

VALUE ENGINEERING REPORT

New I-985 Interchange
Project Nos. NHS00-0000-00(425) CSNHS 0008-00(796)(797)
PI Nos. 0000425, 0008796, 0008797
Hall County

February 17, 2010

OWNER AND DESIGN TEAM:



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

VALUE ENGINEERING CONSULTANT:



MACTEC Engineering and Consulting, Inc.
3200 Town Point Drive NW, Suite 100
Kennesaw, GA 30144

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VALUE ENGINEERING STUDY

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EXECUTIVE SUMMARY

Executive Summary

VALUE ENGINEERING STUDY

New I-985 Interchange – Hall County
February 1-4, 2010

Introduction

This report presents the results of a value engineering (VE) study conducted on the proposed design for a new diamond Interchange on I-985 near Martin Road between Exit 12 (Spout Springs Road / City of Flowery Branch) and exit 16 (SR 53 / City of Oakwood). The new Interchange will join with a new Martin Road Connector roadway that will connect SR 13 on the east side with Thurmon Tanner Parkway on the west side. The new roadway will be a divided four-lane facility with a variable width (20 feet – 32 feet) raised median and be constructed on new location. The roadway will have 16-foot urban shoulders with curb, gutter, and sidewalks. The new Martin Road Connector will cross over I-985 on a 212-foot long by 98.41-foot wide bridge. The current design also includes several other bridges for the Martin Road Connector and the SB ramps to cross identified streams on the west side of the proposed Interchange.

The project also includes major upgrades to the new Martin Road Connector intersections with SR 13 and Thurmon Tanner Parkway and the extension of Industrial Connector Road west of Thurmon Tanner Parkway. The new Interchange will provide access to the adjacent industrial area and provide traffic relief for the I-985 / Spout Springs Road Interchange. Major contract work items include grading, drainage, roadway embankment, asphalt concrete pavement, PC concrete pavement, MSE walls, four bridges, curb and gutter, and concrete sidewalk. The total estimated project cost including right-of-way (R/W) is \$37.5 million. The design is currently in the concept stage. The study took place February 1-4, 2010, at the Georgia DOT headquarters Office in Atlanta using a four person VE team.

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

Considerations

The VE team was advised of several restrictions to consider when developing their recommendations. The restrictions were; to minimize the amount of R/W required by the project, to minimize the project's impact on the various streams (intermittent and perennial)

found on the west side of the project, to minimize the project's impact on identified wetlands, and to accommodate the county bicycle trails in the area. The project's Concept Report and a Draft Environmental Assessment have been prepared.

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 54 ideas with 38 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed 16 independent recommendations and 5 alternative recommendations. Implementation of the 16 independent recommendations has the potential to reduce the project cost by approximately \$7.2 million. A detailed write-up of each recommendation is contained in the respective portion of this report. A summary of the recommendations follows.

Recommendation Highlights

A-3: Reduce the size of the beams on Bridges #1 & #2 to simplify construction, reduce the height of the roadway, and reduce cost. This recommendation replaces the PSC Bulb-Tee 63 inch beams for Bridge #1 and the PSC Bulb-Tee 74 inch beams for Bridge #2 with PSC Bulb Tee 54 inch beams. Using the Bulb-Tee 54 inch beams will reduce the vertical profile, improve constructability, and reduce the cost of the project.

The total potential savings if accepted is \$179,000.

A-9: Replace Bridge #1 with a Triple 8-foot x 8-foot concrete box culvert. This recommendation would replace Bridge #1 with a Triple 8-foot x 8-foot concrete box culvert 200 feet long. The triple box culvert can be constructed without exceeding the 1,500 feet of stream impacts that would require a project specific 404 permit. Constructing the large triple 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a concrete box culvert will simplify construction, reduce future maintenance costs, and result in significant cost savings. See Note, Page 7.

The total potential savings if accepted is \$566,000.

B-5: Shift the NB off-ramp and NB on-ramp in approximately 200 feet to save R/W. This recommendation would shift / realign the NB off-ramp and NB on-ramp intersection with the Martin Road Extension approximately 200 feet closer to I-985. Shifting these ramps toward I-985 will save R/W, reduce the project's impact to the community, and reduce project cost.

The total potential savings if accepted is \$1,549,000.

C-1: Use full depth asphalt pavement in-lieu-of concrete pavement to construct the Interchange ramps. This recommendation would use full-depth asphalt pavement in lieu of PC concrete pavement for the Interchange ramps. The full depth asphalt pavement can provide a significant cost savings over PC concrete pavement even with scheduled maintenance (milling and resurfacing every 10 years).

The total potential savings if accepted is \$1,026,000.

C-2: Use asphalt pavement for the ramp shoulders in-lieu-of PC concrete. This recommendation would use asphalt pavement for the ramp shoulders in lieu of PC concrete pavement. The shoulder widths would remain the same (4-foot left shoulder and a 10-foot right shoulder). Using asphalt pavement for the ramp shoulders can provide a significant cost savings over PC concrete pavement.

The total potential savings if accepted is \$857,000.

C-2.1: ALTERNATE to C-2 Reduce the width of the PC concrete paved outside shoulder from 10 feet to 6 feet. This recommendation would keep the PC concrete ramp shoulders, but reduce the width of the right shoulders from 10 feet to 6 feet. A 4 foot reduction in paving will still provide a 6 foot paved shoulder which is sufficient to support the ramp pavement. The narrower shoulder will discourage truck parking and reduce the project cost.

The total potential savings if accepted is \$381,000.

C-2.2: ALTERNATE to C-2 Reduce the width of the PC concrete paved outside shoulder from 10 feet to 6 feet and construct it with asphalt concrete. This recommendation would replace the PC concrete ramp shoulders with asphalt shoulders and reduce the width of the right shoulders from 10 feet to 6 feet. A 4 foot reduction in paving will still provide a 6 foot paved shoulder width which is sufficient to support the ramp pavement. The narrower shoulder will discourage truck parking and reduce the project cost.

The total potential savings if accepted is \$993,000.

F-1: Construct Bridge #4 on a skew to reduce the deck area and reduce the beam size. This recommendation would skew the bridge bents parallel to the stream and use AASHTO Type I modified PSC beams. Constructing the bridge with bents parallel to the stream will reduce its length by 15 feet. Replacing the large Bulb-Tee 63-inch beams with AASHTO Type I beams will simplify construction, reduce the height of the roadway, reduce the height of the MSE walls, and reduce the cost of the project.

The total potential savings if accepted is \$201,000.

F-1.1: ALTERNATE to F-1 Replace Bridge #4 with a Double 8-foot x 8-foot concrete box culvert. This recommendation would replace Bridge #4 with a Double 8-foot x 8-foot concrete box culvert 120 feet long. The double box culvert can be constructed without exceeding the 1,500 feet of stream impacts that would require a project specific 404 permit. Constructing a double 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Using a concrete box culvert will simplify construction, reduce future maintenance, and result in significant cost savings. See Note, Page 7.

The total potential savings if accepted is \$677,000.

M-1: Construct Bridge #3 on a skew to reduce the deck area and reduce the beam size. This recommendation would skew the bridge bents parallel to the stream and use AASHTO Type I modified PSC beams. Constructing the bridge with bents parallel to the stream will reduce its length by 10 feet. Replacing the large Bulb-Tee 63-inch beams with AASHTO Type I beams

will simplify construction, reduce the height of the roadway, reduce the height of the MSE walls, and reduce the cost of the project.

The total potential savings if accepted is \$125,000.

M-1.1: ALTERNATE to M-1 Replace Bridge #3 with a Double 8-foot x 8-foot concrete box culvert. This recommendation would replace Bridge #3 with a Double 8-foot x 8-foot concrete box culvert 90 feet long. The double box culvert can be constructed without exceeding the 1,500 feet of stream impacts that would require a project specific 404 permit. Constructing a double 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Using a concrete box culvert will simplify construction, reduce future maintenance cost, and result in significant cost savings. See Note, Page 7.

The total potential savings if accepted is \$197,000.

O-1: Eliminate the sidewalk throughout the entire project. This recommendation would eliminate the concrete sidewalks throughout the entire project. The project will be constructed within an industrial area and pedestrian traffic is unlikely. The entire Martin Road Extension will be within the Interstate access control limits, thereby preventing future development from accessing any sidewalks that would be built along the Martin Road Extension.

The total potential savings if accepted is \$323,000.

O-1.1: ALTERENATE to O-1 Construct sidewalk on only one side of the roadways. This recommendation would construct concrete sidewalks on only one side of the various roadways. The project will be constructed within an industrial area and pedestrian traffic is unlikely. The entire Martin Road Extension will be within the Interstate access control limits, thereby preventing future development from accessing any sidewalks that would be built along the Martin Road Extension.

The total potential savings if accepted is \$162,000.

Idea R-1: Replace the bottomless culvert with a standard 6-foot x 6-foot concrete box culvert. This recommendation would replace the large bottomless culvert with a 6-foot x 6-foot concrete box culvert. Constructing a 6-foot x 6-foot box culvert (larger than the existing 4-foot x 4-foot box culvert under I-985) will allow for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a standard concrete box culvert will result in significant cost savings and simplify construction. See Note, Page 7.

The total potential savings if accepted is \$109,000.

X-1: Reduce the shoulder width to 12 feet on the Martin Road extension. This recommendation reduces the overall shoulder width from 16 feet to 12 feet between Thurmon Tanner Parkway and SR 13. The revised shoulder width provides adequate width for the curb & gutter and sidewalk. It would be more consistent with the shoulders widths (10 feet and 12 feet) on Thurmon Tanner Parkway and SR 13. It will reduce earthwork, project R/W, and lower the cost of the project.

The total potential savings if accepted is \$188,000.

X-4: Eliminate the dual bike lanes along SR 13 and East Martin Road and construct a single multi-purpose trail on the east side of SR 13. This recommendation eliminates the on-road bike lanes and provides for a multi-use trail along the eastern side of SR 13. Providing dual bike lanes in the approach roadways to the SR 13 / Martin Road intersection will further complicate and widen the intersection. The intersection approaches already contain dual through lanes, dual left turn lanes and right turn lanes. Moving the bike lanes out of the intersection roadways and placing them on a multi-use trail will eliminate bike traffic from the intersection.

The total potential savings if accepted is \$65,000.

X-5: End the reconstruction of the H. F. Reed Industrial Connector at Station 99. This recommendation would shorten the extension of the H.F. Reed Industrial Parkway approximately 1,000 feet and match the existing two-lane section near Station 99. The current design includes roadway widening well beyond what is required for the intersection improvements and new lane configurations. Reducing the length of the H.F. Reed Industrial Connector widening will save cost and accelerate construction.

The total potential savings if accepted is \$386,000.

Idea X-6: Reduce the median width 4 feet for the Martin Road Extension. This recommendation reduces the Martin Road Extension variable median width four feet. This concept maintains a divided roadway typical section while reducing the overall roadway footprint by four feet. Reducing the roadway footprint will reduce the earthwork, the amount of paved concrete median, and the amount of R/W needed for the project.

The total potential savings if accepted is \$336,000.

X-7: Construct 11-foot lanes in-lieu-of 12-foot lanes on the Martin Road Extension. This recommendation reduces the 12-foot lane widths on Martin Road to 11feet between Thurmon Tanner Parkway and SR 13. Constructing 11-foot lanes on the Martin Road Extension will accommodate the 45 MPH design speed and the projected (2032) ADT traffic of 21,670 with 8% trucks. Reducing the pavement width will save R/W, embankment, pavement, and bridge deck.

The total potential savings if accepted is \$344,000.

X-10: Reduce the length of the turn lane storage areas to the lengths shown in the traffic study report. This recommendation reduces the lengths of the right / left turn lane storage areas to the lengths shown in the traffic study report. This concept provides the required amount of right / left turn lane storage areas to meet the turning conditions shown in the traffic study report. Eliminating the unneeded storage areas reduces the amount of pavement and construction time.

The total potential savings if accepted is \$331,000.

X-12: Reduce the R/W acquisition and buy slope easements. This recommendation would designate a standard 140-foot R/W footprint and use construction easements to acquire any additional areas needed to construct slopes. This concept reduces the amount of R/W required for the project by acquiring construction easements instead of purchasing R/W for required slope maintenance.

The total potential savings if accepted is \$613,000.

Note: Several of the VE team's ideas propose substituting standard concrete box culverts in lieu of bridge crossings. For these recommendations, the VE Team designated a nominal sized hydraulic opening and developed the associated costs based on the designated sized opening. These openings were not developed based on any hydraulic information and a detailed hydrologic study should be completed as part of the project's ongoing design and for proper evaluation of the recommendations. Also, these ideas will introduce additional stream buffer impacts however due to the overall project benefits and project schedule status as long range they should be considered.

