linley, PE	Design Engineer	Hatch Mott MacDonald	770-200-1705
Keith Borkenhagen, PE, CVS	VE Team Facilitator	AMEC	623-556-1875

2.2 Project Description

This project will construct four passing lane segments on SR 10 between the cities of Washington and Lexington in Oglethorpe and Wilkes Counties. The total length of the passing lane segments is 5.2 miles. The four passing lane segments will provide three, 12-foot travel lanes with 10-foot rural shoulders (6.5 feet paved). The project will also reconstruct the four roadway sections to meet current guidelines for horizontal and vertical alignments. Major contract work items include roadway excavation, asphalt pavement and shoulders, drainage improvements / extensions, erosion control, and traffic marking. Traffic will be maintained on a temporary detour road for Site #1 and by staging the traffic during construction for Sites #2, #3, and #4. The total project cost including right-of-way (R/W) is estimated at $7.6 million.

2.3 Project Considerations / Constraints

Several constraints were presented to the VE team for consideration when developing their recommendations. The constraints were;

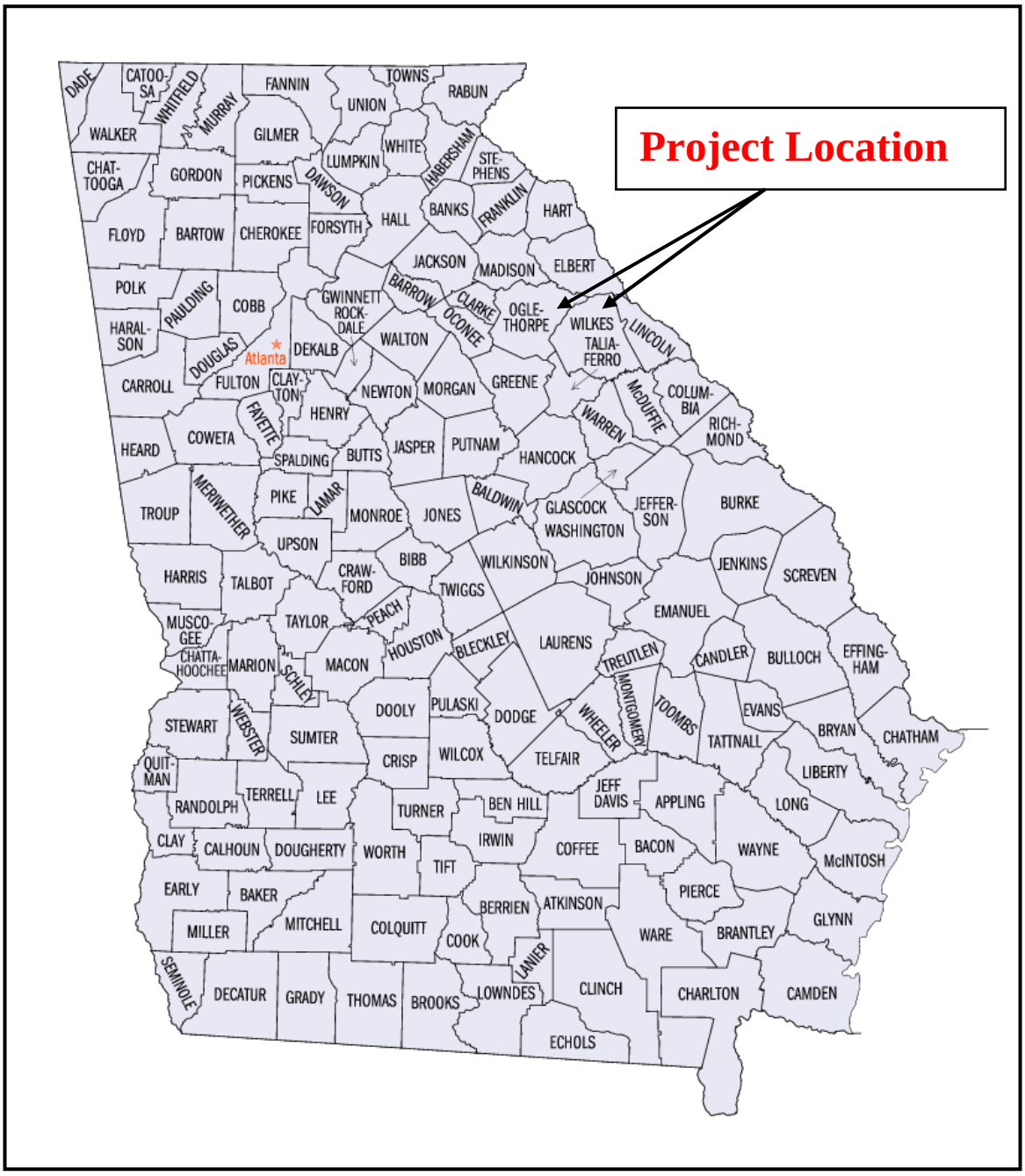
- to not recommend project changes that would increase the amount of R/W needed to construct the project,
- to not recommend project changes that would require changes to the Environmental Documentation, and
- to not recommend project changes that would have a negative impact on any Historical Properties or Wet Lands.

2.4 Project Design Briefing

Prior to beginning work, the VE team was briefed on the design status of the project by Jason Brown, District 2 Design. The following information was presented:

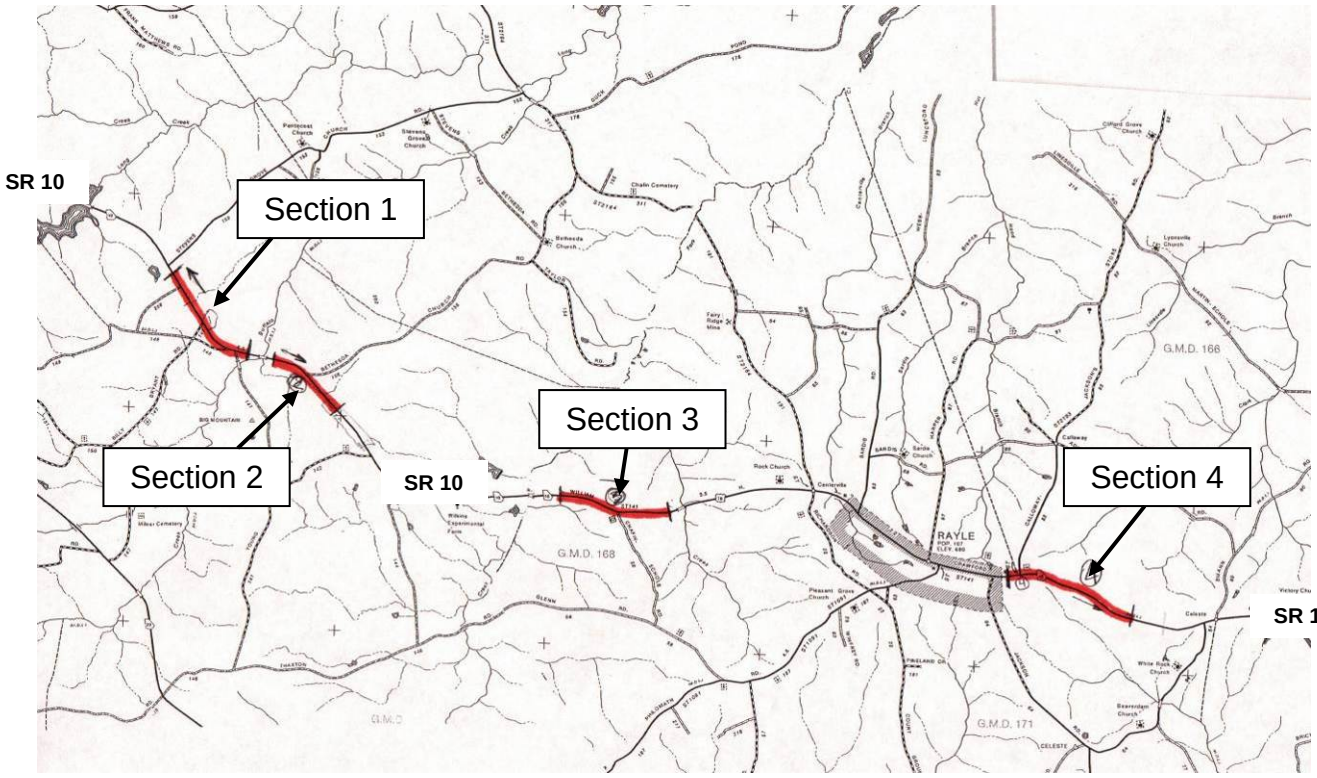
- This project would construct four passing lane segments on SR 10 in Oglethorpe and Wilkes Counties. The existing two-lane road has several areas where passing is prohibited and these passing lanes would allow for better traffic flow through these areas.
- This project has been in development for a number of years. It was originally being developed with six passing lane segments, but a section of SR 10 was widened to four-lanes eliminating the need for two of the passing sections.
- The project has been developed to the stage where preliminary plans have been developed and R/W plans have been completed and authorized. The State has met with some of the property owners but no offers have been made to the owners.
- The project will result in four sections of SR 10 being widened from two-lanes to three-lanes with widened, paved shoulders. The new roadway template will consist of three, 12-foot lanes with 10-foot rural shoulders (6.5 feet paved).
- Three of the passing lane sections will be constructed with traffic staged on the existing roadway during construction. One passing lane section (Site 1) will shift traffic to a detour road during construction due to the need to raise the vertical profile to eliminate a substandard vertical profile.
- There are several Historic properties along the passing lane sections. However, no property will be acquired from the Historic sites. There is also minor wetlands impacts on Site 2. The project has been designed to minimize impact to these areas.
- The Categorical Exclusion document has been prepared. Construction is scheduled for December 2013.

2.5 Project Location Map



2.6 Project Site Map

SR 10 in Oglethorpe and Wilkes Counties



VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
A-1	1 of 4	Eliminate shoulder reconstruction on the side of the roadway opposite to the passing lane.

Comp By: S.J.L. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

The original design would construct the new shoulder alongside the added passing lane to a width of10 feet (6.5 feet being paved) and also reconstruct the existing other shoulder to the same width (10-foot with 6.5 feet being paved).

Proposed Change:

This recommendation eliminates the reconstruction of the existing shoulders on the non-passing lane side of the roadway.

Justification:

The purpose of this project is to reduce motorist delays by adding single direction passing lanes at four sites in-lieu-of widening the entire corridor. The widening and reconstruction of the non-passing lane shoulder is not necessary to construct the new passing lanes. Traffic volumes are relatively low on SR 10 with projected 2035 ADT of 5,400 on Sites 1 and 2, 5,700 on Site 3, and 7,000 on Site 4. Eliminating this work will reduce cost, reduce construction impacts, and accelerate the completion of the project.

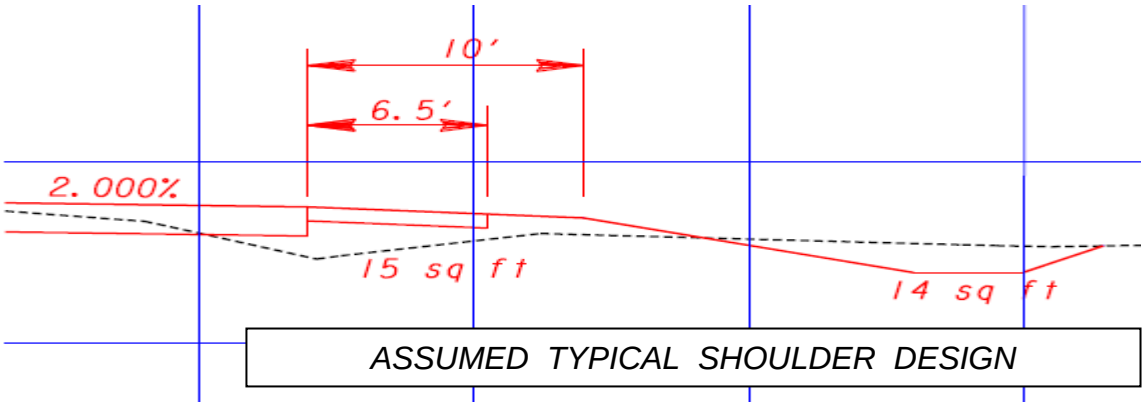
The addition of these four short passing lane Sites with 6.5-foot paved shoulders will not provide adequate lengths to construct future bicycle lanes in this roadway corridor because the majority of the corridor length will still only have 2-foot paved shoulders.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$784,000		
Proposed	$0		
Savings	$784,000		$784,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$784,000**

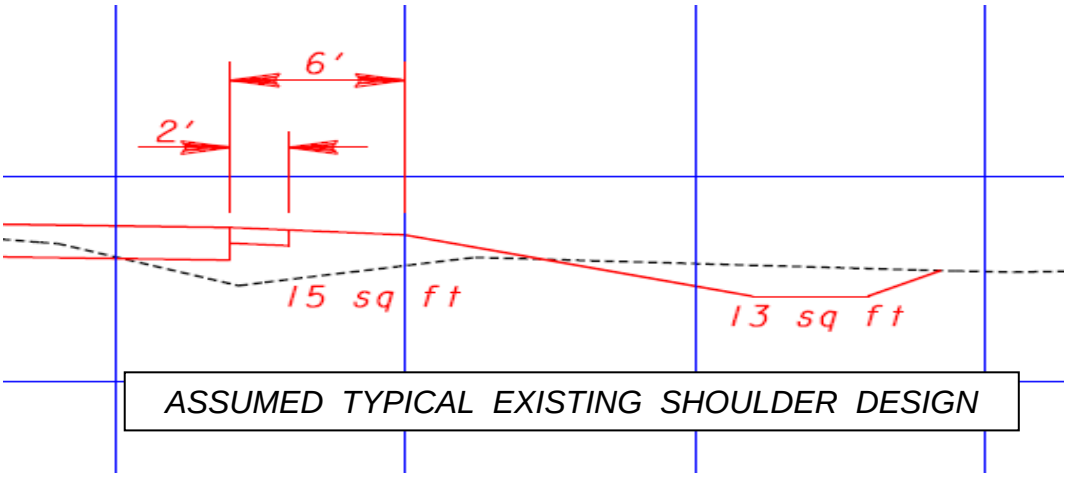
SKETCH

Project: SR 10 Passing Lanes	Idea No.: A-1 Client: GDOT Sheet 2 of 4

Original Shoulder Design



VE Shoulder Design – Keep Existing Shoulder



COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-1 Client: GDOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Unclassified Excavation	CY	25,480	$4.00	$101,920.00	0		$0
9.5 mm Superpave	Ton	1,194	$70.00	$83,580.00	0		$0
19mm Superpave	Ton	2,695	$63.78	$171,887.10	0		$0
GAB	Ton	11,796	$16.44	$193,926.24	0		$0
R/W	Acre	7.2	$20,000.00	$144,000.00	0		$0
ESMT	Acre	0.5	$10,000.00	$5,000.00	0		$0
18" Storm Drain	LF	36	$32.33	$1,163.88	0		$0
24" Storm Drain	LF	72	$35.76	$2,574.72	0		$0
30" Storm Drain	LF	6	$50.66	$303.96	0		$0
36" Storm Drain	LF	28	$64.55	$1,807.40	0		$0
18" FES	EA	6	$515.25	$3,091.50	0		$0
24" FES	EA	12	$631.05	$7,572.60	0		$0
30" FES	EA	1	$816.27	$816.27	0		$0
36" FES	EA	1	$1,026.13	$1,026.13	0		$0
18" Side Drain	LF	1,254	$21.12	$26,484.48	0		$0
18" SES	EA	58	$578.29	$33,540.82	0		$0
3'x3' Box Culvert	LF	32	$140.65	$4,500.80	0		$0
Wingwall & Parapet	CY	2	$578.29	$1,156.58	0		$0
SUBTOTAL				$784,352.48			$0
TOTAL ROUNDED				**$784,000.00**			**$0**

CALCULATIONS

Location	Length of Shld. To be Reconst (FT)	Unclassified Excavation (CY)	Pavement Area (SY)	9.5 mm Superpave (TN)	19 mm Superpave (TN)	GAB (CY)	GAB (TN)	R/W (SF)	R/W (AC)	ESMT'S (SF)	ESMT'S (SF)
Site 1	4,200	4,368	3,033	205	462	1,011	2,022	122,090	2.8	0	0.0
Site 2	4,800	4,992	3,467	234	528	1,156	2,311	65,754	1.5	12,205	0.3
Site 3	6,800	7,072	4,911	332	748	1,637	3,274	65,530	1.5	0	0.0
Site 4	8,700	9,048	6,283	424	957	2,094	4,189	60,131	1.4	9,220	0.2
Total		**25,480**		**1,194**	**2,695**		**11,796**	**313,505**	**7.2**		**0.5**

Assume 104 CY Ex/100 LF
Remove 6.5' Paving on Shoulder
GAB 2 TN/CY

135 lb/SY of 9.5 mm Superpave
220 lf/SY of 19mm Superpave

Assume R/W Cost of $20,000 / Acre & Easement Cost of $10,000 / Acre

Cross Drains	18"	24"	30"	36"	18" FES	24" FES	30" FES	36" FES
Site 1	6	18			1	3		
Site 2	6	12	6	28	1	2	1	1
Site 3	18	12			3	2		
Site 4	6	30			1	5		
Total	**36**	**72**	**6**	**28**	**6**	**12**	**1**	**1**

Side Drains	18"	18" SES
Site 1	38	2
Site 2	152	
Site 3	380	20
Site 4	684	36
Total	**1,254**	**58**

3'X3' Box Culvert		L.F.	Wing & Parapet	
Site 1				
Site 2		16	1	
Site 3		16	1	
Site 4				
Total		**32**	**2**	

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
A-2	1 of 5	Reduce the width of the shoulder adjacent to the passing lane from 10' to 6' and reduce the width of the paved shoulder from 6.5' to 2'.

Comp By: S.J.L. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept::

The original design would construct the new shoulder alongside the added passing lane to a width of10 feet (6.5 feet being paved) and also reconstruct the existing other shoulder to the same width (10-foot with 6.5 feet being paved).

Proposed Change:

This recommendation will reduce the width of the new shoulder adjacent to the passing lane from 10 feet to 6 feet and reduce the width of the paved portion of the shoulder from 6.5 feet to 2 feet.

Justification:

Per AASHTO guidelines, a full shoulder is not as needed on a passing lane section as on a conventional two-lane highway because the vehicles likely to stop are few and there is little difficulty in passing a vehicle with only two wheels on the shoulder. Traffic volumes are relatively low on SR 10 with projected 2035 ADT values of 5,400 on Sites 1 and 2, 5,700 on Site 3, and 7,000 on Site 4. Reducing the width of this paved shoulder will lower project cost, reduce construction, and accelerate the completion of the project.

The addition of these four short passing lane Sites with 6.5-foot paved shoulders will not provide adequate lengths to construct future bicycle lanes in this roadway corridor because the majority of the corridor length will still only have 2-foot paved shoulders.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$475,000		
Proposed	$0		
Savings	$475,000		$475,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$475,000**

CONTINUATION

Project: SR 10 Passing Lanes	Idea No.: A-2 Client: GDOT Sheet 2 of 5

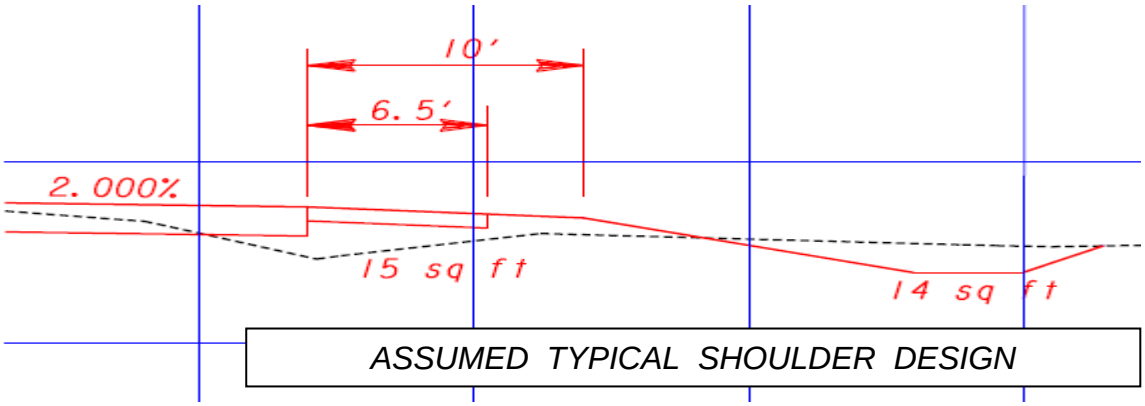
From the "Policy on Geometric Design of Highways and Streets, 2004"
Exhibit 3-63. Passing Lanes Section on Two-Lane Roads
Page 252

"The introduction of a passing-lane section on a two-lane highway does not necessarily involve much additional grading. The width of an added lane should normally be the same as the lane widths of the two-lane highway. It is also desirable for the adjoining shoulder to be at least 1.2 m [4 ft] wide and, whenever practical, the shoulder width in the added section should match that of the adjoining two-lane highway. However, a full shoulder width is not as needed on a passing lane section as on a conventional two-lane highway because the vehicles likely to stop are few and there is little difficulty in passing a vehicle with only two wheels on the shoulder. Thus, if the normal shoulder width on the two-lane highway is 3.0 m [10 ft], a 1.8- to 2.4-m [6- to 8-ft] widening of the roadbed on each side is all that may be needed."

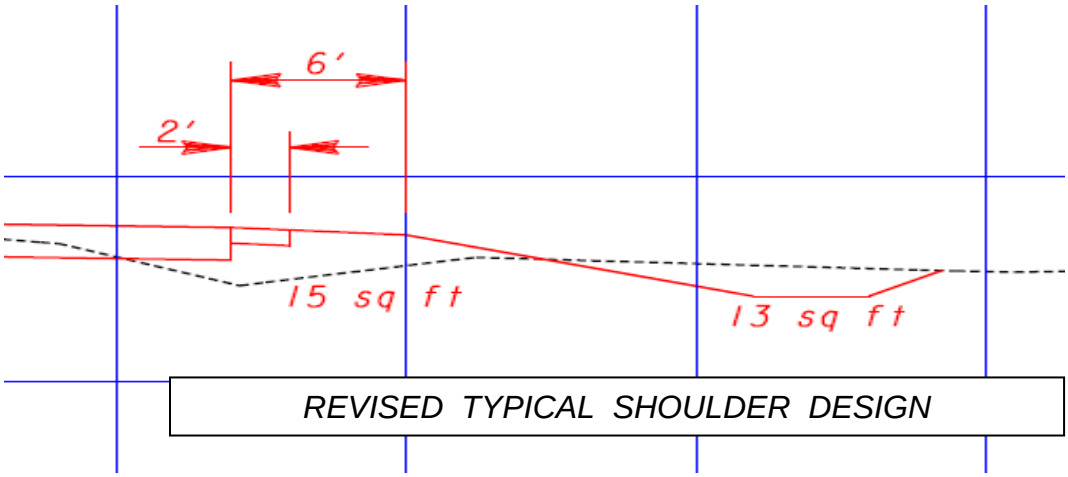
SKETCH

Project: SR 10 Passing Lanes	Idea No.: A-2 Client: GDOT Sheet 3 of 5

Original Shoulder Design



VE Shoulder Design



COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-2 Client: GDOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
9.5 mm Superpave	Ton	925	$70.00	$64,750.000	0		$0
19mm Superpave	Ton	3,014	$63.78	$192,232.92	0		$0
GAB	Ton	9,133	$16.44	$150,146.52	0		$0
R/W	Acre	2.5	$20,000.00	$50,000.00	0		$0
18" Storm Drain	LF	32	$32.33	$1,034.56	0		$0
24" Storm Drain	LF	56	$35.76	$2,002.56	0		$0
30" Storm Drain	LF	4	$50.66	$202.64	0		$0
18" FES	EA	8	$515.25	$4,122.00	0		$0
24" FES	EA	13	$631.05	$8,203.65	0		$0
30" FES	EA	1	$816.27	$816.27	0		$0
3'x3' Box Culvert	LF	12	$140.65	$1,687.80	0		$0
SUBTOTAL				$475,198.92			$0
TOTAL ROUNDED				**$475,000.00**			**$0**

CALCULATIONS

Location	Shoulder to be Reconst (FT)	Unclassified Excavation (CY)	Pavement Area (SY)	9.5 mm Superpave (TN)	19 mm Superpave (TN)	GAB (CY)	GAB (TN)	R/W (SF)	R/W (AC)
Site 1	7,100	0	3,550	240	781	1,183	2,367	26,600	0.6
Site 2	4,800	0	2,400	162	528	800	1,600	19,200	0.4
Site 3	6,800	0	3,400	230	748	1,133	2,267	27,200	0.6
Site 4	8,700	0	4,350	294	957	1,450	2,900	34,800	0.8
Total		**0**		**925**	**3,014**		**9,133**	**10,7800**	**2.5**

Reduce Shoulder Width on Widened Side from 10' to 6'
Assume No Net Difference in Earthwork
Reduce Shoulder Pavement on Widened Side from 6.5' to 2'