New I-985 Interchange
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	SAVINGS POTENTIAL * (%)
RECOMMENDATIONS							
A-3	Reduce the beam size on Bridges #1 & #2 to simplify construction, reduce the height of the roadway, and reduce cost.	\$620,000	\$441,000	\$179,000	N/A	\$179,000	100%
A-9	Replace Bridge #1 with a Triple 8-foot x 8-foot concrete box culvert.	\$1,156,000	\$590,000	\$566,000	N/A	\$566,000	100%
B-5	Shift the NB off-ramp and NB on-ramp in approximately 200 feet to save R/W.	\$1,549,000	\$0	\$1,549,000	N/A	\$1,549,000	100%
C-1	Use full depth asphalt pavement in-lieu-of concrete pavement to construct the Interchange ramps.	\$2,792,000	\$1,489,000	\$1,303,000	(\$277,000)	\$1,026,000	100%
C-2	Use asphalt pavement for the ramp shoulders in-lieu-of PC concrete	\$1,429,000	\$572,000	\$857,000	N/A	\$857,000	100%
C-2.1	<u>ALT to C-2</u> Reduce the PC concrete paved outside shoulder from 10 feet to 6 feet.	\$1,429,000	\$1,048,000	\$381,000	N/A	\$381,000	100%
C-2.2	<u>ALT to C-2</u> Reduce the PC concrete paved outside shoulder from 10 feet to 6 feet and construct them with asphalt.	\$1,429,000	\$436,000	\$993,000	N/A	\$993,000	100%
F-1	Construct Bridge #4 on a skew to reduce the deck area and reduce the	\$879,000	\$678,000	\$201,000	N/A	\$201,000	100%

New I-985 Interchange
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	SAVINGS POTENTIAL * (%)
	beam size.						
F-1.1	<u>ALT to F-1</u> Replace Bridge #4 with a double 8-foot x 8-foot box culvert.	\$879,000	\$202,000	\$677,000	N/A	\$677,000	100%
M-1	Construct Bridge #3 on a skew to reduce the deck area and reduce the beam size.	\$346,000	\$221,000	\$125,000	N/A	\$125,000	100%
M-1.1	<u>ALT to M-1</u> Replace Bridge #3 with a double 8-foot x 8-foot box culvert.	\$346,000	\$149,000	\$197,000	N/A	\$197,000	100%
O-1	Eliminate the sidewalk throughout the entire project.	\$323,000	\$0	\$323,000	N/A	\$323,000	100%
O-1.1	<u>ALT to O-1</u> Construct sidewalk on only one side of the roadways.	\$323,000	\$161,000	\$162,000	N/A	\$162,000	100%
R-1	Replace the bottomless culvert with a standard 6-foot x 6-foot box culvert.	\$186,000	\$77,000	\$109,000	N/A	\$109,000	100%
X-1	Reduce the shoulder width to 12 feet on the Martin Road extension.	\$188,000	\$0	\$188,000	N/A	\$188,000	100%
X-4	Eliminate the dual bike lanes along SR 13 and East Martin Road and construct a single multi-purpose trail on the east side of SR 13.	\$89,000	\$24,000	\$65,000	N/A	\$65,000	100%
X-5	End the reconstruction of Industrial Connector at Station 99.	\$386,000	\$0	\$386,000	N/A	\$386,000	100%

New I-985 Interchange
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	SAVINGS POTENTIAL * (%)
X-6	Reduce the median width 4 feet for the Martin Road Extension.	\$336,000	\$0	\$336,000	N/A	\$336,000	100%
X-7	Construct 11-foot lanes in-lieu-of 12-foot lanes on the Martin Road Extension.	\$344,000	\$0	\$344,000	N/A	\$344,000	100%
X-10	Reduce the length of the turn lane storage areas to the lengths shown in the traffic study report.	\$338,000	\$7,000	\$331,000	N/A	\$331,000	100%
X-12	Reduce the R/W acquisition and buy slope easements.	\$1,217,000	\$604,000	\$613,000	N/A	\$613,000	100%
	* Note: Savings Potential represents how much of an individual item, exclusive of any overlapping dependent items, can be implemented.						

STUDY IDENTIFICATION

Study Identification

Project: New I-985 Interchange	Date: February 1-4, 2010
Location: Hall County	

VE Team Members

Name:	Title:	Organization:	Telephone:
George Obaranec	Construction	MACTEC	770-421-3346
Steve Bitney	Roadway Design	StreetSmarts	770-813-0882
Aruna Sastry	Structures	Sastry & Assoc.	678-366-9375
Keith Borkenhagen	VE Team Facilitator	MACTEC	623-556-1875

Project Description

This project will construct a new diamond Interchange on I-985 near Martin Road between Exit 12 (Spout Springs Road / City of Flowery Branch) and exit 16 (SR 53 / City of Oakwood). The new Interchange will join with a new Martin Road Connector roadway that will connect SR 13 on the east side with Thurmon Tanner Parkway on the west side. The new roadway will be a divided four-lane facility with a variable width (20 feet – 32 feet) raised median and be constructed on new location. The roadway will have 16-foot urban shoulders with curb, gutter, and sidewalks. The new Martin Road Connector will cross over I-985 on a 212-foot long by 98.41-foot wide bridge. The current design also includes several other bridges for the Martin Road Connector and the SB ramps to cross identified streams on the west side of the proposed Interchange.

The project also includes major upgrades to the new Martin Road Connector intersections with SR 13 and Thurmon Tanner Parkway and the extension of Industrial Connector Road west of Thurmon Tanner Parkway. The new Interchange will provide access to the adjacent industrial area and provide traffic relief for the I-985 / Spout Springs Road Interchange. Major contract work items include grading, drainage, roadway embankment, asphalt concrete pavement, PC concrete pavement, MSE walls, four bridges, curb and gutter, and concrete sidewalk. The total estimated project cost including right-of-way (R/W) is \$37.5 million. The design is currently in the concept stage.

Project Restrictions:

The VE team was advised of several restrictions to consider when developing their recommendations. The restrictions were:

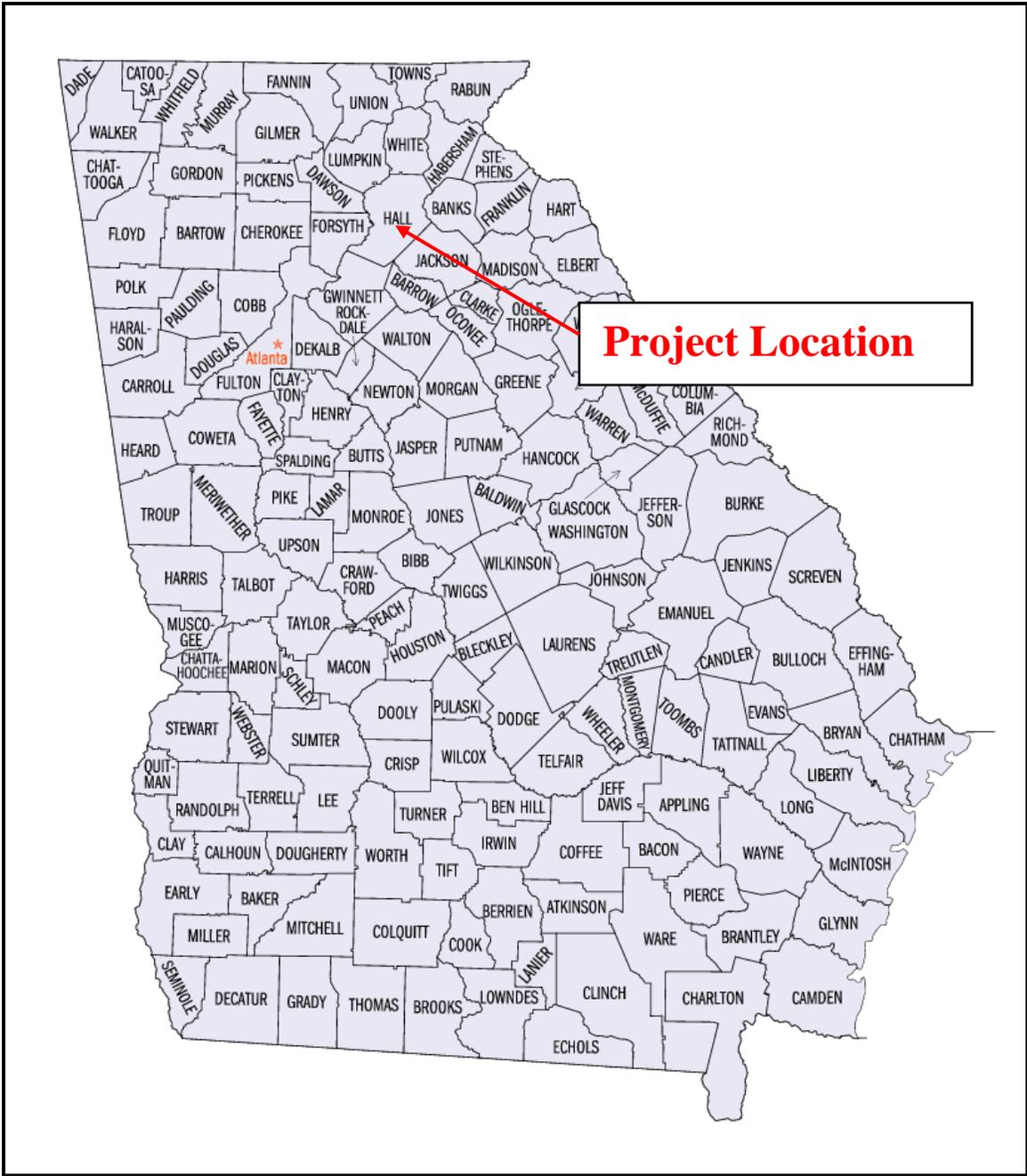
- to minimize the amount of R/W required by the project,
- to minimize the project's impact on the various streams (intermittent and perennial) found on the west side of the project,
- to minimize the project's impact on identified wetlands, and
- to accommodate the county bicycle trails in the area.

Project Briefing:

The VE team was given a design briefing on the current status of the project by Raju Shah, of R. K. Shah & Associates, Inc. The following items were discussed:

- The project involves the construction of a new I-985 Interchange to provide access to the local industrial area and provide traffic relief for the nearby Interchanges.
- The Interchange will connect to a new crossroad (Martin Road Connector). This crossroad will connect to SR 13 on the east and Thurmon Tanner Parkway on the west.
- The new Martin Road Connector will cross over I-985. It will be a divided four-lane urban roadway with a raised median, curb and gutter, and sidewalks. Martin Road will have 16-foot urban shoulders even though Thurmon Tanner Parkway has 10-foot shoulders and SR 13 has 12-foot shoulders.
- The Interchange has several bridges in it to cross over small streams on the west side of I-985. Both the Martin Road Connector and the SB ramps cross the same stream.
- The project is in the early design stage. A draft concept report and environmental assessment has been prepared, but not signed. The project Ecology Report has been approved which specifies the three bridge stream crossings. However, the report indicates that the project has over 700 feet of available stream impacts before it would reach the 1,500 feet of stream impacts that would require a project specific 404 analysis.
- The FHWA has not approved the Interchange Justification Report. The report has traffic projections for years 2012 / 2032 and the FHWA has asked for a traffic update for the years 2015 / 2035.
- SR 13 is currently a two-lane roadway. It is not currently scheduled to be up graded. SR 13 is on the County's bicycle route system.
- The proposed Martin Road Connector Bridge over I-985 will accommodate an ultimate eight-lane I-985 and has been designed with an extra one-foot of vertical clearance to accommodate a possible future overlay of I-985.
- I-985 has a design speed of 70 MPH while the crossroad has a design speed of 45 MPH.

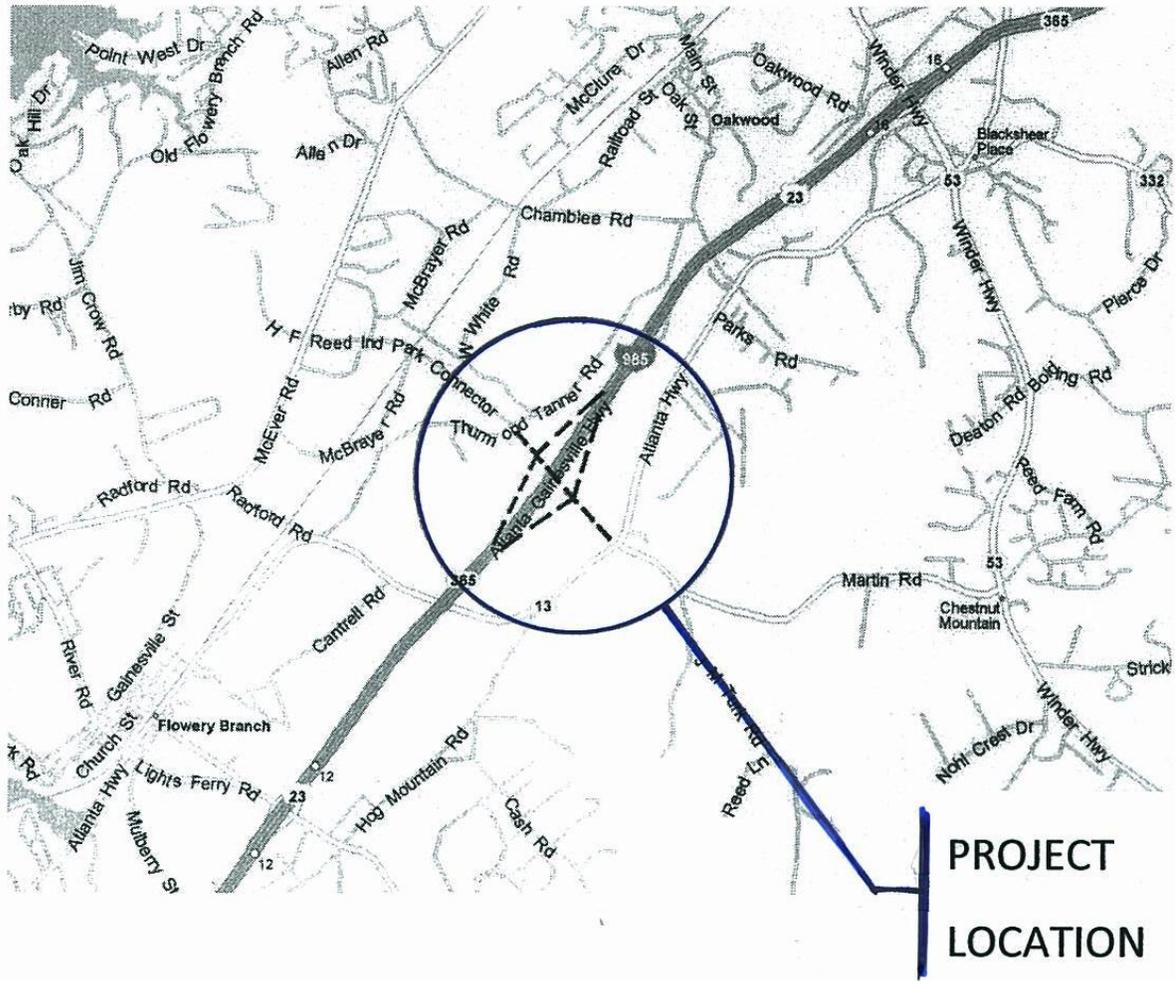
Figure 1
Project Vicinity Map



County Map of Georgia

Project Sketch Map

Project Sketch Map



VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.:
A3

Sheet No.:
1 of 3

CREATIVE IDEA:
Reduce the size of the PSC beams on Bridges #1 & #2 to simplify construction and reduce the height of the roadway.

Comp By: AS Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design utilizes a single span 108'-0" PSC Bulb-Tee 63 inch beams for Bridge #1 and two-span 212'-0" PSC Bulb-Tee 74 inch beams for Bridge #2. The design includes MSE wall abutments (end bents). The current design for Bridge #2 also provides an extra 1-foot of vertical clearance (above the minimum 17'-0" required). This additional height addresses the possibility that future I-985 reconstruction could take place on top of the existing pavement.

Proposed Change:

This recommendation replaces the PSC Bulb-Tee 63 inch beams for Bridge #1 and PSC Bulb-Tee 74 Inch beams for Bridge #2 with PSC Bulb Tee 54 inch beams.