Assume R/W Cost of $20,000 / Acre & Easement Cost Of $10,000 / Acre

Cross Drains	18"	24"	30"	36"	18" FES	24" FES	30" FES	36" FES
Site 1	4	24			1	5		
Site 2	4	8	4		1	2	1	
Site 3	12	8			3	2		
Site 4	12	16			3	4		
Total	**32**	**56**	**4**	**0**	**8**	**13**	**1**	**0**

Side Drains	18"	18" SES
Site 1		
Site 2		
Site 3		
Site 4		
Total	**0**	**0**

3'X3' Box Culvert		L.F.
Site 1		4
Site 2		4
Site 3		4
Site 4		
Total		**12**

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA: Shorten project to provide minimum passing lane length by holding the length of Site 2 and setting Sites 1, 3 & 4 to match.
A-3	1 of 5	

Comp By: G.C.G. Date: 11/7/2012 Checked By: K.E.B. Date: 11/13/2012

Original Concept:

The original concept provides passing lanes with the following lengths:

Original Concept

Site	Passing Lane Direction	Begin Project	Begin Taper	Begin full section	end full section	End taper	End Project	Project Length ft	Project Length miles
1	West	101+00.00	102+00.00	108+60.00	165+40.00	172+00.00	172+00.00	7100.00	1.34
2	East	200+00.00	200+00.00	206+60.00	241+40.00	248+00.00	248+05.00	4805.00	0.91
3	East	307+00.00	307+00.00	313+60.00	368+40.00	375+00.00	375+00.00	6800.00	1.29
4	East	400+00.00	400+00.00	406+60.00	480+40.00	487+00.00	487+00.00	8700.00	1.65
								27405.00	5.19

Proposed Change:

This recommendation would reduce the length of the passing lanes on Site 1, Site 3, and Site 4 to match the shorter length of the passing lane on Site 2. This concept reduces the length of full width passing lanes and the length of lane addition taper per AASHTO guidelines

Justification:

- Change is consistent with AASHTO policy.
- Reduces cost

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$7,600,000		
Proposed	$5,100,000		
Savings	$2,500,000		$2,500,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$2,500,000**

COST WORKSHEET							
Project: SR 10 Passing Lanes					Idea No.: A-3 Client: GDOT Sheet 2 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Cost per mile	Mile	5.19	$1,466,648	$7,612,402			
VE Design:							
Set Sites 1, 3, & 4 to the same length as Site 2	Mile				3.49	$1,466,648	$5,118,602
SUBTOTAL				$7,612,402			$5,118,602
TOTAL ROUNDED				**$7,600,000**			**$5,100,000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-3 Client: GDOT Sheet 3 of 5

Background

From the "Policy on Geometric Design of Highways and Streets, 2004"

Elements of Design regarding Passing Lanes

Page 252:

Minimum length of passing lane is 1000 ft excluding tapers

Optimal length = 0.5 to 2 Miles with longer lengths for higher volumes roads

Page 252-253:

Transition Tapers Length = Width x Speed = 12 ft x 55 = 660 ft

Lane addition taper = 1/2 to 2/3 of Transition Taper Length, use 2/3 x 660ft = 442 ft

From the "Policy on Geometric Design of Highways and Streets, 2004"
Exhibit 3-63. Passing Lanes Section on Two-Lane Roads
Page 252

"A minimum length of 300 m [1,000 ft], excluding tapers, is needed to assure that delayed vehicles have an opportunity to complete at least one pass in the added lane. Where such a lane is provided to reduce delays at a specific bottleneck, the needed length is controlled by the extent of the bottleneck. A lane added to improve overall traffic operations should be long enough, over 0.5 km [0.3 mi], to provide a substantial reduction in traffic platooning. The optimal length is usually 0.8 to 3.2 km [0.5 to 2.0 mi], with longer lengths of added lane appropriate where traffic volumes are higher. The HCM (14) provides guidance in the selection of a passing lane of optimal length. Operational benefits typically result in reduced platooning for 5 to 15 km [3 to 10 miles] downstream depending on volumes and passing opportunities. After that, normal levels of platooning will occur until the next added lane is encountered."

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-3 Client: GDOT Sheet 4 of 5

Data regarding the original concept:

Original Concept

Site	Passing Lane Direction	Begin Project	Begin Taper	Begin full section	end full section	End taper	End Project	Project Length	Project Length
								ft	miles
1	West	101+00.00	102+00.00	108+60.00	165+40.00	172+00.00	172+00.00	7100.00	1.34
2	East	200+00.00	200+00.00	206+60.00	241+40.00	248+00.00	248+05.00	4805.00	0.91
3	East	307+00.00	307+00.00	313+60.00	368+40.00	375+00.00	375+00.00	6800.00	1.29
4	East	400+00.00	400+00.00	406+60.00	480+40.00	487+00.00	487+00.00	8700.00	1.65
								27405.00	5.19

Site	Begin Taper	Full length section	Full length Section	End Taper	Length of project before begin Taper	Length of project after end Taper	original project length	Length of project prior to begin Taper	Length of project after the end Taper
	ft	ft	miles	ft	ft	ft	ft	ft	ft
1	660.00	5,680.00	1.08	660.00	100.00	-	7100.00	100.00	-
2	660.00	3,480.00	0.66	660.00	-	5.00	4805.00	-	5.00
3	660.00	5,480.00	1.04	660.00	-	-	6800.00	-	-
4	660.00	7,380.00	1.40	660.00	-	-	8700.00	-	-
			4.17						

CALCULATIONS

Project: SR 10 Passing Lanes

Idea No.: A-3
Client: GDOT
Sheet 5 of 5

Calculations for setting the length of full-width passing lane equal to the length of Site 2 (3,480 ft) for Sites 1, 3 & 4 with reduced lane addition tapers for all sites.

Calculations based on Green Book (see page reference)

				Page 252	page 253	page 252				
Site	**Speed**	**Lane width**	**Lane Drop Taper**	**Lane Addition Taper Factor**	**Lane Addition Taper**	**Minimum Length (no Taper)**	**Original Concept (no Taper)**	**USE Minimum Length (no Taper)**	**Lane Addition Taper**	**Lane Drop Taper**
	MPH	**ft**	**ft**	**%**	**ft**	**ft**	**ft**	**ft**	**ft**	**ft**
1	55	12	660	67%	442	1000	5,680.00	3480	442	660
2	55	12	660	67%	442	1000	3,480.00	3480	442	660
3	55	12	660	67%	442	1000	5,480.00	3480	442	660
4	55	12	660	67%	442	1000	7,380.00	3480	442	660
						3480	ft =	0.66	miles	

Proposed Alternative Idea A-3 set all sites to the length of site 2 (approx 2/3 mile)

Site	**Passing Lane**	**Begin Project**	**Begin Taper**	**Taper type**	**Begin full section**	**end full section**	**Taper type**	**End taper**	**End Project**
1	West	101+00.00	102+00.00	drop	108+60.00	143+40.00	add	147+82.00	147+82.00
2	East	200+00.00	200+00.00	add	204+42.00	239+22.00	drop	245+82.00	245+87.00
3	East	307+00.00	307+00.00	add	311+42.00	346+22.00	drop	352+82.00	352+82.00
4	East	400+00.00	400+00.00	add	404+42.00	439+22.00	drop	445+82.00	445+82.00

Site	**proposed project length**		**original project length**		**Change in project length**	
	ft	**miles**	**ft**	**miles**	**ft**	**miles**
1	4682	0.89	7100.00	1.34	(2,418.00)	(0.46)
2	4587	0.87	4805.00	0.91	(218.00)	(0.04)
3	4582	0.87	6800.00	1.29	(2,218.00)	(0.42)
4	4582	0.87	8700.00	1.65	(4,118.00)	(0.78)
	18433	3.49		5.19	(8,972.00)	(1.70)

Project Cost Estimate for all four sites

Detailed Cost Estimate	$6,202,401.64			
R/W	$1,410,000.00			
	$7,612,401.64	Cost per mile =	$1,466,648	/mile
Original Project length	5.19	miles	$7,612,402	
Proposed project length	3.49	miles	$5,120,212	
Difference	1.70	miles	$2,492,190	
Savings	$2,492,190.02			

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA: Shorten project to provide minimum passing lane length by holding the length of Site 2 and setting Sites 1, 3 & 4 to one mile.
A-3.1	1 of 5	

Comp By: G.C.G. Date: 11/7/2012 Checked By: K.E.B. Date: 11/13/2012

Original Concept:

The original concept provides passing lanes with the following lengths:

Original Concept

Site	Passing Lane Direction	Begin Project	Begin Taper	Begin full section	end full section	End taper	End Project	Project Length ft	Project Length miles
1	West	101+00.00	102+00.00	108+60.00	165+40.00	172+00.00	172+00.00	7100.00	1.34
2	East	200+00.00	200+00.00	206+60.00	241+40.00	248+00.00	248+05.00	4805.00	0.91
3	East	307+00.00	307+00.00	313+60.00	368+40.00	375+00.00	375+00.00	6800.00	1.29
4	East	400+00.00	400+00.00	406+60.00	480+40.00	487+00.00	487+00.00	8700.00	1.65
								27405.00	5.19

Proposed Change:

This recommendation would reduce the lengths of the Site 1, Site 3, and Site 4 passing lanes to 1-mile in length. The Site 2 passing lane would remain as originally designed. The three Sites would be shorten by reducing the length of full width passing lanes and the length of lane addition taper per AASHTO guidelines

Justification:

- Change is consistent with AASHTO policy.
- Reduces cost

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$7,600,000		
Proposed	$6,600.000		
Savings	$1,000.000		$1,000,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$1,000,000**

COST WORKSHEET							
Project: SR 10 Passing Lanes					Idea No.: A-3.1 Client: GDOT Sheet 2 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Cost per mile	Mile	5.19	$1,466,648	$7,612,402			
VE Design:							
Set Sites 1, 3, & 4 lengths to 1-mile & keep Site 2 “as-is”					4.51	$1,466,648	$6,620,192
SUBTOTAL				$7,612,402			$6,620,192
TOTAL ROUNDED				**$7,600,000**			**$6,600.000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-3.1 Client: GDOT Sheet 3 of 5

Background

From the "Policy on Geometric Design of Highways and Streets, 2004"

Elements of Design regarding Passing Lanes

Page 252:

Minimum length of passing lane is 1000 ft excluding tapers

Optimal length = 0.5 to 2 Miles with longer lengths for higher volumes roads

Page 252-253:

Transition Tapers Length = Width x Speed = 12 ft x 55 = 660 ft

Lane addition taper = 1/2 to 2/3 of Transition Taper Length, use 2/3 x 660ft = 442 ft

From the "Policy on Geometric Design of Highways and Streets, 2004"
Exhibit 3-63. Passing Lanes Section on Two-Lane Roads
Page 252

"A minimum length of 300 m [1,000 ft], excluding tapers, is needed to assure that delayed vehicles have an opportunity to complete at least one pass in the added lane. Where such a lane is provided to reduce delays at a specific bottleneck, the needed length is controlled by the extent of the bottleneck. A lane added to improve overall traffic operations should be long enough, over 0.5 km [0.3 mi], to provide a substantial reduction in traffic platooning. The optimal length is usually 0.8 to 3.2 km [0.5 to 2.0 mi], with longer lengths of added lane appropriate where traffic volumes are higher. The HCM (14) provides guidance in the selection of a passing lane of optimal length. Operational benefits typically result in reduced platooning for 5 to 15 km [3 to 10 miles] downstream depending on volumes and passing opportunities. After that, normal levels of platooning will occur until the next added lane is encountered."

CALCULATIONS

Project: SR 10 Passing Lanes

Idea No.: A-3.1
Client: GDOT
Sheet 4 of 5

Data regarding the original concept:

Original Concept

Site	Passing Lane Direction	Begin Project	Begin Taper	Begin full section	end full section	End taper	End Project	Project Length	Project Length
								ft	miles
1	West	101+00.00	102+00.00	108+60.00	165+40.00	172+00.00	172+00.00	7100.00	1.34
2	East	200+00.00	200+00.00	206+60.00	241+40.00	248+00.00	248+05.00	4805.00	0.91
3	East	307+00.00	307+00.00	313+60.00	368+40.00	375+00.00	375+00.00	6800.00	1.29
4	East	400+00.00	400+00.00	406+60.00	480+40.00	487+00.00	487+00.00	8700.00	1.65
								27405.00	5.19

Site	Begin Taper	Full length section	Full length Section	End Taper	Length of project before begin Taper	Length of project after end Taper	original project length	Length of project prior to begin Taper	Length of project after the end Taper
	ft	ft	miles	ft	ft	ft	ft	ft	ft
1	660.00	5,680.00	1.08	660.00	100.00	-	7100.00	100.00	-
2	660.00	3,480.00	0.66	660.00	-	5.00	4805.00	-	5.00
3	660.00	5,480.00	1.04	660.00	-	-	6800.00	-	-
4	660.00	7,380.00	1.40	660.00	-	-	8700.00	-	-
			4.17						

CALCULATIONS

Project: SR 10 Passing Lanes

Idea No.: A-3.1
Client: GDOT
Sheet 5 of 5

Calculations for setting the length of full-width passing lane equal to one mile for Sites 1, 3 & 4 (keep the length of Site 2 the same (3480 ft) with reduced lane addition tapers for all sites.

Calculations based on Green Book (see page reference)

				Page 252	page 253	page 252				
Site	**Speed**	**Lane width**	**Lane Drop Taper**	**Lane Addition Taper Factor**	**Lane Addition Taper**	**Minimum Length (no Taper)**	**Original Concept (no Taper)**	**USE Minimum Length (no Taper)**	**Lane Addition Taper**	**Lane Drop Taper**
	MPH	**ft**	**ft**	**%**	**ft**	**ft**	**ft**	**ft**	**ft**	**ft**
1	55	12	660	67%	442	1000	5,680.00	5280	442	660
2	55	12	660	67%	442	1000	3,480.00	3480	442	660
3	55	12	660	67%	442	1000	5,480.00	5280	442	660
4	55	12	660	67%	442	1000	7,380.00	5280	442	660

Proposed Alternative Idea A-3 one mile passing lane (except site 2)

Site	**Passing Lane**	**Begin Project**	**Begin Taper**	**Taper type**	**Begin full section**	**end full section**	**Taper type**	**End taper**	**End Project**
1	West	101+00.00	102+00.00	drop	108+60.00	161+40.00	add	165+82.00	165+82.00
2	East	200+00.00	200+00.00	add	204+42.00	239+22.00	drop	245+82.00	245+87.00
3	East	307+00.00	307+00.00	add	311+42.00	364+22.00	drop	370+82.00	370+82.00
4	East	400+00.00	400+00.00	add	404+42.00	457+22.00	drop	463+82.00	463+82.00

Site	**proposed project length**		**original project length**		**Change in project length**	
	ft	**miles**	**ft**	**miles**	**ft**	**miles**
1	6482	1.23	7100.00	1.34	(618.00)	(0.12)
2	4587	0.87	4805.00	0.91	(218.00)	(0.04)
3	6382	1.21	6800.00	1.29	(418.00)	(0.08)
4	6382	1.21	8700.00	1.65	(2,318.00)	(0.44)
	23833	4.51		5.19	(3,572.00)	(0.68)

Project Cost Estimate for all four sites

Detailed Cost Estimate	$6,202,401.64			
R/W	$1,410,000.00			
	$7,612,401.64	Cost per mile =	$1,466,648	/mile
Original Project length	5.19	miles	$7,612,402	
Proposed project length	4.51	miles	$6,620,192	
Difference	0.68	miles	$ 992,209	
Savings	$ 992,209.40			

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
A-11	1 of 6	Construct Site 1 as a new three-lane road on new alignment and eliminate the Detour Road.

Comp By: G.A.O. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

The original design proposes to construct the Site 1 passing lane alongside the existing roadway through the Salem Church Road intersection area. This area requires the vertical profile to be raised approximately 10 feet to eliminate deficiencies in the existing profile. This profile change will require approximately 2,500 feet (Station 121 to Station 146) of the existing roadway to be reconstructed. To accommodate this work, the original concept includes the construction of a 4,200-foot detour road to stage the construction while the new roadway profile is being built. Construction of this detour road will require extensive R/W construction easement acquisition.

Assumed staging for this work includes (1) construct the detour road, (2) reconstruct / raise the profile of the existing road and construct the new passing lane, (3) remove the detour road, and (4) reconstruct Salem Church Road approach to the new raised SR 10.

Proposed Change:

This recommendation would shift the alignment of SR 10 approximately 40 feet west between Stations 121 and Station 158 and stage construct a new three-lane SR 10 through the Salem Church Road intersection area. This concept also eliminates the need to construct the detour road.

Justification:

The current detour road is centered about 75 feet west of the existing SR 10 centerline leaving sufficient space to shift SR 10's centerline approximately 40 feet to allow for staged construction of the new improvements. Shifting the mainline alignment and using partial width construction and traffic shifts will eliminate the requirement for a detour road and allow

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$341,000		
Proposed	$158,000		
Savings	$183,000		$183,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$183,000**

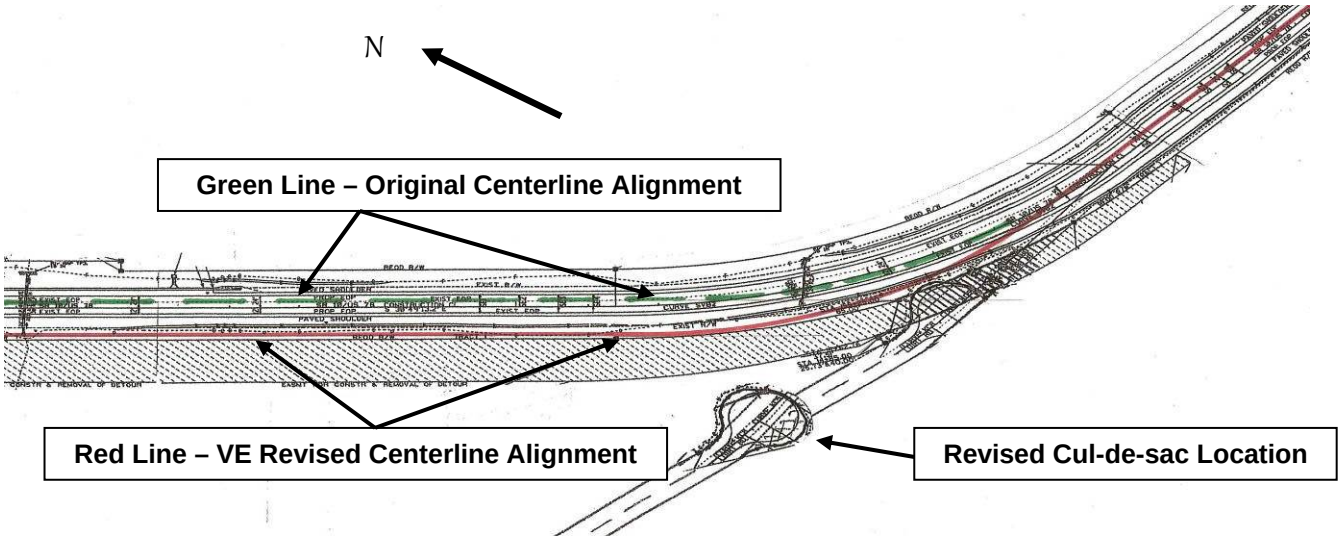
construction of the new full depth mainline pavement section. This concept may require the closing of Salem Church Road to eliminate cross traffic at the new intersection until it has been raised to its new profile height and construction of the new SR 10 mainline / passing lane roadway is complete. Salem Church Road traffic can be easily detoured on existing roads until its intersection can be reopened (See Recommendation Idea A-24).

This concept would require that a portion of the construction easement acquisition be acquired “in full” to construct the shifted new SR 10 roadway. However, it would reduce the overall amount of construction easement acquisition needed to construct the currently proposed SR 10 detour. It would also require the cul-de-sac closing of the Critter Crossing intersection with SR 10 to be relocated further down the road thereby requiring some minor R/W acquisition.

Reconstructing the SR10 roadway on new alignment will simplify the construction staging and eliminate the need for the SR 10 detour road. Assumed staging for the VE concept includes (1) close Salem Church Road, shift the SR 10 alignment and use partial width construction to build SR 10 through this area , and (3) reconstruct the Salem Church Road approach to the new raised SR 10.

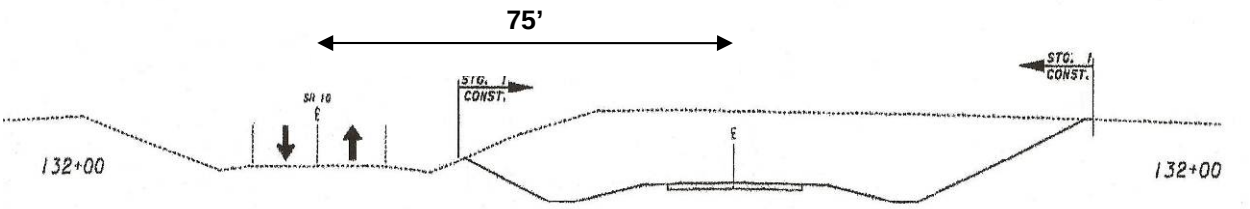
NOTE: This concept would also work with the recommended profile change discussed in Recommendation Idea A-21 with increased overall cost savings.

SKETCH	
Project: SR 10 Passing Lanes	Idea No.: A-11 Client: GDOT Page 3 of 6

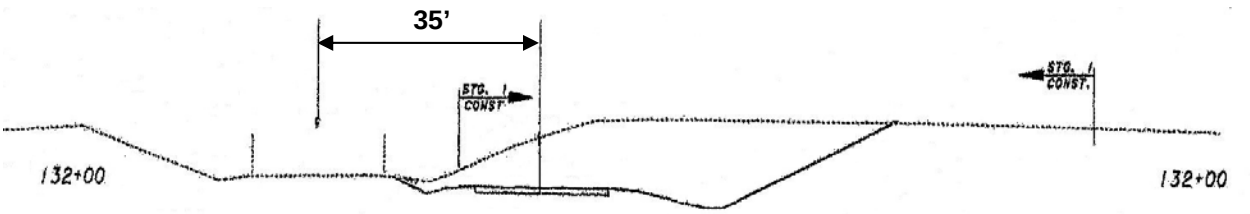


VE Centerline Alignment Shifted ~ 40 Feet West
Construct New Three-Lane Roadway

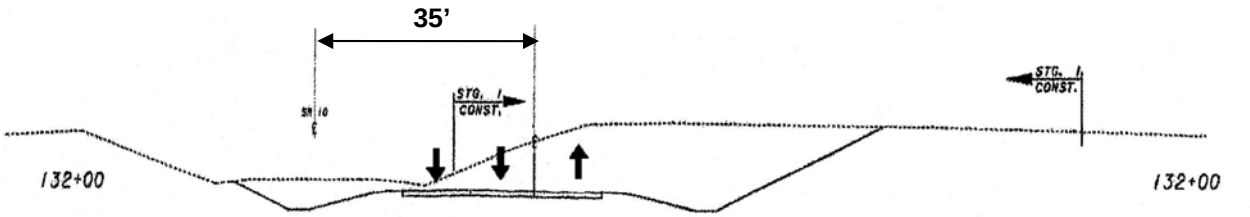
SKETCH	
Project: SR 10 Passing Lanes	Idea No.: A-11 Client: GDOT Sheet 4 of 6



Original Concept
Construct Detour Road ~ 75 Feet West of Existing Centerline
Reconstruct / Widen Roadway Over Existing Centerline



VE Concept
Shift the 3-Lane Roadway Alignment ~ 40 Feet to the West
Stage 1 - Construct 2-Lanes of the New Roadway



VE Concept
Stage 2 – Construct the Third-Lane of the New Roadway

COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-11 Client: GDOT Sheet 5 of 6		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Reduced Excavation	CY	12,037	$4.00	$48,148			
Reduced Embankment	CY	833	$6.00	$4,998			
Detour Pavement	SY	13,067	$22.00	$287,474			
VE Design:							
Additional Full Depth Pavement	SY				4,000	$37.00	$148,000
Additional Staging / MOT	LS				1	$10,000	$10,000
SUBTOTAL				$340,620			$158,000
TOTAL ROUNDED				**$341,000**			**$158.000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-11 Client: GDOT Sheet 6 of 6

Reduced / eliminated detour roadway pavement: Sta 116 – 158; 4,200 ft
Assume 12 ft lanes and 2 ft shoulders; total width = 28 ft
4,200 ft x 28 ft = 117,600 SF / 9 = 13,067 SY

Detour Pavement Cost: Use 4.0 inches asphalt on 8 inches GAB
(4 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.025 ton / SF
(8 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.045 ton / SF
Cost per SY
(0.025 ton / SF x 9 SF / SY x $66 / ton) + (0.045 ton / SF x 9 SF / SY x $16.44 / ton) =
$14.85 + 6.66 = $21.51 / SY **Use: $22 per SY**

Additional mainline reconstruction; beyond detour limits:
At north end; Sta 108 – 116; 800 ft; at south end; Sta 158 – 165; 700 ft; total length – 1,500 ft
1,500 ft x 24 ft = 36,000 SF / 9 = 4,000 SY

SR 10 Pavement Costs: Use 7.25 inches Asphalt on 12 inches GAB
(7.25 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.0453125 ton / SF
(12 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.0675 ton / SF
Cost per SY:
(0.0453125 ton / SF x 9 SF / SY x $66 / ton) + (0.0675 ton / SF x 9 SF / SY x $16.44 / ton) =
$26.92 + $9.99 = $36.91 / SY **Use: $37 per SY**

Right of way impacts: Assume less easement required due to elimination of detour, however some additional permanent right of way along south side and no impacts to north side.
Assume zero net R/W impacts.