Justification:

Using the Bulb-Tee 54 inch beams will reduce the vertical profile of Bridge # 1 by 9 inches and Bridge #2 by 20 inches. Using the smaller Bulb-Tee 54 inch beams will result in improved constructability and reduce the cost of the project. The smaller beams would also reduce the overall height of roadway.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$620,000		
- Proposed	\$441,000		
- Savings	\$179,000		\$179,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$179,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

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

Current Bridges

Bridge #1 – Single span 108 ft long x 98.41 ft wide

Bridge #2 – Dual spans 106 ft long x 2 x 98.41 ft wide

Use of BT 63 beams 2,350 LF

Cost of beams $2,350 \times \$155.09 / \text{ft} = \$364,461.50$

Use of BT 74 beams 1500 LF

Cost of beams $1,500 \times \$168.38 / \text{ft} = \$252,570.00$

VE Recommended Bridge:

Use BT 54 beams 3,840 LF

Cost of beams $3,840 \times \$114.77 / \text{ft} = \$440,717$

Embankment Reduction:

$(200 \text{ ft. long} \times 2.2 \text{ ft high} \times 98.41 \text{ ft wide}) \times \frac{1}{2} = 21,650 \text{ CF} / 27 = 802 \text{ CY}$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: A-9	Sheet No.: 1 of 4	CREATIVE IDEA: Replace Bridge #1 with a Triple 8-foot x 8-foot concrete box culvert.
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Comp By: AS Date: 02/04/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The proposed Bridge #1 is a three-span structure that is 108 feet long and 90.41 feet wide. It uses PSC Bulb-Tee 63-inch beams and MSE wall abutments (end bents). The bridge has its abutments perpendicular to the roadway. Constructing a bridge will reduce the project’s impact on Stream #16.

Proposed Change:

This recommendation would replace Bridge #1 with a triple 8-foot x 8-foot concrete box culvert 200 feet long.

Justification:

The most recent update of the project’s Ecology Report states that the project is over 700 feet short of the 1,500 feet of stream impacts that would require a project specific 404 permit. The triple box culvert can be constructed without exceeding the 1,500 foot limit.

Constructing a large triple 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a concrete box culvert will simplify construction and result in significant cost savings. The box culvert concept will also reduce future maintenance cost since there would be no bridge to maintain.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$1,156,000		
- Proposed	\$590,000		
- Savings	\$566,000		\$566,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$566,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: A-9
Client: GDOT
Sheet 4 of 4

Current Bridge:

Bridge #1 Single span 108 ft long x 98.41 ft wide

Estimate combines Bridge #1 & 2, MSE walls, traffic barrier, etc. = \$3,424,000

Bridge #1 proportional cost = $\$3,424,000 / 320 \text{ ft} = \$107,000 \times 108 \text{ ft} = \$1,156,000$

VE- Concrete Box Culvert Concept:

Triple 8' X 8' Georgia Standard Concrete Box Culvert

Triple Box = $3.028 \text{ CY} / \text{LF} \times 200 \text{ ft. long} = 605.6 \text{ CY} @ \$557.82 = \$337,816$

Reinforcing Steel = $343 \text{ LB} / \text{LF} \times 200 \text{ ft. long} = 68,600 \text{ LB} @ \$0.69 = \$47,334$

Total Cost = \$385,150

Additional Embankment:

Martin Road Grade = 4.25% Assume Fill Height over Triple Box = $30 \text{ ft} - 8.5 \text{ ft} = 21.5 \text{ ft}$

Fill east of box:

$(100 \text{ ft} \times 25 \text{ ft ave} \times 200 \text{ ft}) + 2 \times (50 \text{ ft} \times 25 \text{ ft ave} \times \frac{1}{2} \times 200) = 500,000 \text{ CF} + 250,000 \text{ CF}$

Fill west of box:

$(100 \text{ ft} \times 14 \text{ ft ave} \times 200 \text{ ft}) + 2 \times (28 \text{ ft} \times 14 \text{ ft ave} \times \frac{1}{2} \times 200 \text{ ft}) = 280,000 \text{ CF} + 78,400 \text{ CF}$

Fill over box:

$25 \text{ ft} \times 21.5 \text{ ft} \times 200 \text{ ft} = 107,500 \text{ CF}$

Total Fill = $1,215,900 \text{ CF} / 27 \text{ CF} / \text{CY} = 45,033 \text{ CY} @ \$3.79 = \$170,675$

Guardrail = 2 @ 450 ft = 900 ft

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: B-5	Sheet No.: 1 of 4	CREATIVE IDEA: Shift the NB off-ramp and NB on-ramp in approximately 200 feet to save R/W.
-------------------------	-----------------------------	--

Comp By: GAO Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept: Keep ramp alignment as proposed

The current design has the NB off-ramp and NB on-ramp intersection with Martin Road approximately 400 feet east of the centerline of I-985.

Proposed Change:

This recommendation would shift / realign the NB off-ramp and NB on-ramp intersection with the Martin Road Extension approximately 200 feet closer to I-985.

Justification:

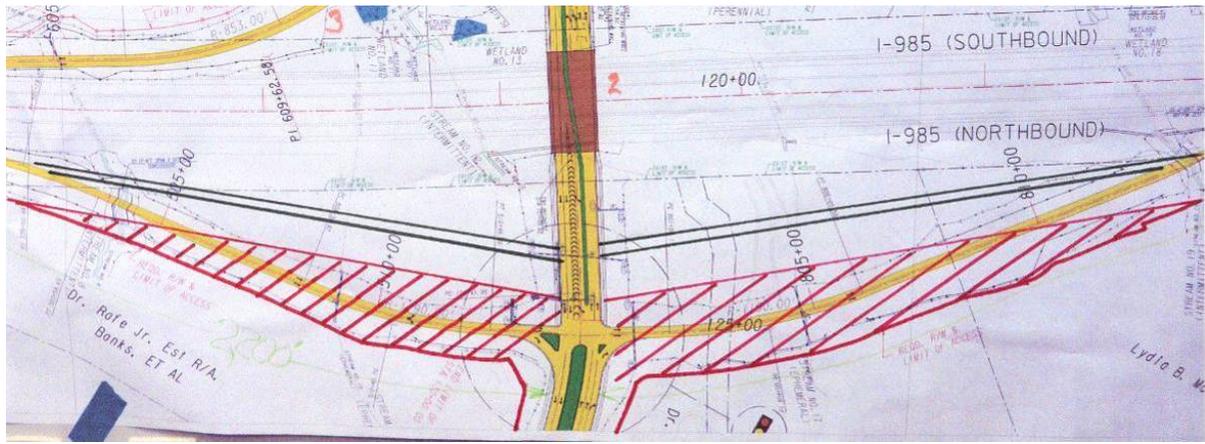
Shifting the NB off-ramp and NB on-ramp 200 feet closer to I-985 will still maintain about 700 feet between ramp interchanges (provides more than the 660 feet required for intersections). Shifting these ramps in toward I-985 will save R/W, reduce the project's impact to the community, and reduce project cost.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$1,549,000		
- Proposed	\$0		
- Savings	\$1,549,000		\$1,549,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			1,549,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: B-5
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: B-5
Client: GDOT
Sheet 4 of 4

R/W Cost per acre

Fee acquisition = \$2.61 per SF

Mark-up: = Total cost / net cost = \$16,641,400 / \$6,710,242 = 2.4799

R/W = \$2.61 / SF x 43,560 SF / AC x 2.4799 = \$281,943 per acre **Use \$282,000 / AC**

R/W Reduction:

NB on-ramp (scaled)

$(800 \text{ ft} \times 140 \text{ ft}) + (450 \text{ ft} \times 110 \text{ ft} \times \frac{1}{2}) = 112,000 + 24,750 = 136,750 \text{ SF}$

NB off-ramp

$(600 \text{ ft} \times 125 \text{ ft}) + (500 \text{ ft} \times 110 \text{ ft} \times \frac{1}{2}) = 75,000 + 27,500 = 102,500 \text{ SF}$

Total area = 136,750 SF + 102,500 SF = 239,250 SF / 43,560 SF / AC = 5.4924 AC

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: C-1	Sheet No.: 1 of 5	CREATIVE IDEA: Use full depth asphalt pavement in-lieu-of PC concrete pavement to construct the Interchange ramps
-------------------------	-----------------------------	---

Comp By: GAO Date: 02/02/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design includes PC concrete pavement for the Interchange ramps. The pavement section consists of 8 inches of plain PC pavement, 3 inches of asphalt, and 12 inches of GAB. The two-lane ramps include the same PC Pavement section for the 10-foot outside and 4-foot inside shoulders.

Proposed Change:

This recommendation would use full-depth asphalt pavement in lieu of PC concrete pavement for the Interchange ramps.

Justification:

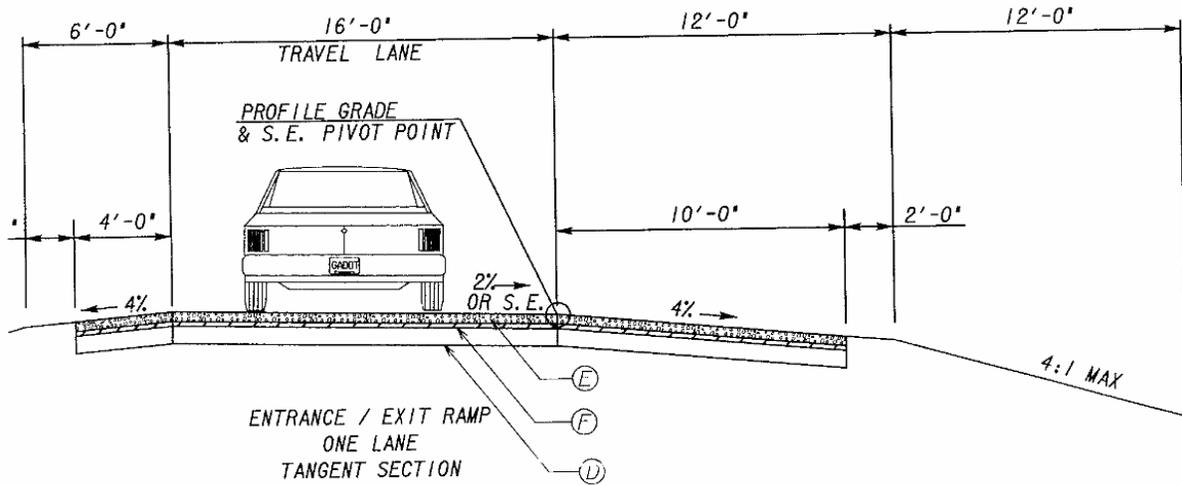
The current GDOT practice is to use PC concrete pavement for all Interstate ramps. PC concrete pavement does not rut in the approach areas to the cross road intersection. However, full depth asphalt pavement can provide a significant cost savings over PC concrete pavement even with scheduled maintenance (milling and resurfacing every 10 years).

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$2,792,000		
- Proposed	\$1,489,000		
- Savings	\$1,303,000		\$1,303,000
FUTURE COST: – Savings		\$277,000	(\$277,000)
TOTAL PRESENT WORTH SAVINGS			\$1,026,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: C-1
Client: GDOT
Sheet 2 of 5



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: C-1
Client: GDOT
Sheet 4 of 5

Pavement Cost:

Current PC Pavement Section

8-inch plain PC concrete + 3 inches asphalt + 12 inches GAB

\$55.00 / SY for 8-inch plain PC pavement

Asphalt (3/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.01875 Ton/SF

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

Cost per SY

$\$55 + (0.01875 \text{ Ton/SF} \times 9 \text{ SF} / \text{SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton/SF} \times 9 \text{ SF} / \text{SY} \times \$15 / \text{Ton}) =$
 $\$55 + \$9.79 + \$9.11 = \$73.90 / \text{SY}$ **USE: \$75 per SY**

VE Pavement Concept:

Asphalt pavement: 9 ½ in asphalt + 12 inch GAB

(9.5/12 ft) (150 #/CF) (1 ton / 2000 #) = 0.059375 ton/SF

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

Cost per SY

$(0.059375 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$58 / \text{ton}) + (0.0675 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$15 / \text{ton}) =$
 $\$30.99 + \$9.11 = \$40.10 / \text{SY}$ **USE: \$40 per SY**

Area of ramps

SE = (1,000 ft x 38 ft) + (500 ft x 30 ft) + (750 ft x 26 ft) = 38,000 SF + 15,000 SF + 19,500 SF = 72,500 SF

SW = (1,200 ft x 38 ft) + (1,800 ft x 24 ft) = 45,600 SF + 43,200 SF = 88,800 SF

NE = (1,300 ft x 38 ft) + (2,000 ft x 26 ft) = 49,400 SF + 52,000 SF = 101,400 SF

NW = (1,200 ft x 38 ft) + (1,100 ft x 26 ft) = 45,600 SF + 28,600 SF = 72,400 SF

Total = 335,100 SF / 9 SF / SY = **37,233 SY**

Life-Cycle Costs:

Mill 1 ½ in: 35,567 SY x \$2.00 / SY = \$71,134

1 ½ in overlay: (1.5/12 ft) (150 #/CF) (1 ton / 2,000 #) = 0.009375 ton/SF

0.009375 ton / SF x 35,567 SY x 9 SF/SY = 3,001 tons USE 3,000

3,000 x \$58.00 = \$174,000

Total Mill & Overlay Cost = \$71,134 + \$174,000 = \$245,134 **Use \$245,000**

See LCC Worksheet

Development Phase – Life Cycle Cost Worksheet

Creative Idea: C-1

Client:

Recommendation: Use Asphalt Pavement in-lieu-of PC
Concrete Pavement

Sheet 5 of 5

Discount Rate: 4%

Economic Life: 20 Yrs.

	Original Design		Alternate No. 1	
1. Initial Cost:	\$2,792,000	\$2,792,000	\$1,489,000	\$1,489,000
Single Expenditures: (i.e. stage const. or major maintenance)				
a. Year 10 PWF 0.6756	\$0	\$0	\$245,000	\$165,522
b. Year 20 PWF 0.4564	\$0	\$0	\$245,000	\$111,818
c. Year _____ PWF _____				
d. Salvage / Unused Service Life Year _____ PWF _____				
2. Future Single Costs:				\$277,340
Annual Costs:				
a. General Maintenance PWF _____				
b. Other Annual Costs PWF _____				
3. Future Annual Costs:				
4. Total Future Costs: (2 + 3)		\$0		\$277,340
5. Total Life Cycle Costs: (1 + 4)		\$2,792,000		\$1,766,340

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: C-2	Sheet No.: 1 of 4	CREATIVE IDEA: Use asphalt pavement for the ramp shoulders in-lieu-of PC concrete shoulders.
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Comp By: GAO Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design includes PC concrete pavement for the Interchange ramps. The pavement section consists of 8 inches of plain PC pavement, 3 inches of asphalt, and 12 inches of GAB. The two-lane ramps include the same PC Pavement section for the 10-foot outside and 4-foot inside shoulders.