Reduced earthwork:
Reduced excavation / cut: Sta 129+00 – 139+00; 1,000 ft; avg end area – 250 SF
1,000 ft x 250 ft = 250,000 CF /9 = 9,259 CY
Sta 145+00 – 150+00; 500 ft; avg end area – 150 SF
500 ft x 150 ft = 75,000 CF = 2,778 CY
Total 9,259 CY + 2,778 CY = 12,037 CY

Reduced embankment:
Sta 141+00 – 144+00; 300 ft; avg end area – 75 SF
300 ft x 75 ft = 22,500 CY / 9 = 833 CY

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA: **Alternate to Idea A-11** Construct Site 1 as a four-lane roadway on new alignment and eliminate the Detour Road and the Site 2 Passing Lane section.
A-11.1	1 of 5	

Comp By: G.A.O. Date: 11/72012 Checked By: K.E.B Date: 11/12/2012

Original Concept:

The original design proposes to construct the Site 1 passing lane alongside the existing roadway through the Salem Church Road intersection area. This area requires the vertical profile to be raised approximately 10 feet to eliminate deficiencies in the existing profile. This profile change will require approximately 2,500 feet (Station 121 to Station 146) of the existing roadway to be reconstructed. To accommodate this work, the original concept includes the construction of a 4,200-foot detour road to stage the construction while the new roadway profile is being built. Construction of this detour road will require extensive R/W construction easement acquisition.

Assumed staging for this work includes (1) construct the detour road, (2) reconstruct / raise the profile of the existing road and construct the new passing lane, (3) remove the detour road, and (4) reconstruct Salem Church Road approach to the new raised SR 10. The original design concept also proposes to construct a 3,400-foot WB passing lane at Site 2, which is located approximately 3,000 feet south of Site 1.

Proposed Change:

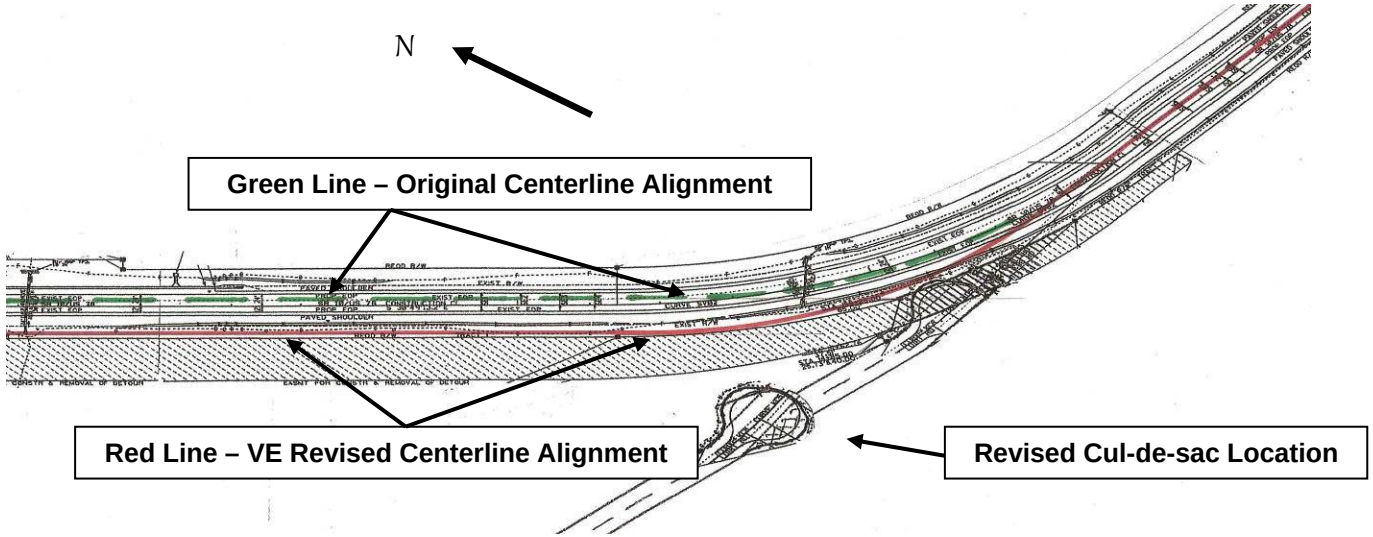
This recommendation would shift the alignment of SR 10 approximately 40 feet west between Stations 121 and Station 158 and stage construct a new four-lane SR 10 through the Salem Church Road intersection area. This concept eliminates the need to construct the detour road and eliminates the short Site 2 passing lane section by constructing both passing lanes on the VE recommended four-lane roadway in Site 1.

Justification:

This concept is an alternative to Recommendation A-11, however, it would construct realigned a four-lane roadway section to allow for dual passing lanes in-lieu-of a three-lane. An additional significant benefit of this recommendation is that it completely eliminates one of the sites and the associated impacts.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$1,680,000		
Proposed	$479,000		
Savings	$1,201,000		$1,201,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$1,201,000**

SKETCH	
Project: SR 10 Passing Lanes	Idea No.: A-11.1 Client: GDOT Page 3 of 5



VE Centerline Alignment Shifted ~ 40 Feet West
Construct New Four-Lane Roadway

COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-11.1 Client: GDOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Excavation	CY	12,037	$4.00	$48,148			
Embankment	CY	833	$6.00	$4,998			
Detour Pavement	SY	13,067	$22.00	$287,474			
Elimination of Site 2	LF	4,805	$278.00	$1,334,685			
VE Design:							
Additional Asphalt Pavement	SY				12,667	$37.00	$468,679
Additional Staging	LS				1	$10,000	$10,000
SUBTOTAL				$1,675,305			$478,679
TOTAL ROUNDED				**$1,680,000**			**$479,000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-11.1 Client: GDOT Sheet 5 of 5

Reduced / eliminated detour roadway pavement: Sta 116 – 158; 4,200 ft
Assume 12 ft lanes and 2 ft shoulders; total width = 28 ft
4,200 ft x 28 ft = 117,600 SF / 9 = 13,067 SY

Detour Pavement Cost: Use 4.0 inches asphalt on 8 inches GAB
(4 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.025 ton / SF
(8 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.045 ton / SF
Cost per SY
(0.025 ton / SF x 9 SF / SY x $66 / ton) + (0.045 ton / SF x 9 SF / SY x $16.44 / ton) =
$14.85 + 6.66 = $21.51 / SY **Use: $22 per SY**

Additional mainline reconstruction; shift alignment beyond detour limits:
At north end; Sta 108 – 116; 800 ft; at south end; Sta 158 – 165; 700 ft; total length – 1,500 ft
1,500 ft x 24 ft = 36,000 SF / 9 = 4,000 SY
Additional lane; Sta 103+00 to 168+00; - 6,500 ft
6,500 ft x 12 ft = 78,000 SF/9 = 8,667 SY
Total area of additional pavement required: 4,000 SY + 8,667 SY = **12,667 SY**

SR 10 Pavement Costs: Use 7.25 inches Asphalt on 12 inches GAB
(7.25 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.0453125 ton / SF
(12 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.0675 ton / SF
Cost per SY:
(0.0453125 ton / SF x 9 SF / SY x $66 / ton) + (0.0675 ton / SF x 9 SF / SY x $16.44 / ton) =
$26.92 + $9.99 = $36.91 / SY **Use: $37 per SY**

R/W impacts: Assume less easement required due to elimination of detour, however some additional permanent R/W along south side and no impacts to north side.
Adequate space on north side. Assume zero net R/W impacts.

Reduced earthwork:
Reduced excavation/cut: Sta 129+00 – 139+00; 1,000 ft; x avg end area – 250 SF
1,000 ft x 250 SF = 250,000 CF / 27 = 9,259 CY
Sta 145+00 – 150+00; 500 ft; x avg end area – 150 SF
500 ft x 150 SF = 75,000 CF / 27 = 2,778 CY
Total 9,259 CY + 2,778 CY = **12,037 CY**

Reduced embankment: Sta 141+00 – 144+00; 300 ft; avg end area – 75 SF
300 ft x 75 SF = 22,500 CF / 27 = **833 CY**

Eliminate Site 2; length – 4,805 feet
Total cost of project - $6,202,401 + $1,410,000 = $7,612,401
Total length of project = 27,405 feet
$7,612,401 / 27,405 = $277.77 per feet = $1,466,648 per mile

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
A-16	1 of 4	Revised proposed profile to a point profile.

Comp By: S.J.L. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept::

The proposed roadway is to be widened and overlaid based on a mathematically derived profile requiring additional leveling between the existing surface and proposed surface courses.

Proposed Change:

This recommendation revises the proposed profile to a point profile based on existing road conditions.

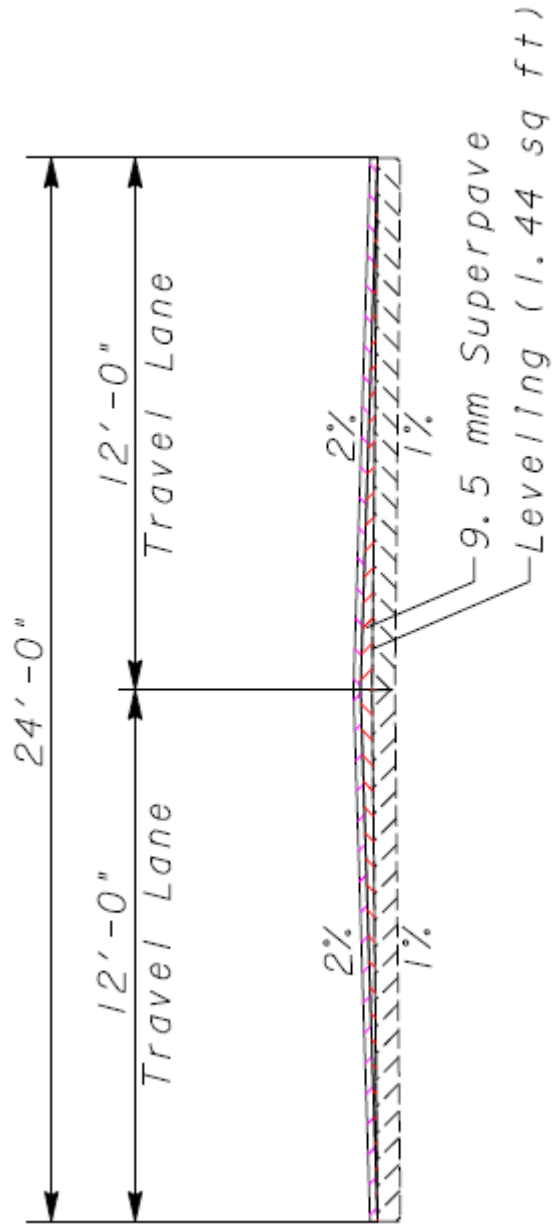
Justification:

A best-fit profile can be used to justify that the existing conditions meet desired design speed. If the best-fit profile verifies that the existing conditions meet a 55 mph design speed, a point profile will ease construction and reduce the amount of leveling.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$258,000		
Proposed	$172,000		
Savings	$86,000		$86,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$86,000**

SKETCH

Project: SR 10 Passing Lanes	Idea No.: A-16 Client: GDOT Sheet 2 of 4



ASSUMED LEVELING TYPICAL SECTION

COST WORKSHEET							
Project: SR 10 Passing Lanes					Idea No.: A-16 Client: GDOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Asphalt Leveling	Ton	3,859	$66.78	$257,704			
VE Design:							
Asphalt Leveling	Ton				2,573	$66.78	$171,825
SUBTOTAL				$247,704			$171,825
TOTAL ROUNDED				**$248,000**			**$172,000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-16 Client: GDOT Sheet 4 of 4

LEVELING = 110 LBS/SY/INCH

= 3,960 LBS/CY

= 1.98 TONS/CY

STATION	LEVELING	LEVELING	LEVELING	CUM. LEVELING (TONS) / 100
(FEET)	(SQ FT)	(CU YD)	(TONS)	Ft
00+00.00	1.44			0
01+00.00	1.44	5.33	10.56	10.56

Use Leveling of 10.5 tons / 100 ft

Location	**Length of Mainline to be Leveled**		**Leveling**
	(FT)	Tons / 100 Ft	(TN)
Site 1	4,200	10.5	441
Site 2	4,800	10.5	504
Site 3	6,800	10.5	714
Site 4	8,700	10.5	913.5
Total			**2572.5**

Orig	**Rev**		**Reduction**
3,859	**2,573**		**1,287**

Unit Cost	**$66.78/Ton**	**Cost Savings**	**$85,912.47**

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA: Revise the roadway profile through the Salem Church Road intersection area by using the minimum K values for the vertical curves.
A-21	1 of 5	

Comp By: G.A.O. Date: 11/6/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

The original design would construct the Site 1 passing lane through the Salem Church Road intersection area on a revised profile having a maximum grade change of approximately 10 feet. This grade change is required to eliminate deficiencies in the existing profile. The original design uses vertical curve K values of 138, 156, and 319 to achieve the desired revised profile. Due to the change in vertical profile, this site requires the construction of a detour road that crosses Salem Church Road on the west side of the roadway. The current design requires the reconstruct of SR 10 between Station 121+00 and Station 146+50.

Proposed Change:

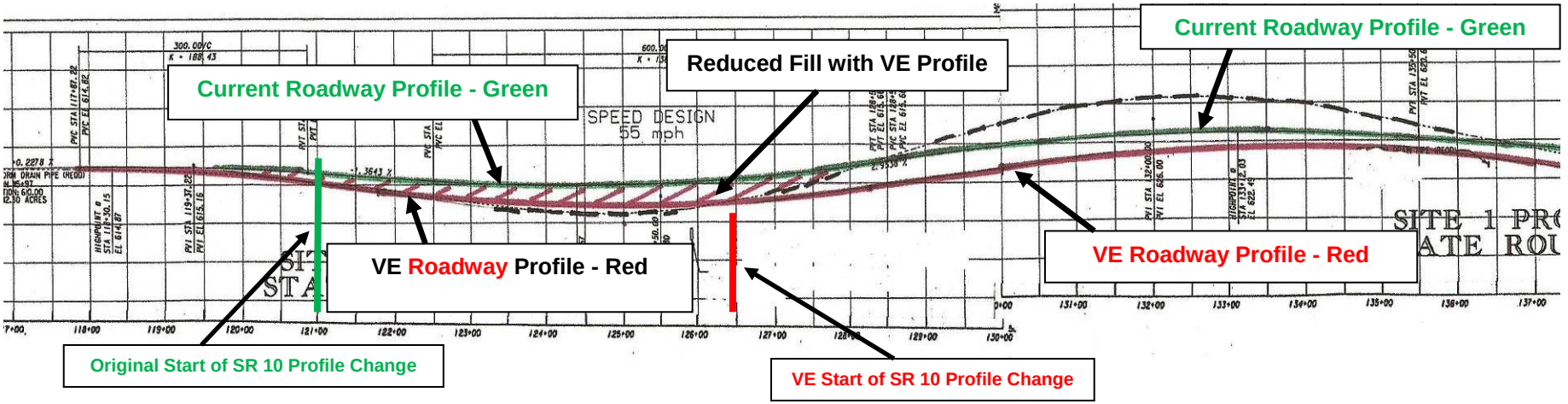
This recommendation would redesign the roadway vertical profile through the Salem Church Road intersection area for a design speed of 55 MPH using K values of 115, 117, and 116 for the crest and sag vertical curves.

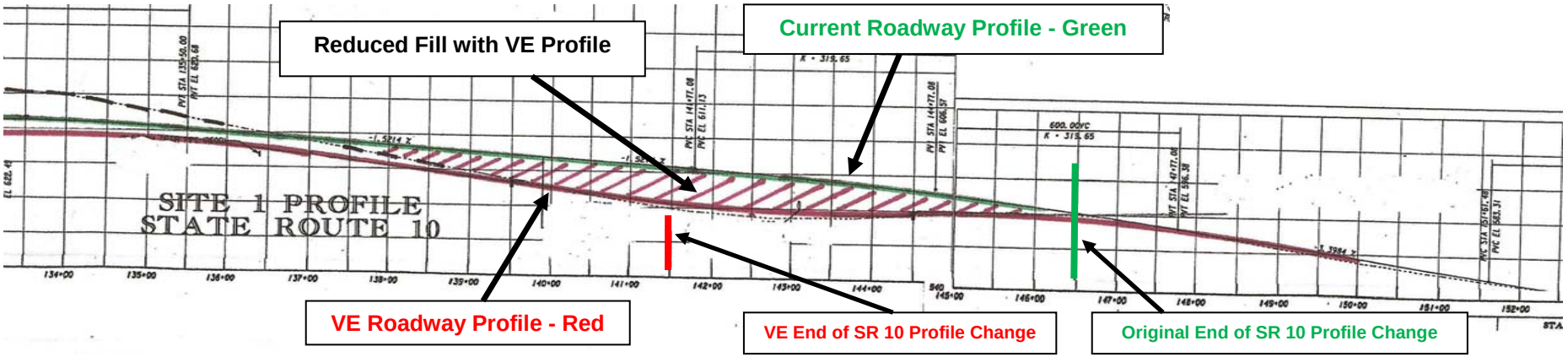
Justification:

Using the minimum K values for a 55 MPH design will shorten the SR 10 reconstruction limits through the Salem Church Road area of the deficient vertical alignment. The VE concept will complete the reconstruct of SR 10 between Station 126+50 and Station 141+50. Shortening the reconstruction limits by approximately 1,050 feet will shorten the length of the detour road and reduce the amount of the construction easement required. In addition, the VE vertical profile at the Salem Church Road intersection will be approximately 2 feet lower than the original profile allowing for an easier and more readily constructible tie-in.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$338,000		
Proposed	$72,000		
Savings	$266,000		$266,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$266,000**

SKETCH	
Project: SR 10 Passing Lanes	Idea No.: A-21 Page 2 of 5





REVISED PROFILE DATA - SITE 1

Project: SR 10 Passing Lanes	Idea No.: A-21 Client: GDOT Sheet 3 of 5

VE Revised Profile - Site 1

	Green Line Current Design		**Red Line VE Design**
Curve 1		**Curve 1**	
LVC	600 FT	LVC	650 FT
K	138.95	K	115
PVC	Sta 122+50 Elev 610.89	PVC	~Sta 121+75 ~Elev 608
PVI	Sta 125+50 Elev 606.80	PVI	Sta 125+00 Elev 600
PVT	Sta 128+50 Elev 615.66	PVT	~Sta 128+25 ~Elev 609
Curve 2		**Curve 2**	
LVC	700 FT	LVC	700 FT
K	156.42	K	117
PVC	Sta 128+50 Elev 615.66	PVC	~Sta 130+00 ~Elev 613
PVI	Sta 132+00 Elev 626.00	PVI	Sta 133+50 Elev 624
PVT	Sta 135+50 Elev 620.68	PVT	~Sta 137+00 ~Elev 614
Curve 3		**Curve 3**	
LVC	600 FT	LVC	500 FT
K	319.65	K	116
PVC	Sta 141+77 Elev 611.13	PVC	~Sta 139+50 ~Elev 607
PVI	Sta 144+77 Elev 606.57	PVI	Sta 142+00 Elev 597
PVT	Sta147+77 Elev 596.38	PVT	~Sta 144+50 ~Elev 598

COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-21 Client: GDOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Asphalt Pavement	SY	2,800	$37.00	$103,600			
Embankment	CY	23,899	$6.00	$143,394			
Detour Pavement	CY	3,267	$22.00	$71,874			
R/W Easement	Acre	1.928	$10,000	$19,280			
VE Design:							
Excavation	CY				18,056	$4.00	$72,224
SUBTOTAL				$338,148			$72,224
TOTAL ROUNDED				**$338,000**			**$72,000**

CALCULATIONS

Project: SR 10 Passing Lanes	Idea No.: A-21 Client: GDOT Sheet 5 of 5

SR 10; mainline; reduced reconstruction limits:

At northern end; from Sta 121+00 to 126+50; 550 ft

At southern end; from Sta 146+00 to 141+00; 500 ft; total length reduced – 1,050 ft

1,050 ft x 24 ft = 25,200 SF / 9 = **2,800 SY**

SR 10 Pavement Costs: Use 7.25 inches Asphalt on 12 inches GAB

(7.25 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.0453125 ton / SF

(12 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.0675 ton / SF

Cost per SY:

(0.0453125 ton / SF x 9 SF / SY x $66 / ton) + (0.0675 ton / SF x 9 SF / SY x $16.44 / ton) =

$26.92 + $9.99 = $36.91 / SY **Use: $37 per SY**

Earthwork analysis: embankment reduction:

Sta 121+00 to 127+00; 600 ft x average height – 5 ft x average width 75 ft

Sta 138+00146+00; 800 ft x average height – 7 ft x average width 75 ft

(600 ft x 5 ft x 75 ft) + (800 ft x 7 ft x 75 ft) = 225,000 CF + 420,000 CF = 645,000 CF / 27 = **23,889 CY**

Additional excavation:

Sta 127+00 140+00 = 1,300 ft x average height – 5 ft x average width – 75 ft

1,300 ft x 5 ft x 75 ft = 487,500 CF / 27 = **18,056 CY**

Reduction in current detour route 1,050 ft;

Assume 12 ft lanes and 2 ft shoulders; total width = 28 ft

1,050 ft x 28 ft = 29,400 SF / 9 = **3,267 SY**

Detour Pavement Cost: Use 4.0 inches asphalt on 8 inches GAB

(4 / 12 ft) (150 # / CF) (1 ton / 2000 #) = 0.025 ton / SF

(8 / 12 ft) (135 # / CF) (1 ton / 2000 #) = 0.045 ton / SF

Cost per SY

(0.025 ton / SF x 9 SF / SY x $66 / ton) + (0.045 ton / SF x 9 SF / SY x $16.44 / ton) =

$14.85 + 6.66 = $21.51 / SY **Use: $22 per SY**

Reduced Easement required:

1,050 ft x 80 ft = 84,000 SF = **1.928 acres**

Assume Easement Cost at $10,000 per acre

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
A-24	1 of 3	Close Salem Church Road to traffic during the construction of the Site 1 passing lane.

Comp By: S.J.L. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

The original design would allow local traffic to access SR 10 directly via Salem Church Road while it is being reconstructed under traffic.

Proposed Change:

This recommendation would close Salem Church Road and detour traffic to Paradise Hogan Road, Arbor Place Road, and Critters Crossing Road during construction of Salem Church Road.

Justification:

The detouring of this traffic will allow for ease of construction of the Salem Church Road tie-in. The proposed grade of Salem Church Road is approximately 8 feet higher than existing elevation. To construct this approach under traffic would require the utilization of flagmen during work hours and the safeguarding of the traveling public going through the area during non-work hours.

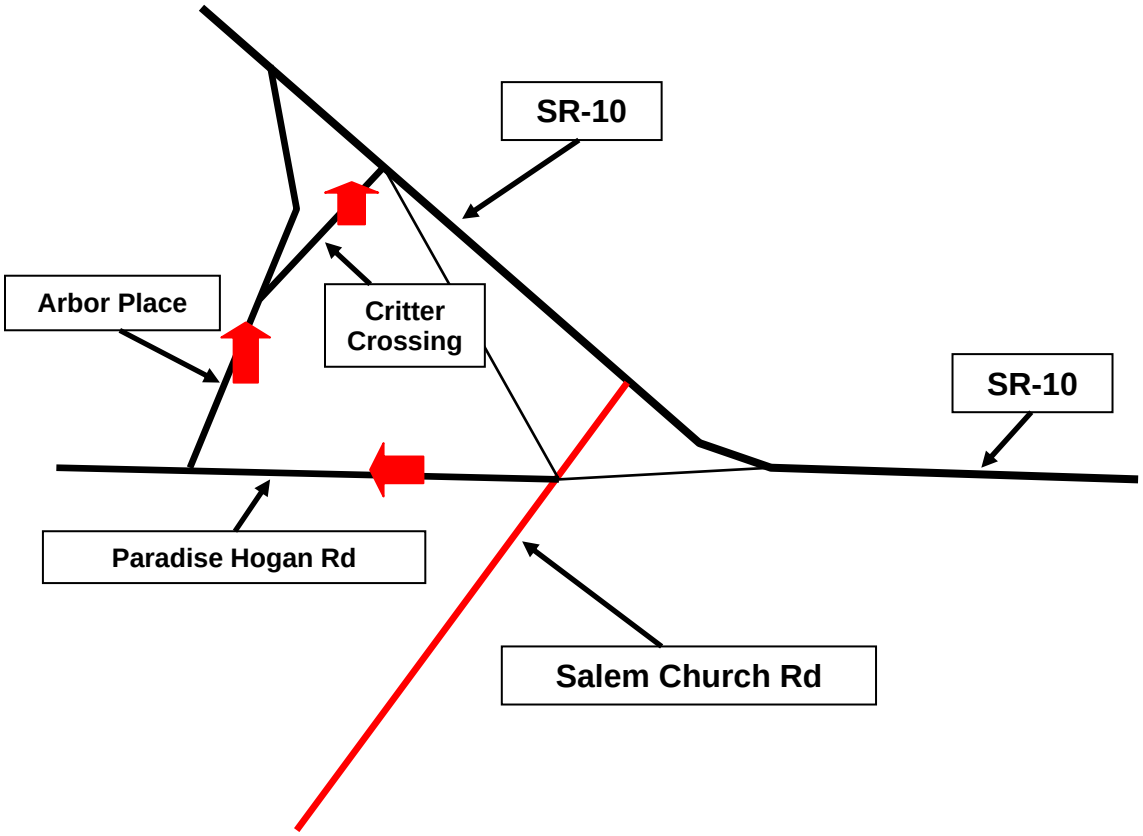
A reasonable detour route exists to carry the low volume Salem Church Road traffic around a "closed" road situation and access SR 10 at the Critters Crossing T-intersections at Station 112. The detour distance is approximately 1.5 miles.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$30,000		
Proposed	$6,000		
Savings	$24,000		$24,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$24,000**

SKETCH	
Project: SR 10 Passing Lanes	Idea No.: A-24 Client: GDOT Sheet 2 of 3

Proposed Detour Route for Closed Salem Church Road @ Site 1

Use Paradise Hogan Rd – Arbor Place – Critter Crossing



COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: A-24 Client: GDOT Sheet 3 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Connection to Detour Rd	LS	1	$25,000	$25,000			
Temporary Traffic Control	LS	1	$5,000	$5,000			
VE Design:							
Road Closure Barricades	LS				1	$5,000	$5,000
Detour Signing	LS				1	$1,000	$1,000
SUBTOTAL				$30,000			$6,000
TOTAL ROUNDED				**$30,000**			**$6,000**

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
B-4	1 of 3	Remove guardrail by flattening slopes to 4:1 in selected areas.