Proposed Change:

This recommendation uses full depth asphalt pavement for the ramp shoulders in-lieu-of PC concrete pavement. The shoulder widths would remain the same (4-foot left shoulder and a 10-foot right shoulder).

Justification:

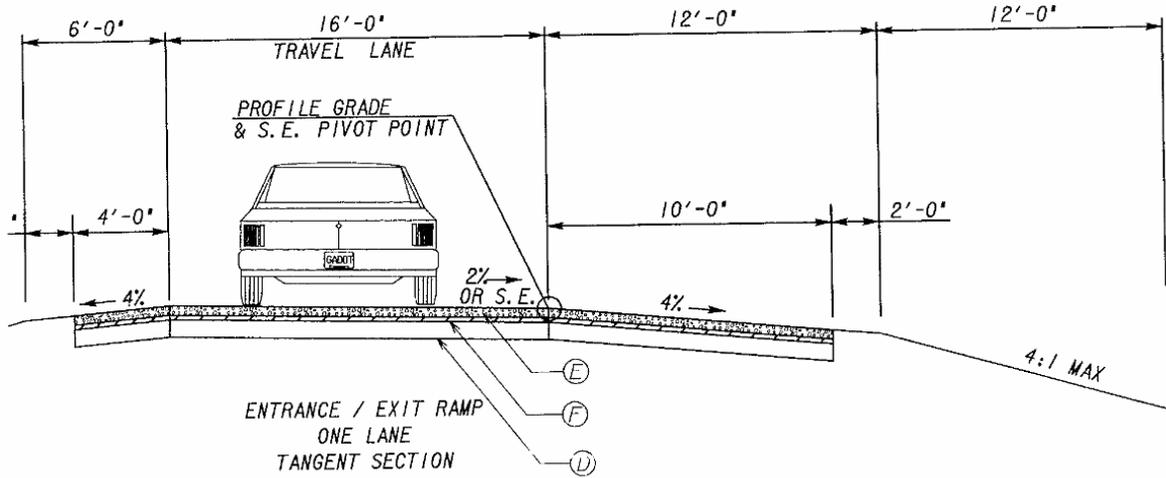
The current GDOT practice is to use PC concrete pavement for all Interstate ramps. However, using full depth asphalt pavement for the ramp shoulders can provide a significant cost savings over PC concrete pavement.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<u>INITIAL COST:</u> - Original	\$1,429,000		
- Proposed	\$572,000		
- Savings	\$857,000		\$857,000
<u>FUTURE COST:</u> – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$857,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: C-2
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: C-2
Client: GDOT
Sheet 4 of 4

Pavement Cost Breakdown:

Current PC Pavement Section Including Shoulders

8-inch plain PC concrete + 3 inches asphalt + 12 inches GAB

\$55.00 / SY for 8-inch plain PC pavement

Asphalt (3/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.01875 Ton/SF

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

Cost per SY

$\$55 + (0.01875 \text{ Ton/SF} \times 9 \text{ SF / SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton/SF} \times 9 \text{ SF / SY} \times \$15 / \text{Ton}) =$
 $\$55 + \$9.79 + \$9.11 = \$73.90 / \text{SY}$ **USE: \$75 per SY**

VE Shoulder Design Concept

Asphalt shoulder pavement: Assume 6-inches of asphalt + 12 inches GAB

Asphalt (6/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.0375 Ton/SF

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

Cost per SY

$(0.0375 \text{ Ton / SF} \times 9 \text{ SF / SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton / SF} \times 9 \text{ SF / SY} \times \$15 / \text{Ton}) =$
 $\$19.57 + \$9.11 = \$28.68 / \text{SY}$ **USE: \$30 per SY**

Length of Ramps:

SE – 2,200 LF

SW – 3,650 LF

NE – 3,900 LF

NW – 2,500 LF

Total = 12,250 LF

Shoulder widths = 10 ft + 4 ft = 14 ft

Area = 12,250 ft x 14 ft = 171,500 SF / 9 SF / SY = 19,056 SY

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: C-2.1	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce the width of the right PC concrete ramp shoulder from 10 feet to 6 feet.
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Comp By: GAO Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design includes PC concrete pavement for the Interchange ramps. The pavement section consists of 8 inches of plain PC pavement, 3 inches of asphalt, and 12 inches of GAB. The two-lane ramps include the same PC Pavement section for the 10-foot outside and 4-foot inside shoulders.

Proposed Change:

This recommendation would keep the PC concrete ramp shoulders, but reduce the width of the right shoulders from 10 feet to 6 feet.

Justification:

The shoulders along the ramps are 12 feet wide to the break point. A 4 foot reduction in paving will still provide a 6 foot paved shoulder which is sufficient to support the ramp pavement. A narrower shoulder will discourage truck parking. This concept will reduce the project cost while still providing the same function.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$1,429,000		
- Proposed	\$1,048,000		
- Savings	\$381,000		\$381,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$381,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: C-2.1

Client: GDOT

Sheet 3 of 3

Pavement Cost Breakdown:

Current PC Pavement Section Including Shoulders

8-inch plain PC concrete + 3 inches asphalt + 12 inches GAB

\$55.00 / SY for 8-inch plain PC pavement

Asphalt (3/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.01875 Ton/SF

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

Cost per SY

$\$55 + (0.01875 \text{ Ton/SF} \times 9 \text{ SF} / \text{SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton/SF} \times 9 \text{ SF} / \text{SY} \times \$15 / \text{Ton}) =$
 $\$55 + \$9.79 + \$9.11 = \$73.90 / \text{SY}$ **USE: \$75 per SY**

VE Shoulder Design Concept:

4 ft Left & 6 ft Right PC Concrete Shoulders:

Length of Ramps:

SE – 2,200 LF

SW – 3,650 LF

NE – 3,900 LF

NW – 2,500 LF

Total = 12,250 LF

Shoulder widths = 6 ft + 4 ft = 10 ft

Area = 12,250 ft x 10 ft = 122,500 SF / 9 SF / SY = **13,611 SY**

Additional earthwork & seeding

Area = 12,250 ft x 4 ft = 49,000 SF / 9 SF / SY = **5,444 SY**

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: C-2.2	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce the width of the right PC concrete ramp shoulder from 10 feet to 6 feet and construct it with full depth asphalt.
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Comp By: GAO Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design includes PC concrete pavement for the Interchange ramps. The pavement section consists of 8 inches of plain PC pavement, 3 inches of asphalt, and 12 inches of GAB. The two-lane ramps include the same PC Pavement section for the 10-foot outside and 4-foot inside shoulders.

Proposed Change:

This recommendation would replace the PC concrete ramp shoulders with full depth asphalt shoulders and reduce the width of the right shoulders from 10 feet to 6 feet.

Justification:

The shoulders along the ramps are 12 feet wide to the break point. A 4 foot reduction in paving will still provide a 6 foot paved shoulder width which is sufficient to support the ramp pavement. A narrower shoulder will discourage truck parking. This concept will reduce the project cost while still providing the same function.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$1,429,000		
- Proposed	\$436,000		
- Savings	\$993,000		\$993,000
FUTURE COST: – Savings			
TOTAL PRESENT WORTH SAVINGS			\$993,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: C-2.2

Client: GDOT

Sheet 3 of 3

Pavement Cost Breakdown:

Current PC Pavement Section Including Shoulders

8-inch plain PC concrete + 3 inches asphalt + 12 inches GAB

\$55.00 / SY for 8-inch plain PC pavement

Asphalt (3/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.01875 Ton/SF

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

Cost per SY

$\$55 + (0.01875 \text{ Ton/SF} \times 9 \text{ SF / SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton/SF} \times 9 \text{ SF / SY} \times \$15 / \text{Ton}) =$
 $\$55 + \$9.79 + \$9.11 = \$73.90 / \text{SY}$ **USE: \$75 per SY**

VE Shoulder Design Concept:

4 ft Left & 6 ft Right Asphalt Shoulders: Assume 6-inches of asphalt + 12 inches GAB

Asphalt (6/12 ft) (150 #/CF) (1 Ton / 2000 #) = 0.0375 Ton/SF

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

Cost per SY

$(0.0375 \text{ Ton / SF} \times 9 \text{ SF / SY} \times \$58 / \text{Ton}) + (0.0675 \text{ Ton / SF} \times 9 \text{ SF / SY} \times \$15 / \text{Ton}) =$
 $\$19.57 + \$9.11 = \$28.68 / \text{SY}$ **USE: \$30 per SY**

Length of Ramps:

SE – 2,200 LF

SW – 3,650 LF

NE – 3,900 LF

NW – 2,500 LF

Total = 12,250 LF

Shoulder widths = 6 ft + 4 ft = 10 ft

Area = 12,250 ft x 10 ft = 122,500 SF / 9 SF / SY = **13,611 SY**

Additional earthwork & seeding

Area = 12,250 ft x 4 ft = 49,000 SF / 9 SF / SY = **5,444 SY**

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: F-1	Sheet No.: 1 of 4	CREATIVE IDEA: Construct Bridge #4 on skew instead of rectangular to reduce the deck area and use smaller beams.
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Comp By: AS Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The proposed Bridge #4 is a three-span structure that is 125 feet long and 40.41 feet wide. It uses PSC Bulb-Tee 63-inch beams and MSE wall abutments (end bents). The bridge has its abutments perpendicular to the roadway.

Proposed Change:

This recommendation would skew the bridge bents parallel to the stream and use AASHTO Type I modified PSC beams.

Justification:

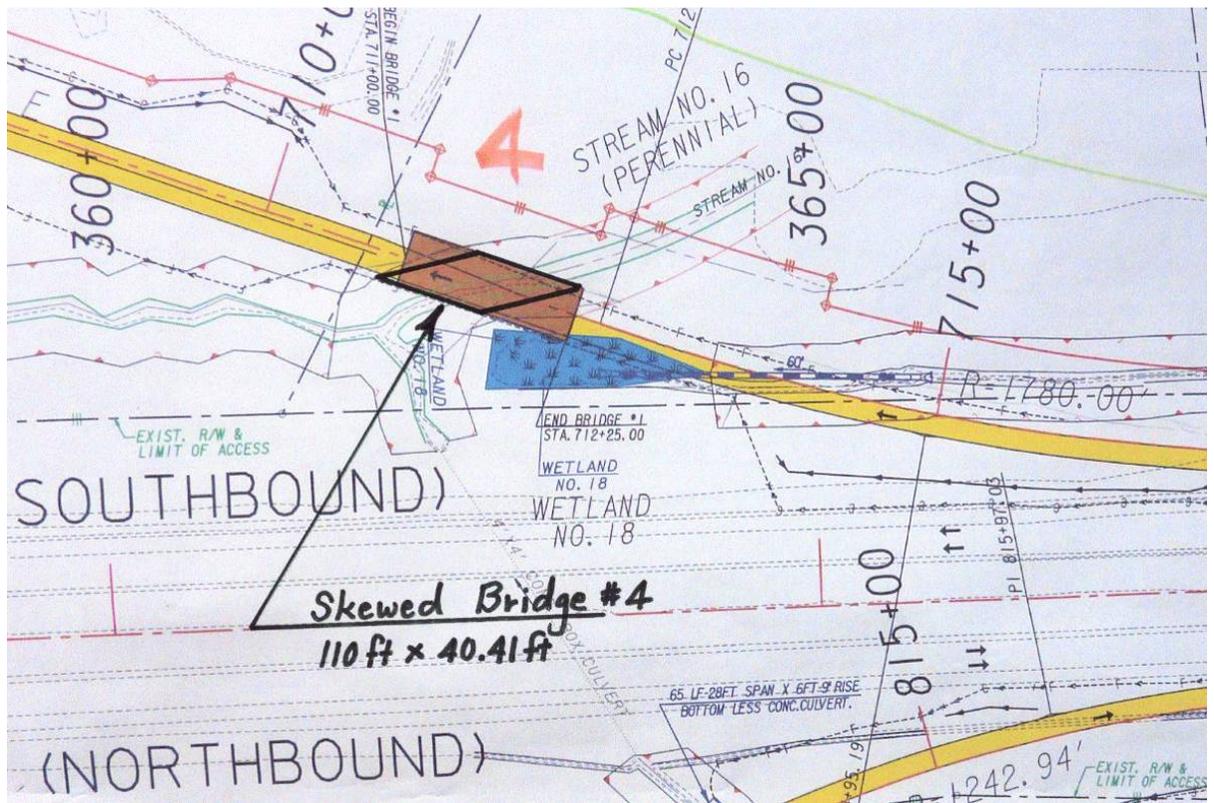
Constructing the bridge with bents parallel to the stream will reduce its length by 15 feet. Replacing the large Bulb-Tee 63-inch beams with AASHTO Type I beams will simplify construction, reduce the height of the roadway by 2 feet 11 inches, reduce the height of the MSE walls, and reduce the cost of the project.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$879,000		
- Proposed	\$678,000		
- Savings	\$201,000		\$201,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$201,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: F-1
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: F-1
Client: GDOT
Sheet 4 of 4

Current Bridge:

Bridge #4 Three span 125ft long x 40.41 ft wide

Uses BT 63 Beams 5,051 SF @ \$81.28 / SF = \$410,545

MSE wall 10-20 ft height 11,200 SF @ \$34.30 / SF = \$384,160

Traffic Barrier H for Walls 560 LF @ \$150 / LF = \$84,000

Total Cost = \$878,705

VE Bridge Concept:

Bridge #4 – Three span 110 ft long x 40.41ft wide

Use AASHTO Type I (Mod) Beams 4,445 SF @ \$53.95 / SF = \$239,808

MSE wall 10-20 ft height 10,338 SF @ \$34.3 / SF = \$354,593

Traffic Barrier H for Walls 560 LF @ \$150/LF = \$84,000

Total Cost = \$678,401

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: F-1.1	Sheet No.: 1 of 4	CREATIVE IDEA: <u>Alternative to F-1</u> Replace Bridge #4 with a Double 8-foot x 8-foot concrete box culvert.
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Comp By: AS Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The proposed Bridge #4 is a three-span structure that is 125 feet long and 40.41 feet wide. It uses PSC Bulb-Tee 63-inch beams and MSE wall abutments (end bents). The bridge has its abutments perpendicular to the roadway. Constructing a bridge will reduce the project's impact on Stream #16.

Proposed Change:

This recommendation would replace Bridge #4 with a Double 8-foot x 8-foot concrete box culvert 120 feet long.

Justification:

The most recent update of the project's Ecology Report states that the project is over 700 feet short of the 1,500 feet of stream impacts that would require a project specific 404 permit. The double box culvert can be constructed without exceeding the 1,500 foot limit.

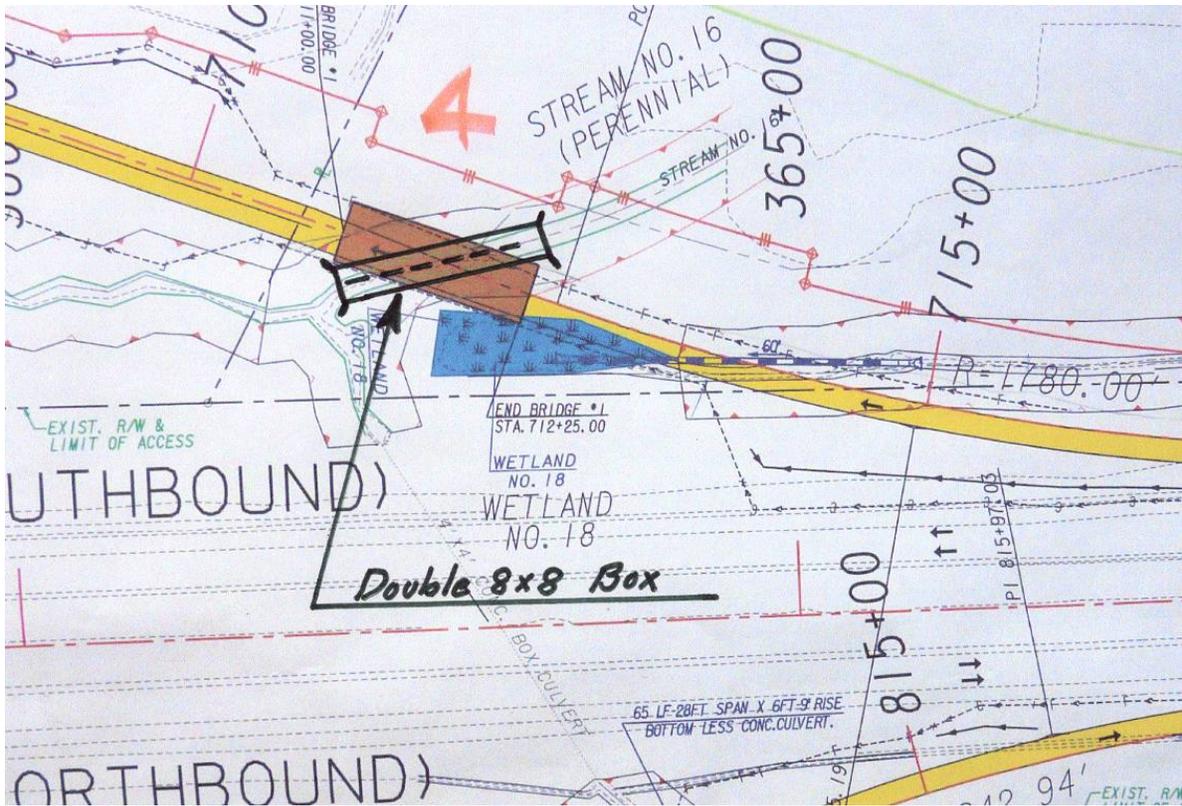
Constructing a large double 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a standard double concrete box culvert will simplify construction and result in significant cost savings. The box culvert concept will also reduce future maintenance cost since there would be no bridge to maintain.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<u>INITIAL COST:</u> - Original	\$879,000		
- Proposed	\$202,000		
- Savings	\$677,000		\$677,000
<u>FUTURE COST:</u> – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$677,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: F-1.1
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: F-1.1

Client: GDOT

Sheet 4 of 4

Current Bridge:

Bridge #4 Three span 125ft long x 40.41 ft wide

Uses BT 63 Beams 5,051 SF @ \$75.94 / SF = \$383,573

MSE wall 10-20 ft height 11,200 SF @ \$34.3 / SF = \$384,160

Traffic Barrier H for Walls 560 LF @ \$150 / LF = \$84,000

Total Cost = \$851,733

VE- Concrete Box Culvert Concept:

Double 8' X 8' Georgia Standard Concrete Box Culvert

Double Box = 2.139 CY / LF x 120 ft. long = 256.68 CY @ \$557.82 = \$143,181

Reinforcing Steel = 220.5 LB / LF x 120 ft. long = 26,460 LB @ \$0.69 = \$18,247

Total Cost = \$161,428

Additional Embankment:

$2 \times (12 \text{ ft} \times 24 \text{ ft} \times \frac{1}{2}) + (12 \text{ ft} \times 72 \text{ ft}) = 288 \text{ SF} + 864 \text{ SF} = 1,152 \text{ SF} \times 125 \text{ ft} = 144,000 \text{ CF}$

$144,000 \text{ CF} / 27 \text{ CF} / \text{CY} = 5,333 \text{ CY} @ \$3.79 = \$20,212$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.:
M-1

Sheet No.:
1 of 4

CREATIVE IDEA:
Construct Bridge #3 on a skew instead of rectangular to reduce the deck area and use smaller beams.

Comp By: AS Date: 02/04/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The proposed Bridge #3 is a three-span structure that is 90 feet long and 40.41 feet wide. It uses PSC Bulb-Tee 63-inch beams and MSE wall abutments (end bents). The bridge has its abutments perpendicular to the roadway.

Proposed Change:

This recommendation would skew the bridge bents parallel to the stream and use AASHTO Type I modified PSC beams.

Justification:

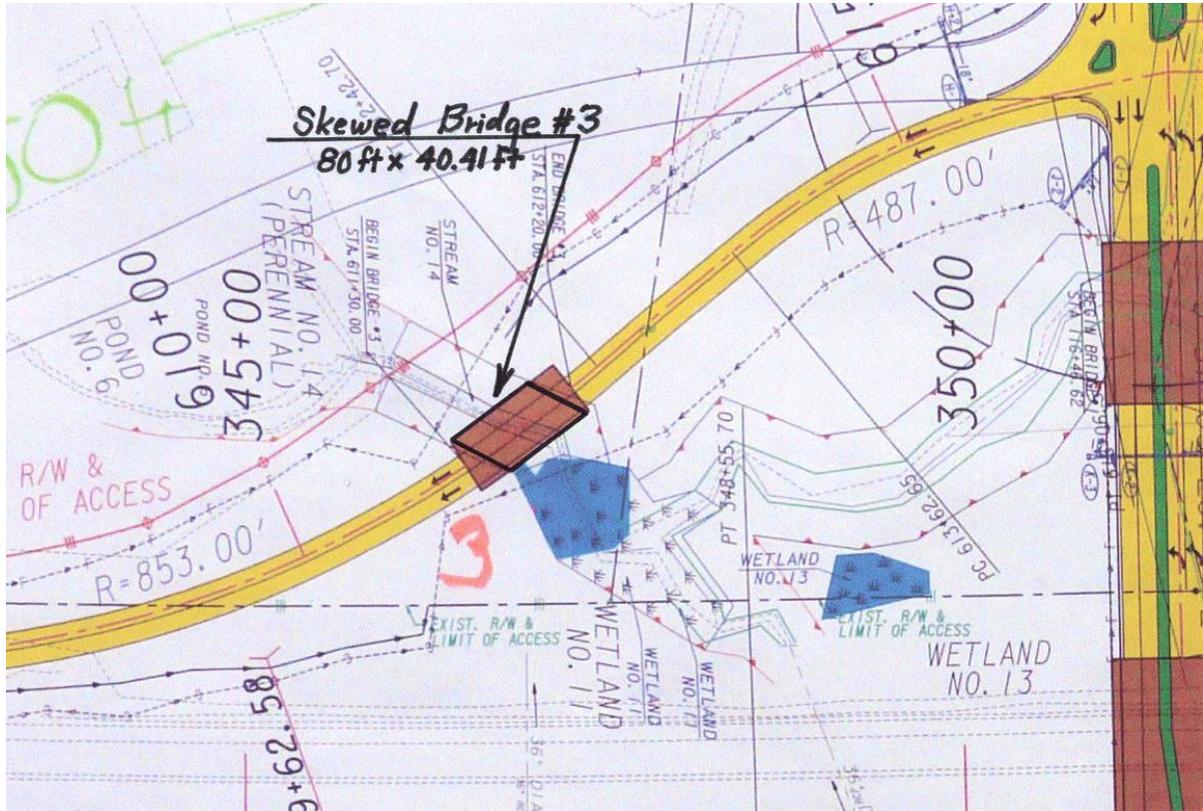
Constructing the bridge with bents parallel to the stream will reduce its length by 10 feet. Replacing the large Bulb-Tee 63-inch beams with AASHTO Type I beams will simplify construction, reduce the height of the roadway by 2 feet 11 inches, reduce the height of the MSE walls, and reduce the cost of the project.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$346,000		
- Proposed	\$221,000		
- Savings	\$125,000		\$125,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$125,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: M-1
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: M-1
Client: GDOT
Sheet 4 of 4

Current Bridge:

Bridge #3 Three span 90ft long x 40.41 ft wide

Uses BT 63 Beams 3,637 SF @ \$81.28 / SF = \$295,615

MSE wall 10-20 ft height 1,200 SF @ \$34.30 / SF = \$41,160

Traffic Barrier H for Walls 60 LF @ \$150 / LF = \$9,000

Total Cost = \$345,775

VE Bridge Concept:

Bridge #3 – Three span 80 ft long x 40.41ft wide

Use AASHTO Type I (Mod) Beams 3,233 SF @ \$53.95 / SF = \$174,420

MSE wall 10-20 ft height 1,100 SF @ \$34.3/ SF = \$37,730

Traffic Barrier H for Walls 60 LF @ \$150/LF = \$9,000

Total Cost = \$221,150

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: M-1.1	Sheet No.: 1 of 4	CREATIVE IDEA: Replace Bridge #3 with a Double 8-foot x 8-foot concrete box culvert.
---------------------------	-----------------------------	--

Comp By: AS Date: 02/04/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The proposed Bridge #3 is a three-span structure that is 90 feet long and 40.41 feet wide. It uses PSC Bulb-Tee 63-inch beams and MSE wall abutments (end bents). The bridge has its abutments perpendicular to the roadway. Constructing a bridge will reduce the project's impact on Stream #14.

Proposed Change:

This recommendation would replace Bridge #3 with a Double 8-foot x 8-foot concrete box culvert 90 feet long.

Justification:

The most recent update of the project's Ecology Report states that the project is over 700 feet short of the 1,500 feet of stream impacts that would require a project specific 404 permit. The double box culvert can be constructed without exceeding the 1,500 foot limit.

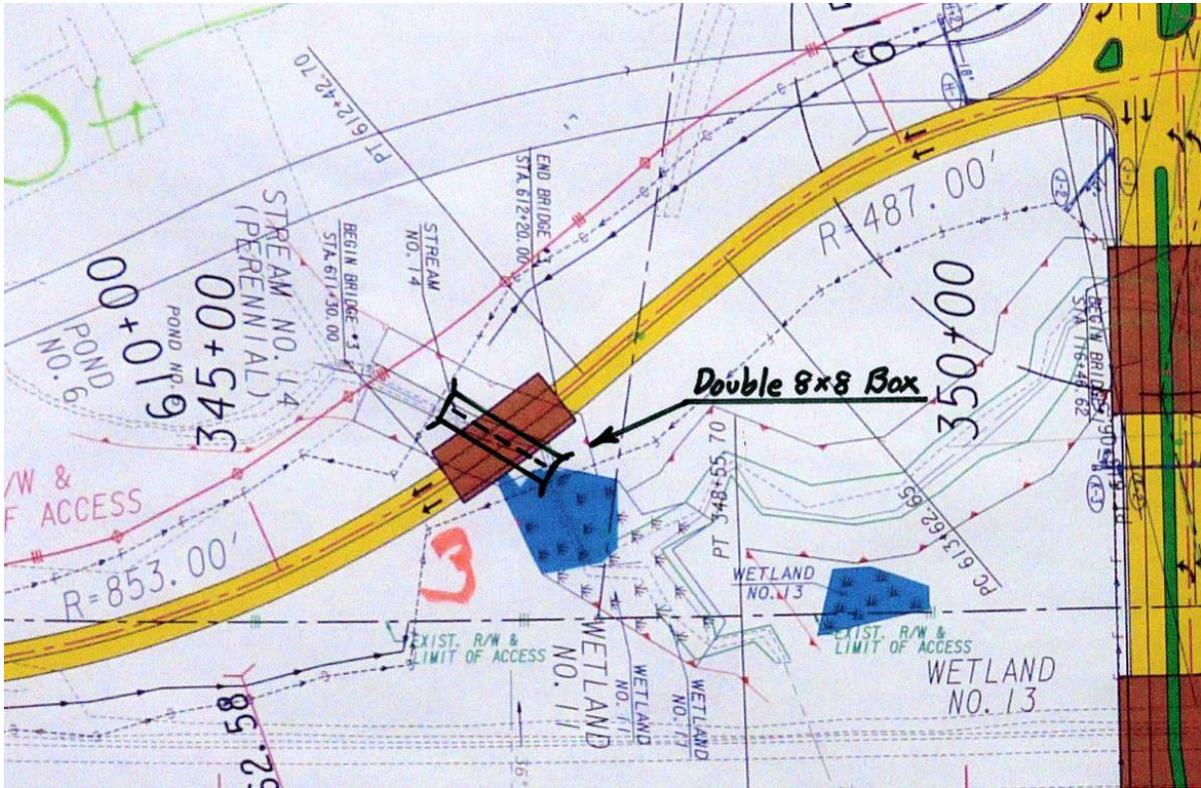
Constructing a large double 8-foot x 8-foot box culvert will allow sufficient room for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a standard double concrete box culvert will simplify construction and result in significant cost savings. The box culvert concept will also reduce future maintenance cost since there would be no bridge to maintain.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$346,000		
- Proposed	\$149,000		
- Savings	\$197,000		\$197,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$197,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: M-1.1
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: M-1.1

Client: GDOT

Sheet 4 of 4

Current Bridge:

Bridge #3 Three span 90ft long x 40.41 ft wide

Uses BT 63 Beams 3,637 SF @ \$81.28 / SF = \$295,615

MSE wall 10-20 ft height 1,200 SF @ \$34.30 / SF = \$41,160

Traffic Barrier H for Walls 60 LF @ \$150 / LF = \$9,000

Total Cost = \$345,775

VE- Concrete Box Culvert Concept:

Double 8' X 8' Georgia Standard Concrete Box Culvert

Double Box = 2.139 CY / LF x 90 ft. long = 192.51 CY @ \$557.82 = \$107,386

Reinforcing Steel = 220.5 LB / LF x 90 ft. long = 19,845 LB @ \$0.69 = \$13,693

Total Cost = \$121,079

Additional Embankment:

$2 \times (12 \text{ ft} \times 24 \text{ ft} \times \frac{1}{2}) + (12 \text{ ft} \times 72 \text{ ft}) = 288 \text{ SF} + 864 \text{ SF} = 1,152 \text{ SF} \times 90 \text{ ft} = 103,680 \text{ CF}$

$103,680 \text{ CF} / 27 \text{ CF} / \text{CY} = 3,840 \text{ CY} @ \$3.79 = \$14,554$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: O-1	Sheet No.: 1 of 3	CREATIVE IDEA: Eliminate the concrete sidewalks throughout the entire project.
-------------------------	-----------------------------	--

Comp By: SSB Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design provides for 5-foot concrete sidewalks on both sides of roadways throughout the entire project.