Comp By: S.J.L. Date: 11/7/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

Guardrail was placed at all locations where the difference between shoulder break point and existing ground is 10 feet or greater.

Proposed Change:

This recommendation would flatten the roadway side slopes at four locations to allow for removal of the guardrail.

Justification:

Removal of guardrail will reduce the cost of project and reduce future maintenance costs. The four locations where guardrail can be removed are; Station 124 – 128+77 Left, Station 11 – 16 on CR 147 Left, Station 11 – 16 on CR 147 Right, and Station 318+22 – 323 Right.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$49,000		
Proposed	$8,000		
Savings	$41,000		$41,000
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			**$41,000**

COST WORKSHEET

Project: SR 10 Passing Lanes					Idea No.: B-4 Client: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
W beam	LF	1,955	$15.93	$31,143.15			
Type 12 Anchor	EA	4	$1,796.71	$7,186.84			
Type 1 Anchor	EA	4	$619.95	$2,479.80			
6” Asphalt Curb	LF	955	$8.70	$8,308.50			
VE Design:							
W beam	LF				0		$0
Type 12 Anchor	EA				0		$0
Type 1 Anchor	EA				0		$0
6” Asphalt Curb	LF				0		$0
R/W	Acre				0.25	$20,000	$5,000.00
3’ x 3’ Box Culvert	LF				20	$140.65	$2,813.00
SUBTOTAL				$49,118.29			$7,813
TOTAL ROUNDED				**$49,000**			**$8,000**

CALCULATIONS

Project: SR 10 Passing Lanes

Idea No.: B-4
Client: GDOT
Sheet 3 of 3

Location	Length (LF)	Type 1 Anchor (EA)	Type 12 Anchor (EA)	6" Asphalt Curb (LF)
124+00 -128+77.50 LT	477.5	1	1	477.5
11+00 - 16+00 CR 147 LT	500	1	1	0
11+00 - 16+00 CR 147 RT	500	1	1	0
318+22.50 - 323+00 RT	477.5	1	1	477.5
Total	**1955**	**4**	**4**	**955**

Reduction in Costs

	Quantity	$ / Unit	$
W Beam	1,955	$15.93	$31,143.15
Type 12 Anchor	4	$1,796.71	$7,186.84
Type 1 Anchor	4	$619.95	$2,479.80
6" Asphalt Curb	955	$8.70	$8,308.50

Total Additional Savings **$49,118.29**

Assume Borrow & R/W is Negligible between Original & Revised Sections

Increase in Costs

	Quantity	$ / Unit	$
R/W	0.25	$20,000.00	$5,000.00
3'x3' Box Culvert	20	$140.65	$2,813.00

Total Additional Costs **$7,813.00**

Net Costs **$41,305.29**

DEVELOPMENT AND RECOMMENDATION PHASE

Project: SR 10 Passing Lanes

IDEA No.:	Sheet No.:	CREATIVE IDEA:
G-1	1 of 3	Replace all existing cross drain pipes

Comp By: GCG Date: 11/6/2012 Checked By: K.E.B. Date: 11/12/2012

Original Concept:

The original concept replaces all corrugated metal cross drainage pipes and retains existing concrete cross drainage pipes on each site. The concrete drainage pipes will be extended as necessary to accommodate the new roadway cross section.

Proposed Change:

This recommendation would replace concrete and metal cross drainage pipes throughout the length of the project.

Justification:

The replacement of the majority of the cross drainage pipes (mostly metal) throughout the length of the entire project provides a good opportunity to also replace the few (11) existing concrete drainage pipes at the same time. Replacing the concrete drainage pipes at the same time as the metal drainage pipes will provide a completely new drainage system for the reconstructed / widened roadway sites. This concept would also minimize future drainage system maintenance and potential field change orders.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	$0		
Proposed	($28,000)		
Savings	($28,000)		($28,000)
FUTURE COST: – Savings		N/A	N/A
TOTAL PRESENT WORTH SAVINGS			($28,000)

COST WORKSHEET							
Project: SR 10 Passing Lanes					Idea No.: G-1 Client: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:							
Replace Concrete Pipe	LF	0	$0	$0			
Value Engineering Design:							
Site 1							
(CR 147) Station 11+30 24” concrete Pipe	LF				75.30	$ 35.76	$2,692.73
(CR 147) Station 13+76 24” concrete Pipe	LF				81.76	$ 35.76	$2,923.74
Site 2							
Station 230+07 36” concrete Pipe	LF				50.36	$ 64.55	$3,250.74
(CR 156) Station 13+93 18” concrete Pipe	LF				29.91	$ 32.33	$966.99
Site 3							
Station 343+85 24” concrete Pipe	LF				46.78	$ 35.76	$1,672.85
Station 354+83 18” concrete Pipe	LF				68.86	$ 32.33	$2,226.24
Station 363+41 18” concrete pipe	LF				49.28	$32.33	$1,560.89
Station 367+88 18” concrete Pipe	LF				50.03	$ 32.33	$1,617.47
Site 4							
Station 400+50 18” concrete Pipe	LF				58.01	$ 32.33	$1,875.46
Station 407+11 24” concrete Pipe	LF				61.79	$ 35.76	$2,209.61
Station 426+64 18” concrete Pipe	LF				61.34	$ 32.33	$1,983.12
Station 453+42 24” concrete Pipe	LF				61.34	$ 35.76	$2,193.52
Station 462+22 24” concrete Pipe	LF				64.79	$ 35.76	$2,316.89
SUBTOTAL				$0			$ 27,490.25
TOTAL ROUNDED				**$0**			**$ 28,000**

CALCULATIONS	
Project: SR 10 Passing Lanes	Idea No.: G-1 Client: GDOT Sheet 3 of 3

Length of pipe in Cost Worksheet is gathered from the lengths and pipe sizes shown on the Drainage Profile sheets.

APPENDIX

Sources

Approving/Authorizing Persons

Name:	Position:	Telephone:
Jason Brown	District 2 Program Manager	478-553-2334
Jamie Lindsey	District 2 Design Engineer	478-552-4642
Lisa Myers	State Project Review Engineer – Engineering Services	404-631-1770

Personal Contacts

Name:	Telephone:	Notes:
Eric Wilkinson	478-538-8522	Project Design Briefing
Jason Brown	478-553-2334	Project Design Briefing
Jason Brown	478-553-2334	General project questions from VE team after first day of study. Staging, cost estimate clarification, passing lane site justification, detour road cost.

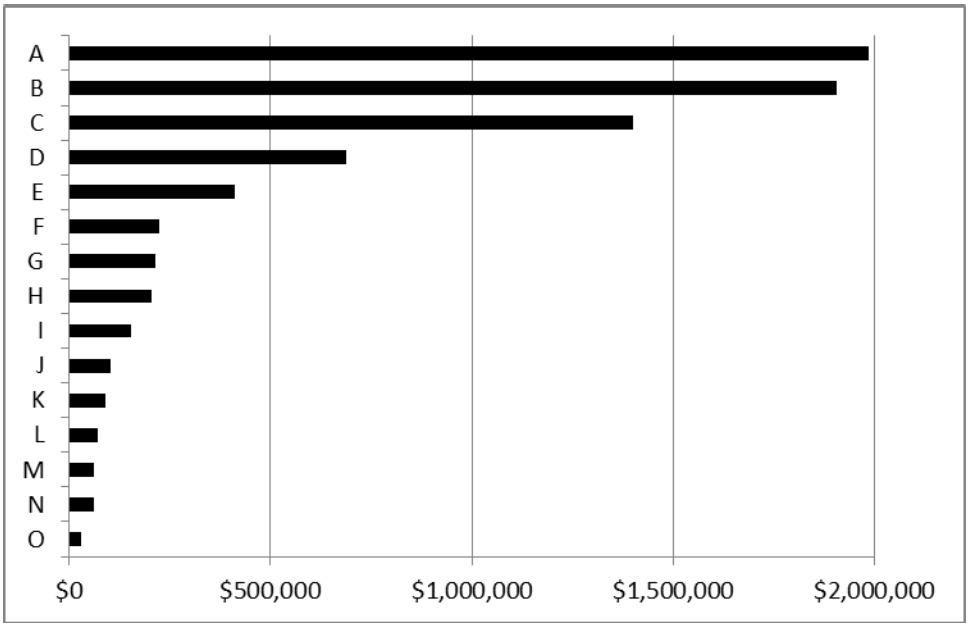
Documents/Abstracts

Reference:	Reference:
Project Concept Report	Pavement Design Worksheet
Project Layout Sketches	Project Cross Sections
Preliminary Plans	Project Profile
Project Cost Estimate	Design Files