Proposed Change:

This recommendation would eliminate the concrete sidewalks throughout the entire project.

Justification:

The project will be constructed within an industrial area and pedestrian traffic is unlikely. The entire Interchange area (Martin Road Extension and the Interstate Ramps) will be within the Interstate access control limits, thereby preventing future development from accessing any sidewalks that would be built along the Martin Road Extension.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$323,000		
- Proposed	\$0		
- Savings	\$323,000		\$323,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$323,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

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

Concrete Sidewalk:

9,400 SY @ \$34.31 / SY = \$322,514

Total Savings = \$322,514

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: O-1.1	Sheet No.: 1 of 3	CREATIVE IDEA: <u>Alternative to O-1</u> Construct concrete sidewalks on only one side of the roadways throughout the entire project.
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Comp By: SSB Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design provides for 5-foot concrete sidewalks on both sides of roadways throughout the entire project.

Proposed Change:

This recommendation would construct concrete sidewalks on only one side of the various roadways.

Justification:

The project will be constructed within an industrial area and pedestrian traffic is unlikely. The entire Interchange area (Martin Road Extension and the Interstate Ramps) will be within the Interstate access control limits, thereby preventing future development from accessing any sidewalks that would be built along the Martin Road Extension.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<u>INITIAL COST:</u> - Original	\$323,000		
- Proposed	\$161,000		
- Savings	\$162,000		\$162,000
<u>FUTURE COST:</u> – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$162,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: 0-1.1
Client: GDOT
Sheet 3 of 3

Concrete Sidewalk:

9,400 SY Original Estimate

$9,400 \text{ SY} / 2 = 4,700 \text{ SY}$ $4,700 \text{ SY} \times \$34.31 / \text{SY} = \$161,257$

Total Savings = \$161,257

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: R-1	Sheet No.: 1 of 4	CREATIVE IDEA: Replace the bottomless culvert over Stream #19 on the NB on-ramp with a standard 6-foot x 6-foot concrete box culvert.
-------------------------	-----------------------------	--

Comp By: AS Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design would construct a bottomless culvert over Stream #19 on the NB on-ramp to I-985. The bottomless culvert would have a 28-foot span and a 6-foot – 9-inch rise. This design will span the stream buffer area in order to not disturb the stream.

Proposed Change:

This recommendation would replace the large bottomless culvert with Georgia Standard 6-foot x 6-foot concrete box culvert.

Justification:

Intermittent Stream #19 currently goes under I-985 in a 4-foot x 4-foot concrete box culvert. Constructing the proposed large bottomless culvert is an expensive alternative to protect a small section of an intermittent stream. The most recent update of the project’s Ecology Report states that the project is over 700 feet short of the 1,500 feet of stream impacts that would require a project specific 404 permit.

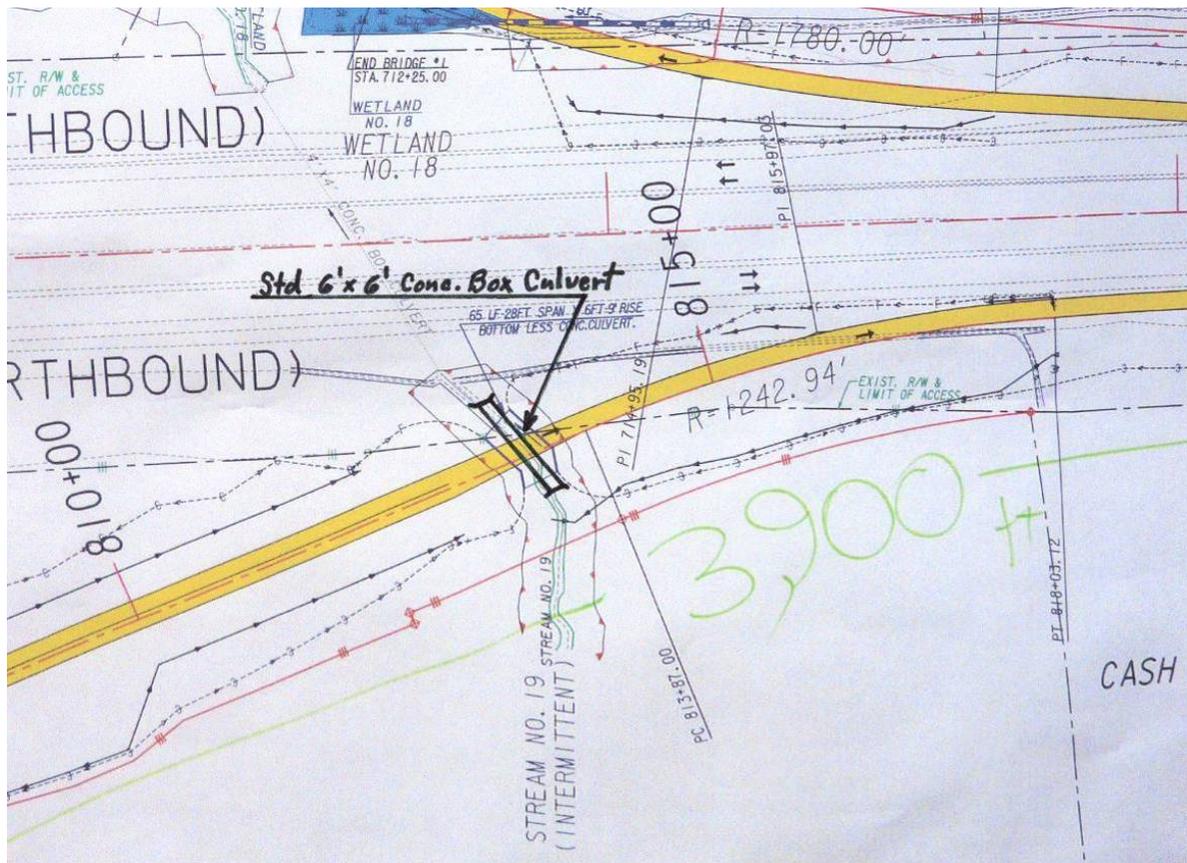
Constructing a 6-foot x 6-foot box culvert (larger than the existing 4-foot x 4-foot box culvert under I-985) will allow for the bottom 2 feet of the culvert to be covered with suitable material. Utilizing a standard concrete box culvert will result in significant cost savings and simplify construction.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<u>INITIAL COST:</u> - Original	\$186,000		
- Proposed	\$77,000		
- Savings	\$109,000		\$109,000
<u>FUTURE COST:</u> – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$109,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: R-1
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: R-1
Client: GDOT
Sheet 4 of 4

Current Design: Bottomless Bridge Culvert
Single span 28' wide x 6'-9" rise
Lump Sum = \$186,200

VE Concept: 6 ft x 6 ft concrete box culvert

6 ft x 6 ft concrete box culvert

Class A Concrete $0.759 \text{ CY / LF} \times 150 \text{ ft} = 113.85 \text{ CY} @ \$557.82 = \$63,508$
Reinforcing Steel $77.77 \text{ LB / LF} \times 150 \text{ ft} = 11,666 \text{ LB} @ \$0.69 = \$8,050$

Total = \$63,508 + \$8,050 = \$71,558

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-1	Sheet No.: 1 of 4	CREATIVE IDEA: Reduce the shoulder width to 12 feet on the Martin Road Extension.
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Comp By: SSB Date: 02/03/10 Checked By: KB Date: 02/08/2010

Original Concept:

The current design provides 16-foot shoulders along the Martin Rd. Extension from Thurmon Tanner Parkway to SR 13.

Proposed Change:

The recommendation reduces the overall shoulder width from 16 feet to 12 feet between Thurmon Tanner Parkway and SR 13.

Justification:

The revised shoulder width provides adequate width for the curb & gutter and sidewalk. It would be more consistent with the shoulders widths (10 feet and 12 feet) on Thurmon Tanner Parkway and SR 13. It will reduce earthwork, project R/W, and lower the cost of the project.

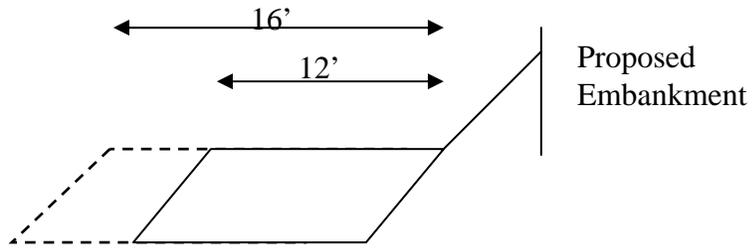
LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<u>INITIAL COST:</u> - Original	\$188,000		
- Proposed	\$0		
- Savings	\$188,000		\$188,000
<u>FUTURE COST:</u> – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$188,000

SKETCH

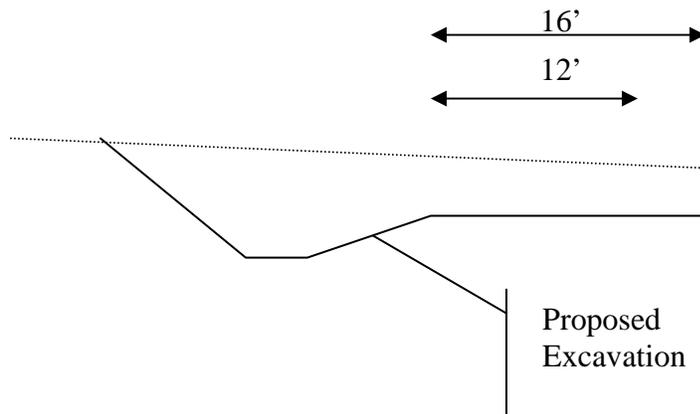
Project: New I-985 Interchange – Hall County

Idea No.: X-1
Client: GDOT
Sheet 2 of 4

Fill Section



Cut Section



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-1
Client: GDOT
Sheet 4 of 4

Reduction in Unclassified Excavation:

Note: Lengths and depths scaled from conceptual drawings.

Sta 107+00 to Sta 113+60, L = 660', Avg. Depth = 10', $(4 \times 10 \times 660 \times 2)/27 = 1,909$ CY

Sta 126+60 to Sta 130+50, L = 390', Avg. Depth = 10', $(4 \times 10 \times 390 \times 2)/27 = 1,156$ CY

Sta 130+50 to Sta 135+50, L = 500', Avg. Depth = 12', $(4 \times 12 \times 500 \times 2)/27 = 1,778$ CY

Total Unclassified Exc. = 1,909 CY + 1,156 CY + 1,778 CY = **4,843** CY

Reduction in Borrow Excavation:

Lengths and heights scaled from conceptual drawings.

Sta 113+60 to Sta 115+00, L = 140', Avg. Height = 10', $(4 \times 10 \times 140 \times 2)/27 = 415$ CY

Sta 115+60 to Sta 116+25, L = 65', Avg. Height = 23', $(4 \times 23 \times 65 \times 2)/27 = 443$ CY

Sta 121+60 to Sta 125+00, L = 340', Avg. Height = 30', $(4 \times 30 \times 340 \times 2)/27 = 3,022$ CY

Sta 125+80 to Sta 126+60, L = 80', Avg. height = 5', $(4 \times 5 \times 80 \times 2)/27 = 119$ CY

Sta 135+50 to Sta 142+50, L = 700', Avg. Height = 10' $(4 \times 10 \times 700 \times 2)/27 = 2,074$ CY

Total Borrow Exc. = 415 CY + 443 CY + 3,022 CY + 119 CY + 2,074 CY = **6,073** CY

Reduction in Right of Way:

R/W Cost per acre

Fee acquisition = \$2.61 per SF

Mark-up: = Total cost / net cost = \$16,641,400 / \$6,710,242 = 2.4799

R/W = \$2.61 / SF x 43,560 SF / AC x 2.4799 = \$281,943 per acre **Use \$282,000 / AC**

L = 660 ft + 390 ft + 500 ft + 140 ft + 65 ft + 340 ft + 80 ft + 700 ft = 2,875 ft

$(2,875 \text{ ft} \times 4 \text{ ft} \times 2 \text{ sides}) / 43,560 \text{ SF} / \text{AC} = 0.53 \text{ AC}$

$0.53 \text{ AC} \times \$282,000 = \$149,460$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-4	Sheet No.: 1 of 3	CREATIVE IDEA: Eliminate the dual bike lanes on SR 13 and East Martin Road and provide a multi-use trail on east side of SR 13
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Comp By: GAO Date: 02/03/1010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design includes dual four-foot bike lanes on the SR 13 approaches to Martin Road along with dual four-foot bike lanes on Martin Road east of SR 13.

Proposed Change:

This recommendation eliminates the on-road bike lanes and provides for a multi-use trail along the eastern side of SR 13.

Justification:

While SR 13 is on Hall County’s bike trail system, the existing two-lane road does not have any bike trails. Providing dual bike lanes in the approach roadways to the SR 13 / Martin Road intersection will further complicate and widen the intersection. The intersection approaches already contain dual through lanes, dual left turn lanes and right turn lanes.

Moving the bike lanes out of the intersection roadways and placing them on a multi-use trail will eliminate bike traffic from the intersection. This concept will also reduce the project cost.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$89,000		
- Proposed	\$24,000		
- Savings	\$65,000		\$65,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$65,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

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

Eliminate Bike Lane:

(Scaled off drawings)

SR 13: 2150 ft

Martin Road (east of SR 13) 700 ft

$$(2,250 \text{ ft} + 750 \text{ ft}) \times 4 \text{ ft} = 12,000 \text{ SF} / 9 = 1,333 \text{ SY}$$

Eliminate Sidewalk:

$$2 \text{ sides} \times 1,350 \text{ ft} \times 5 \text{ ft wide} = 13,500 \text{ SF} / 9 = 1,500 \text{ SY}$$

New Multi-use trail:

10 feet wide x 1,350 long with 4 in asphalt / 4 in GAB

$$1,350 \text{ ft} \times 10 \text{ ft} = 13,500 \text{ SY} / 9 = 1,500 \text{ SY}$$

Cost of multi-use trail: 4 in asphalt / 4 inch GAB

$$\text{Asphalt} = (4/12 \text{ ft}) (150 \text{ \#/CF}) (1 \text{ Ton} / 2000 \text{ \#}) = 0.025 \text{ Ton/SF}$$

$$\text{GAB} = (4/12 \text{ ft}) (135 \text{ \#/CF}) (1 \text{ Ton} / 2000\text{\#}) = 0.0225 \text{ Ton/SF}$$

Trail Cost per SY

$$(0.025 \text{ Ton/SF} \times 9 \text{ SF} / \text{SY} \times \$58 / \text{Ton}) + (0.0225 \text{ Ton} / \text{SF} \times 9 \text{ SF} / \text{SY} \times \$15 / \text{Ton}) = \\ \$13.05 + \$3.04 = \$16.09 / \text{SY} \quad \text{USE } \$16 \text{ per SY}$$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-5	Sheet No.: 1 of 4	CREATIVE IDEA: End the reconstruction of the H.F. Reed Industrial Parkway at Station 99.
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Comp By: GAO Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept: Construct the full width widening as shown on the concept plan.

The H.F. Reed Industrial Parkway is a two-lane road that ends in a T-intersection with Thurmon Tanner Parkway. The current design widens it to a divided four-lane road ending at White Road, approximately 1,700 feet west of Thurmon Tanner Parkway. This design has the last 1,000 feet of the proposed widening cross hatched out to neck back down to a two-lane roadway at White Road.

Proposed Change:

This recommendation would shorten the extension of H.F. Reed Industrial Parkway approximately 1,000 feet and match the existing two-lane section near Station 99.

Justification:

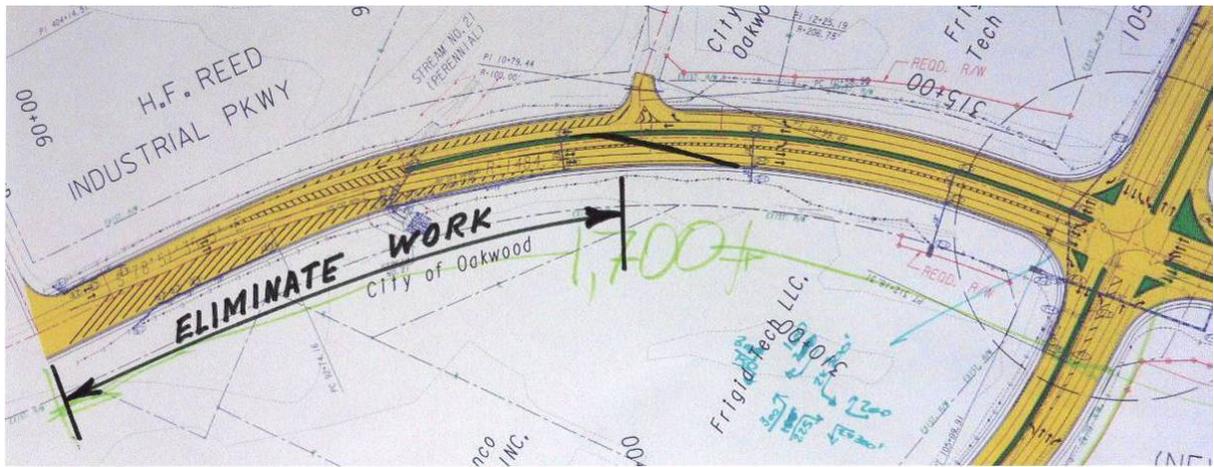
H.F. Reed Industrial Parkway is a 2 lane roadway. The current design includes roadway widening well beyond what is required for the intersection improvements and new lane configurations. The limits of work can be reduced about 950 feet. There are no anticipated or programmed projects to widen H.R. Reed Industrial Parkway to the west. Future roadway widening would also have to widen an existing two-lane railroad bridge about 1,500 feet beyond the project limit. Reducing the length of the H.F. Reed Industrial widening will save cost and accelerate construction.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$386,000		
- Proposed	\$0		
- Savings	\$386,000		\$386,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$386,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: X-5
Client: GDOT
Sheet 2 of 4



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-5
Client: GDOT
Sheet 4 of 4

Asphalt pavement: 9 ½ in asphalt / 12 inch GAB

$$(9.5/12 \text{ ft}) (150 \text{ \#/CF}) (1 \text{ ton} / 2000 \text{ \#}) = 0.059375 \text{ ton/SF}$$

$$(12/12 \text{ ft}) (135 \text{ \#/CF}) (1 \text{ ton} / 2000\text{\#}) = 0.0675 \text{ ton/SF}$$

Cost per SY

$$(0.059375 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$58 / \text{ton}) + (0.0675 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$15 / \text{ton}) = \\ \$ 30.99 + 9.11 = \$40.10 / \text{SY} \quad \text{USE: } \mathbf{\$40 \text{ per SY}}$$

HF Reed Industrial Parkway – shorten project limit by 950 ft

Current width of improvements / roadway pavement = 80 ft

Pavement Area:

$$950 \text{ ft} \times 80 \text{ ft} = 76,000 \text{ SF} / 9 = 8,444 \text{ SY} @ \$40.00 = \$337,760$$

Length of curbing

$$2 \times 950 \text{ ft} = 1,900 \text{ LF}$$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-6	Sheet No.: 1 of 4	CREATIVE IDEA: Reduce the median width four feet on the Martin Road Extension.
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Comp By: SSB Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design provides for an eight-foot minimum width median along Martin Road Extension. The median width varies from 8 feet to 32 feet with the narrower widths covered with 6" paved concrete median.

Proposed Change:

This recommendation reduces the Martin Road Extension median width four feet.

Justification:

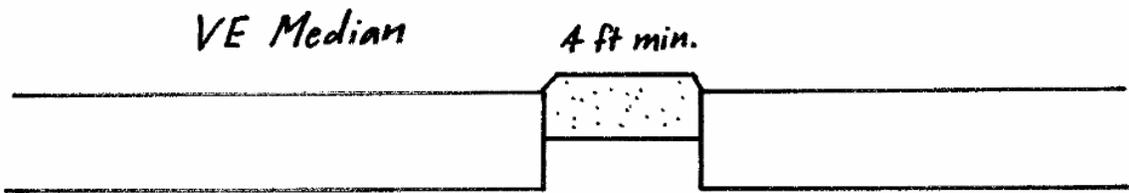
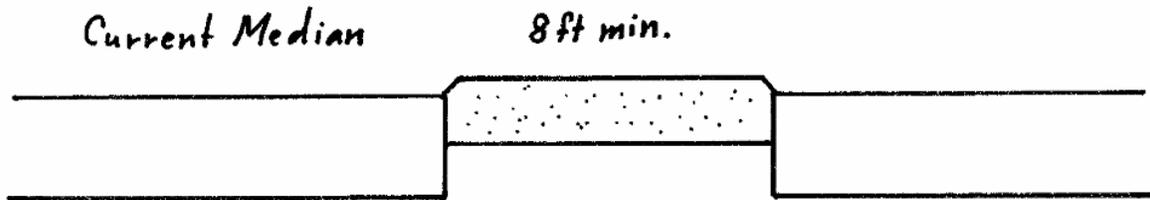
This concept maintains a divided roadway typical section while reducing the overall roadway footprint by four feet. Reducing the roadway footprint will reduce the earthwork, the amount of paved concrete median, and the amount of R/W needed for the project. These changes will reduce project cost.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$336,000		
- Proposed	\$0		
- Savings	\$336,000		\$336,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$336,000

SKETCH

Project: New I-985 Interchange – Hall County

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



CALCULATIONS

Project: New I-985 Interchange – Hall County

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

Paved 6" Concrete Median:

Between Station 99+00 to Station 147+00
Length as measured from the concept plan = 2,765 ft
 $(2,765 \text{ ft} \times 4 \text{ ft}) / 9 \text{ SF/SY} = 1,229 \text{ SY}$

R/W Reduction

R/W Cost per acre

Fee acquisition = \$2.61 per SF
Mark-up: = Total cost / net cost = $\$16,641,400 / \$6,710,242 = 2.4799$
 $R/W = \$2.61 / \text{SF} \times 43,560 \text{ SF} / \text{AC} \times 2.4799 = \$281,943 \text{ per acre}$ Use **\$282,000 / AC**
Length measured from the concept plans = 2,700 ft / side Assume 2:1 slopes
 $(2,700 \text{ ft} \times 4 \text{ ft}) \times 2 \text{ sides} = 21,600 \text{ SF} / 42,560 \text{ SF} / \text{AC} = 0.4959 \text{ AC}$ Say 0.5 AC
 $0.5 \text{ AC} \times \$282,000 / \text{AC} = \$141,000$

Earthwork

Unclassified Exc.

Note: Lengths and depths scaled from conceptual drawings
Sta 107+00 to Sta 113+60, L = 660', Avg. Depth = 10', $(4 \times 10 \times 660) / 27 = 978 \text{ CY}$
Sta 126+60 to Sta 130+50, L = 390', Avg. Depth = 10', $(4 \times 10 \times 390) / 27 = 578 \text{ CY}$
Sta 130+50 to Sta 135+50, L = 500', Avg. Depth = 12', $(4 \times 12 \times 500) / 27 = 889 \text{ CY}$
Total Unclassified Exc. = $1,909 + 1,156 + 1,778 = 2,445 \text{ CY}$

Borrow Exc.

Lengths and heights scaled from conceptual drawings
Sta 99+00 to Sta 104+60, L = 560', Avg. Height = 4', $(4 \times 4 \times 560) / 27 = 332 \text{ CY}$
Sta 113+60 to Sta 115+00, L = 140', Avg. Height = 10', $(4 \times 10 \times 140) / 27 = 207 \text{ CY}$
Sta 115+60 to Sta 116+25, L = 65', Avg. Height = 23', $(4 \times 23 \times 65) / 27 = 221 \text{ CY}$
Sta 121+60 to Sta 125+00, L = 340', Avg. Height = 30', $(4 \times 30 \times 340) / 27 = 1,511 \text{ CY}$
Sta 125+80 to Sta 126+60, L = 80', Avg. height = 5', $(4 \times 5 \times 80) / 27 = 59 \text{ CY}$
Sta 135+50 to Sta 142+50, L = 700', Avg. Height = 10' $(4 \times 10 \times 700) / 27 = 1,037 \text{ CY}$
Sta 145+00 to Sta 150+00, L = 500', Avg. Height = 2', $(4 \times 2 \times 500) / 27 = 148 \text{ CY}$
Total Borrow Exc. = $415 + 443 + 3,022 + 119 + 2,074 = 3,515 \text{ CY}$

Bridge Reduction:

Bridge #1 & #2 = $320 \text{ ft} \times 4 \text{ ft} = 1,280 \text{ SF}$ @ $\$108 / \text{SF} = \$138,240$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-7	Sheet No.: 1 of 4	CREATIVE IDEA: Construct 11-foot lanes in-lieu-of 12-foot lanes along the Martin Road Extension between Thurmon Pkwy and SR 13
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Comp By: SSB Date: 02/03/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design would construct 12-foot lanes along the Martin Road Extension between Thurmon Tanner Parkway and SR 13.

Proposed Change:

This recommendation will reduce the 12-foot lane widths on Martin Road to 11feet between Thurmon Tanner Parkway and SR 13.

Justification:

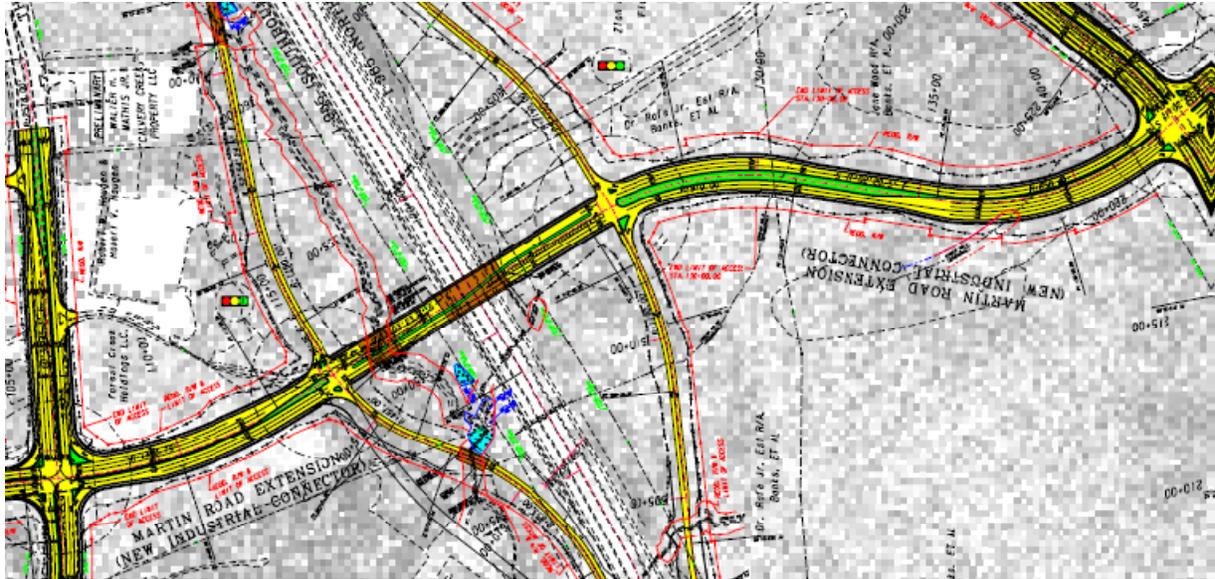
Constructing 11-foot lanes on the new Martin Road Extension will accommodate the 45 MPH design speed and the projected (2032) ADT traffic of 21,670 with 8% trucks. Reducing the pavement width will save R/W, embankment, pavement, and bridge deck. This concept will reduce the cost of the project while maintaining the same functions.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$344,000		
- Proposed	\$0		
- Savings	\$344,000		\$344,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$344,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: X-7
Client: GDOT
Sheet 2 of 4