SR 10 Passing Lanes

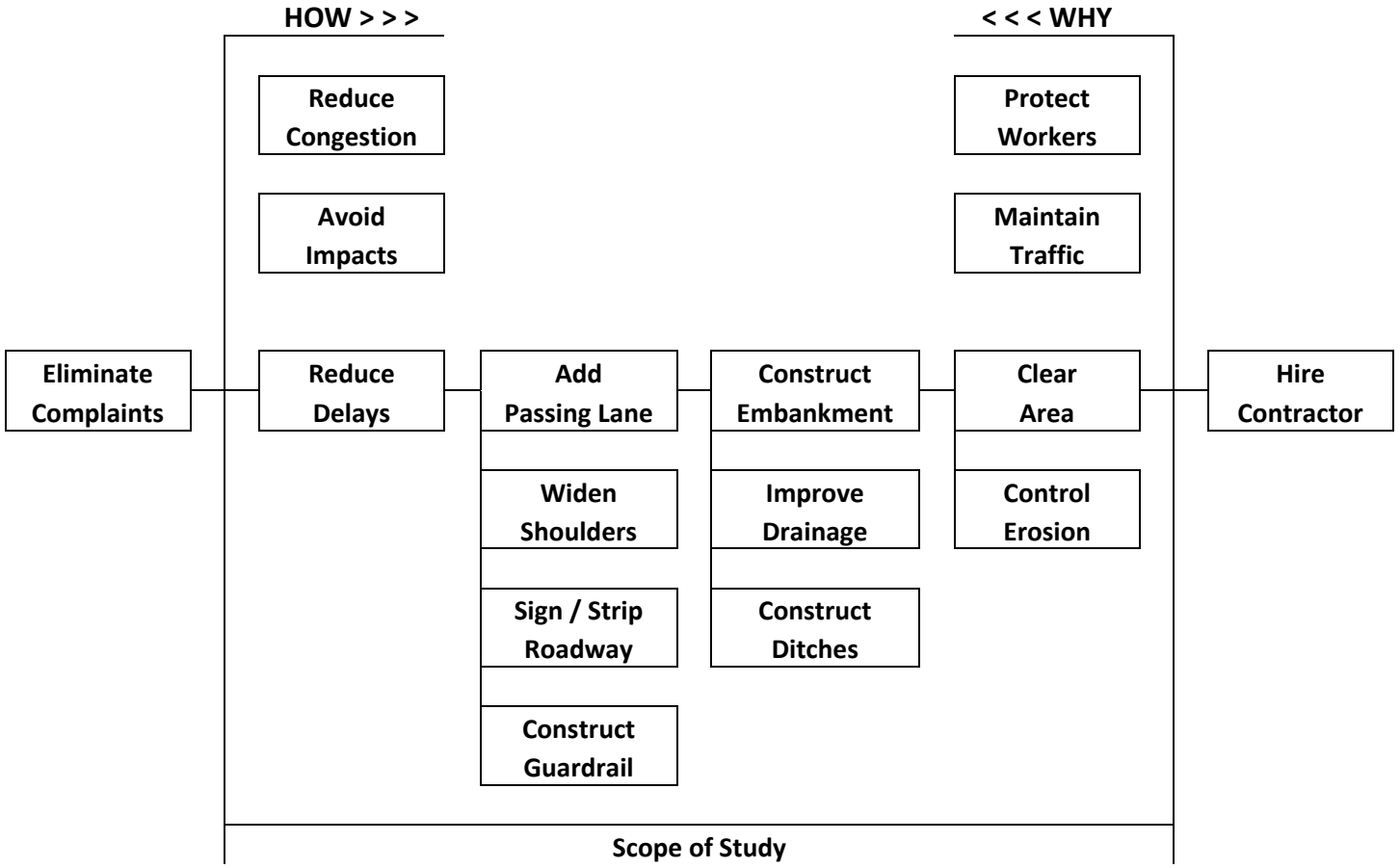
Cost Model / Distribution

Item	Description	$ Amount	% of Total Project
A	Asphalt Pavement	$1,984,000	26.1
B	Grading Complete	$1,907,000	25.1
C	R/W	$1,400,000	18.4
D	Granular Aggregate Base	$688,000	9.1
~ 80% Line			
E	Miscellaneous	$412,000	5.4
F	Temporary Erosion Control (Mis.)	$223,000	2.9
G	Drain Pipes	$215,000	2.8
H	Temp & Permanent Mulch	$206,000	2.7
I	Riprap CKDM (Temp Erosion)	$153,000	2.0
J	Traffic Control	$102,000	1.3
K	Erosion Control (Mis.)	$90,000	1.2
L	Underdrain pipe (Erosion Control)	$70,000	0.9
M	Pavement Fabric Strips	$62,000	0.8
N	Guardrail	$60,000	0.8
O	Signing and Marking	$30,000	0.4
	Total:	$7,602,000	



FAST DIAGRAM

SR 10 Passing Lanes



INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 10 Passing Lanes
Function: Reduce Delays

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
A	**Asphalt Pavement**	Construct	Passing Lanes	$1,984,000	26.1	Yes
		Improve	Road Structure			
		Accommodate	Bike Lanes			
		Construct	Shoulders			
		Adjust	Road Profile			
		Level	Pavement			
		Construct	Detours			
		Improve	Intersections			
B	**Grading Complete**	Widen	Roadway	$1,907,000	25.1	Yes
		Add	Passing Lane			
		Construct	Ditches			
		Remove	Old Pipes			
		Remove	Old Pavement			
		Construct	Slopes			
		Raise	Grade			
		Remove	Old Roadbed			
		Grade	Shoulders			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 10 Passing Lanes
Function: Reduce Delays

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
C	**Right of Way**	Hold	Project	$1,400,000	18.4	Yes
		Add	Passing Lanes			
		Widen	Roadway			
		Avoid	Impacts			
		Accommodate	Ditches			
		Improve	Clear Zone			
		Save	Oak Trees			
D	**Granular Aggregate Base**	Support	Loads	$688,000	9.1	Yes
		Widen	Roadway			
		Widen	Shoulders			
		Accommodate	Drainage			
		Allow	Drainage			
E	**Miscellaneous**	Construct	Project	$412,000	5.4	No
F	**Temporary Erosion Control (Misc.)**	Control	Erosion	$223,000	2.9	No

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 10 Passing Lanes
Function: Reduce Delays

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
G	**Drainage Pipes**	Extend	Existing Pipes	$215,000	2.8	Yes
		Replace	Existing Pipes			
		Cross	Driveways			
H	**Mulch**	Prevent	Erosion	$206,000	2.7	Yes
		Stabilize	Embankments			
		Cover	Slopes			
I	**Riprap Check dams**	Reduce	Water Velocity	$153,000	2.0	Yes
		Minimize	Erosion			
J	**Traffic Control**	Protect	Workers	$102,000	1.3	Yes
		Guide	Motorists			
		Stage	Construction			
		Maintain	Traffic			
		Identify	Work Zone			
		Separate	Const / Traffic			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 10 Passing Lanes
Function: Reduce Delays

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
K	**Erosion Control (Misc.)**	Control	Sediment	$90,000	1.2	No
		Control	Erosion			
L	**Underdrain Pipe**	Capture	Ground Water	$70,000	0,9	Yes
		Control	Erosion			
M	**Pavement Fabric**	Connect	Pavement	$62,000	0.8	No
		Connect	Shoulders			
N	**Guardrail**	Protect	Motorists	$60,000	0.8	Yes
		Reduce	R/W Takes			
		Shield	Hazards			
O	**Signal / Markings**	Advise	Motorists	$30,000	0.4	No
		Display	Information			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A	**Asphalt Pavement**		
A-1	Eliminate Shoulder Widening on opposite side of roadway as the passing lane.	Not required to add passing lanes, reduce cost, simplify construction	✓
A-2	Reduce Shoulder Widening on PL side of the roadway	See Ideas A-1 and A-18	✓
A-3	Shorten passing lane sections to provide only the minimum length passing lane segment.	Reduce project length, reduce cost, simplify construction, passing lane lengths excessive	✓
A-4	Construct the passing lane wide enough to only provide for an 11-foot center lane.	Not practicable for 55 MPH rural section,	X
A-5	Reduce the structural section of the asphalt pavement.	Current pavement design meets requirements	X
A-6	Validate the need for “four” passing lane segments.	Continuation from 1999 concept report	X
A-7	Widen the entire corridor to a three-lane roadway section.	Outside scope of approved CE	X
A-8	Make the passing lane segments equal, two EB and two WB	No change in construction concept, provides better passing lane balance	✓
A-9	Widen roadway six feet on both sides in-lieu-of widening 12 feet on one side.	May reduce R/W and / or Environmental impacts	✓
A-10	Construct two, four-lane passing sections in-lieu-of four, two-lane passing sections.	Accomplish project goals of having four passing lane sections, with less overall impacts	✓
A-11	Construct Section 1 on new alignment as a three-lane road.	Simplify construction, eliminate need for detour road	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A-12	Construct the Section 1 detour on the other side of the roadway.	Has additional R/W impacts, increases constructability issues	X
A-13	Reduce the length of all four passing lane sections to the length of the shortest passing section (Section 2).	Reduce cost, reduce project impacts, simplify construction	✓
A-14	Shift Section 2 out of the horizontal curve and crossroad.	Eliminate need to reconstruct intersection	✓
A-15	Relocate passing Section 1 to eliminate the large profile change.	Eliminate 8-9 foot grade raise through the intersection	✓
A-16	Redefine the roadway profile in the areas where there is large leveling quantities to reduce the amount of leveling.	Reduce amount of asphalt leveling required on the project, reduce cost, simplify construction	✓
A-17	Construct the new shoulders “full depth” to use in staging traffic control.	Current design already as strong as proposed detour road. Can use for staging traffic	X
A-18	Reduce the width of the new shoulders from 10 feet to 6 ½ feet. (See page 252 in Green Book)	Reduce cost, simplify construction, meets AASHTO Green Book requirements	✓
A-19	Relocate the detour road closed to the mainline roadway.	Reduce R/W impacts	✓
A-20	Construct passing “turn-outs” in-lieu-of full passing lanes.	Would not provide adequate passing distances	X
A-21	Revise Section 1 roadway profile to reduce proposed construction through the area.	Reduce K values of curves, reduce detour length, maximize use of existing pavement, save R/W	✓
A-22	Reconstruct Salem Church intersection to 90 degrees.	Existing skew doesn’t require realignment	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A-23	Reduce starting lane taper to ½ the standard length.	Reduce pavement / embankment cost	✓
A-24	Close Salem Church Rd and detour traffic during const.	Accelerate construction, construct “in the clear”	✓
B	**Grading Complete**		
B-1	Replace all existing pipes with new pipes	See Idea G-1	X
B-2	Eliminate work on the opposite side of the roadway from the passing lane side.	See Idea A-1	X
B-3	Reduce the mainline roadway speed to 45 MPH through the Salem Church intersection to reduce the amount of profile change.	Not practicable in the rural area, need to maintain 55 MPH	X
B-4	Flatten slopes to eliminate the need for guardrail.	Possible cost savings if R/W available	✓
B-5	Verify the detour road is being paid for under the “grading complete” item.	Item cost needs to be identified in project cost estimate	DS
B-6	Reduce the roadway section width through the wetland and stream areas.	Reduce project impacts	✓
B-7	Eliminate the detour road.	See Idea A-11	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
C	**R/W**		
C-1	Reduce the length of the passing lane segments.	See Idea A-3	✓
C-2	Reduce the number of passing lane segments.	Reduce cost, reduce impacts, simplify const.	X
C-3	Combine passing Sections 1 and 2 into a single four-lane roadway through the Section 1 area.	Reduce project impacts	✓
C-4	Reduce the length of passing Section 4 by starting it after Station 435 to avoid the Historic areas.	Reduce project impacts	✓
C-5	Eliminate passing Section 3 and keep only two WB passing Sections (#2 and #4).	Reduce project impacts, reduce number of overall passing lane sections	✓
D	**Granular Aggregate Base**		
	See Ideas in Part A – Asphalt Pavement	See Ideas A-1 to A-24	X
G	**Drainage Pipes**		
G-1	Replace all existing drainage pipes. (Assume all CMP pipes being replaced & RCP being extended.)	Already cutting roadway to replace CMP, improves life of all drainage pipes	✓
G-2	Verify concrete box culverts are structurally sound to remain in-place.	Assure existing concrete box culvert is structurally sound to be extended	DS
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
H	**Mulch**		
H-1	Reduce the areas to be mulched.	Possible environmental concerns	X
I	**Riprap Check dams**		
I-1	Verify the number and need for the check dams.	Verify items included in the plans	✓
J	**Traffic Control**		
J-1	Verify the traffic staging / shifts to allow construction.	Assure adequate staging to construct project	✓
J-2	Verify the type of traffic protection alongside the edge of the travel way / construction.	Combine with Idea J-1	X
J-3	Verify the cost estimate for traffic control.	Verify item cost is included is cost estimate	DS
K	**Erosion Control**		
K-1	Verify the pipe end treatment riprap usage.	Make plans comply with riprap outflow standard	DS
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
L	**Underdrain Pipe**		
L-1	Verify how / where under drainpipe is being used in the erosion control area.	Clearly identify and show in the plans	DS
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

VE STUDY SIGN-IN SHEET

Project No.: STP00-0014-01(062) County: Oglethorpe/Wilkes PI No.: 222460- Date: November 5-8, 2012

Days

FIRST	LAST	NAME	GDOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers	Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders	Engineering Services	404-631-1752	msanders@dot.ga.gov
✓	O	Ken Werho	Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	✓	Kate D'Ambrosio	TEA Traffic Operations	404-635-2842	kdambrosio@dot.ga.gov
✓	✓	Alexander Bandoh	TEA Materials & Research	678-575-2674	abandoh@dot.ga.gov
✓	O	Marc Mastronardi	Construction	404-631-1971	mmastronardi@dot.ga.gov
✓	✓	Eric Wilkinson	Program Delivery	478-538-8522	ewilkinson@dot.ga.gov
✓	✓	Jason Brown	D2- Design	478-553-2334	jasbrown@dot.ga.gov
✓	✓	Jamie Lindsey	D2- District Design Eng.	478-552-4642	jlindsey@dot.ga.gov
✓	O	Kevin Dirth	TEA D2		kdirth@dot.ga.gov
✓	✓	Neal O'Brien	D2 Precon. Engineer	478-552-4692	nobrien@dot.ga.gov
✓	✓	Keith Borkenhagen	AMEC	623-556-1875	kborkenhagen@msn.com
✓	✓	George Obaranec	AMEC	770-421-3346	george.obaranec@amec.com
✓	✓	Steve Linley	Hatch Mott MacDonald	770-200-1705	steve.linley@hatchmott.com
✓	✓	Greg Grant	RS&H	678-429-7501	greg.grant@rsandh.com
O	✓	Vonda Everett	D2 Environmental	478-552-4631	veverett@dot.ga.gov

✓ Check all that attend O Did Not Attend 15 Attended Project Overview (Day 1) 13 Attended Project Presentation (Day 4)