Embankment –
Assume 2:1 Slope; 10' High;
5 Wide

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-7
Client: GDOT
Sheet 4 of 4

Asphalt pavement: 9 1/2 in asphalt / 12 inch GAB

$$(9.5/12 \text{ ft}) (150 \text{ \#/CF}) (1 \text{ ton} / 2000 \text{ \#}) = 0.059375 \text{ ton/SF}$$

$$(12/12 \text{ ft}) (135 \text{ \#/CF}) (1 \text{ ton} / 2000\text{\#}) = 0.0675 \text{ ton/SF}$$

Cost per SY

$$(0.059375 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$58 / \text{ton}) + (0.0675 \text{ ton/SF} \times 9 \text{ SF/SY} \times \$15 / \text{ton}) = \\ \$30.99 + 9.11 = \$40.10 / \text{SY} \quad \text{USE: } \mathbf{\$40 \text{ per SY}}$$

Pavement Reduction:

$$\text{Through lanes: } 3,197 \text{ ft} \times 4 \text{ EA} = 12,788 \text{ LF}$$

$$\text{Turn lanes: Total} = 5,410 \text{ LF (scaled off plans)}$$

Total Area:

$$1 \text{ ft} \times (12,788 \text{ LF} + 5,410 \text{ LF}) / 9 \text{ SF} / \text{SY} = 2,022 \text{ SY} @ \$40 / \text{SY} = \$80,880$$

$$\mathbf{\text{Bridge deck: } 108 \text{ ft} + 212 \text{ ft} = 320 \text{ ft}}$$

$$320 \text{ ft} \times 5 \text{ ft} = 1,600 \text{ SF} \quad 1,600 \text{ SF} \times \$108/\text{SF} = \$172,800$$

Embankment

$$\text{See Sketch} - (50 \text{ SF} \times 3,197 \text{ ft}) / 27 = 5,920 \text{ CY} \quad 5,920 \text{ CY} \times \$2.79/\text{CY} = \$22,438$$

R/W Reduction

R/W Cost per acre

$$\text{Fee acquisition} = \$2.61 \text{ per SF}$$

$$\text{Mark-up:} = \text{Total cost} / \text{net cost} = \$16,641,400 / \$6,710,242 = 2.4799$$

$$\text{R/W} = \$2.61 / \text{SF} \times 43,560 \text{ SF} / \text{AC} \times 2.4799 = \$281,943 \text{ per acre} \quad \text{Use } \mathbf{\$282,000 / \text{AC}}$$

$$\text{R/W area} = 5 \text{ ft wide} \times 2,100 \text{ LF} = 10,500 \text{ SF}$$

$$10,500 \text{ SF} / 43,560 \text{ SF} / \text{AC} = 0.24 \text{ AC} \quad 0.24 \text{ AC} \times \$282,000 / \text{AC} = \mathbf{\$67,680}$$

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-10	Sheet No.: 1 of 5	CREATIVE IDEA: Reduce the length of the turn lane storage areas to the lengths shown in the traffic study report.
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Comp By: SSB Date: 02/02/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design for the right / left turn lane storage areas are longer than the minimum lengths identified in the traffic study report.

Proposed Change:

This recommendation reduces the lengths of the right / left turn lane storage areas to the lengths shown in the traffic study report. This concept also lengthens (east and west of the ramp intersections) the grass median areas on the Martin Road Extension.

Justification:

This concept provides the required amount of right / left turn lane storage areas to meet the turning conditions shown in the traffic study report. Eliminating the unneeded storage areas reduces the amount of pavement thereby reducing cost. It would also reduce construction time.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$338,000		
- Proposed	\$7,000		
- Savings	\$331,000		\$331,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$331,000

SKETCH

Project: New I-985 Interchange – Hall County

Idea No.: X-10
 Client: GDOT
 Sheet 2 of 5

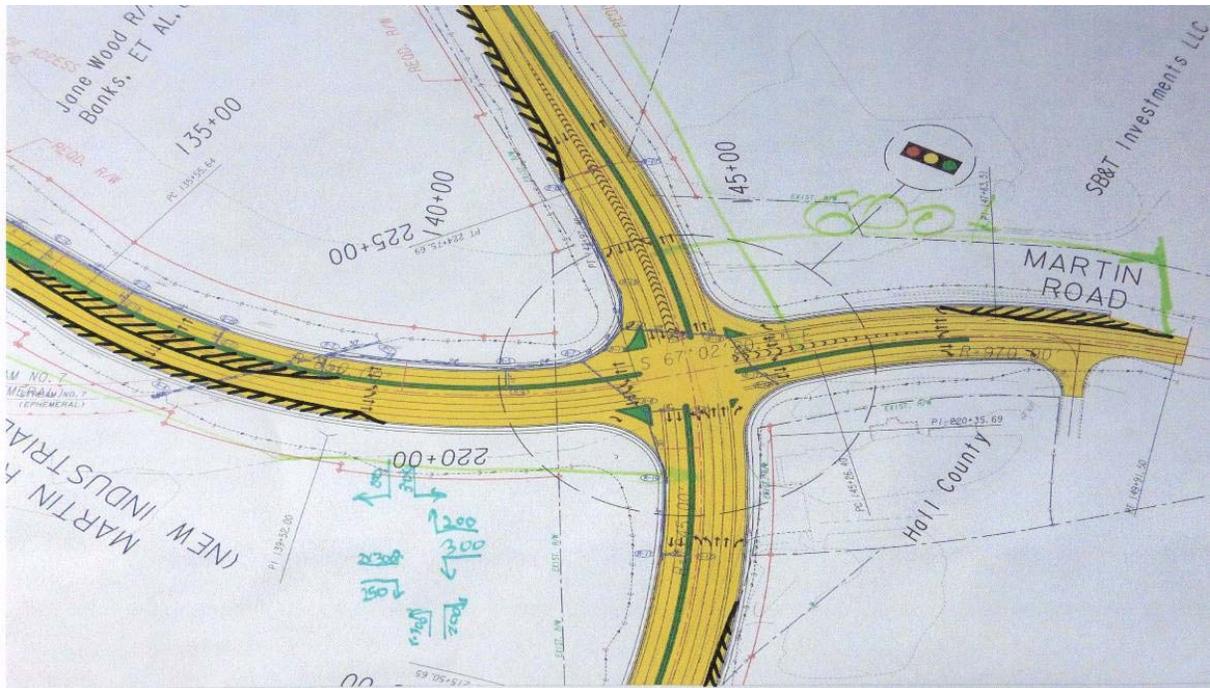
Table 12 – Turn Bay Storage Lengths

Recommended Minimum Storage Lengths

Martin Road Connector @	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR	Control
Thurmond Tanner Pkwy	300	150	2x300	200	300	225	2x300	160	Signalized
I-985 SB		200	2x300				300		Signalized
I-985 NB	300			200		250			Signalized
SR 13	2x300	250	300	200	2x300	200	300	200	Signalized

* Bold Indicates new construction

The turn bay storage lengths in the table were developed based on the 95 percentile queue for the worst case scenario (AM or PM Peak Hour Design Year). These lengths do not include deceleration or taper lengths.



CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-10

Client: GDOT

Sheet 4 of 5

Turn Lane Storage Reductions:

	Turn Lane Req.	Turn Lane Provided	Turn Lane Excess
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Thurmon Tanner Parkway Intersection:

EB Industrial to NB TTP	LT 1 @ 300 ft	1 @ 900 ft provided	1 @ 600 ft excess
EB Industrial to SB TTP	RT 1 @ 150 ft	None provided	
WB Martin to SB TTP	LT 2 @ 300 ft	2 @ 570 ft provided	2 @ 270 ft excess
WB Martin to NB TTP	RT 1 @ 200 ft	1 @ 450 ft provided	1 @ 250 ft excess
SB TTP to Martin	LT 2 @ 300 ft	2 @ 560 ft provided	2 @ 260 ft excess
SB TTP to WB Industrial	RT 1 @ 160 ft	1 @ 520 ft provided	1 @ 260 ft excess
NB TTP to WB Industrial	LT 1 @ 300 ft	1 @ 510 ft provided	1 @ 210 ft excess
NB TTP to EB Martin	RT 1 @ 225 ft	1 @ 500 ft provided	1 @ 275 ft excess

Interchange Ramp Intersections:

SB off ramp:	Dual lane ramp splits for right lane and left lane		No excess
EB Martin to SB on ramp	RT 1 @ 200 ft	1 @ 570 ft provided	1 @ 370 ft excess
WB Martine to SB on ramp	LT 2 @ 300 ft	2 @ 380 ft provided	2 @ 80 ft excess
EB Martin to NB on ramp	LT 1 @ 300ft	1 @ 300 ft provided	No Excess.
WB Martin to NB on ramp	RT 1 @ 200 ft	1 @ 440 ft provided	1 @ 240 ft excess
NB off ramp:	Dual lane ramp splits for right lane and left lane		No excess

SR 13 Interchange:

EB Martin to NB SR 13	LT 2 @ 300 ft	2 @ 710 ft provided	2 @ 410 ft excess
EB Martin to SB SR 13	RT 1 @ 250 ft	1 @ 680 ft provided	1 @ 430 ft excess
WB Martin to NB SR 13	RT 1 @ 200ft	1 @ 450 ft provided	1 @ 250 ft excess
WB Martin to SB SR 13	LT 1 @ 300 ft	1 @ 300 ft provided	No excess
SB SR 13 to EB Martin	LT 1 @ 300 ft	1 @ 540 ft provided	1 @ 240 ft excess
SB SR 13 to WB Martin	RT 1 @ 200 ft	1 @ 460 ft provided	1 @ 260 ft excess
NB SR 13 to WB Martin	LT 2 @ 300 ft	2 @ 570 ft provided	2 @ 270 ft excess
NB SR 13 to EB Martin	RT 1 @ 200 ft	1 @ 570 ft provided	1 @ 370 ft excess

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-10

Client: GDOT

Sheet 5 of 5

Lane Reduction:

Thurmon Tanner Intersection:

EB Industrial Pkwy 600 ft x 12 ft + 7,200 SF

WB Martin (2 x 270 ft x 12 ft) + (1 x 250 ft x 12 ft) = 6,480 + 3,000 = 9,480 SF

SB Thurmon (2 x 260 ft x 12 ft) + (1 x 260 ft x 12 ft) = 6,240 + 3,120 = 9,360 SF

NB Thurmon (1 x 210 ft x 12 ft) + (1 x 275 ft x 12 ft) = 2,520 + 3,300 = 5,820 SF

Subtotal Area = 31,860 SF

Ramp Intersections:

EB Martin to SB on ramp 1 x 370 ft x 12 ft = 4,440 SF

WB Martin to SB on ramp 2 x 80 ft x 12 ft = 1,920 SF

EB Martin to NB on ramp None

WB Martin to NB on ramp 1 x 240 ft x 12 ft = 2,880 SF

Subtotal Area = 9,240 SF

SR 13 Intersection:

EB Martin (2 x 410 ft x 12 ft) + (1 x 430 ft x 12 ft) = 9,840 + 5,160 = 15,000 SF

WB Martin (1 x 250 ft x 12 ft) + (none) = 3,000 SF

SB SR 13 (1 x 240 ft x 12 ft) + (1 x 260 ft x 12 ft) = 2,880 + 3,120 = 6,000 SF

NB SR 13 (2 x 270 ft x 12 ft) + (1 x 370 ft x 12 ft) = 6,480 + 4,440 = 10,920 SF

Subtotal Area = 34,920 SF

Total Area = 34,920 + 9,240 + 31,860 = 76,020 SF / 9 = 8,446.7 SY Say **8,450 SY**

Asphalt pavement: 9 ½ in asphalt / 12 inch GAB

(9.5/12 ft) (150 #/CF) (1 ton / 2000 #) = 0.059375 ton/SF

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

Cost per SY

(0.059375 ton/SF x 9 SF/SY x \$58 / ton) + (0.0675 ton/SF x 9 SF/SY x \$15 / ton) =

\$ 30.99 + 9.11 = \$40.10 / SY USE: **\$40 per SY**

Additional Grass Median Area on Martin Road Extension:

Dual Left – WB Martin to SB Thurmon @ 270 ft x 24 ft = 6,480 SF / 9 = 720 SY

Dual Left – EB Martin to NB SR 13 @ 410 ft x 24 ft = 9,840 SF / 9 = 1,093 SY

Total area = 720 SY + 1,093 SY = 1,813 SY

DEVELOPMENT AND RECOMMENDATION PHASE

New I-985 Interchange – Hall County

IDEA No.: X-12	Sheet No.: 1 of 4	CREATIVE IDEA: Reduce R/W acquisition and use temporary slope easements where possible.
--------------------------	-----------------------------	---

Comp By: GAO Date: 02/02/2010 Checked By: KB Date: 02/08/2010

Original Concept:

The current design would acquire R/W as shown on the plans which in several instances goes beyond the limits of the grading.

Proposed Change:

This recommendation would designate a standard 140-foot R/W footprint and use construction easements to acquire any additional areas needed to construct slopes.

Justification:

This concept reduces the amount of R/W required for the project by acquiring construction easements instead of purchasing R/W for required slope maintenance. Easements can be acquired at 50 percent of the R/W costs thereby reducing the project cost.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST: - Original	\$1,217,000		
- Proposed	\$604,000		
- Savings	\$613,000		\$613,000
FUTURE COST: – Savings			N/A
TOTAL PRESENT WORTH SAVINGS			\$613,000

CALCULATIONS

Project: New I-985 Interchange – Hall County

Idea No.: X-12

Client: GDOT

Sheet 4 of 4

Martin Road Extension:

Between Thurmon Tanner Parkway and I-985 SB ramp intersection:

Average width of reduction = 60 ft x 1,000 ft = 60,000 SF

Between I-985 NB ramp intersection and SR 13 intersection

Average width of reduction = 80 ft x 1,600 ft = 128,000 SF

Total area converted from Right of Way acquisition to slope easement

$60,000\text{SF} + 128,000\text{ SF} = 188,000\text{ SF} = 4.316\text{ AC}$

R/W Cost vs. easement costs (from R/W cost estimate)

Fee acquisition = \$ 2.61 per SF

Permanent easement = \$1.31 per SF

$\$1.31 / \$2.61 = 0.50$ factor

R/W Mark-up: = Total cost / net cost = $\$16,641,400 / \$6,710,242 = 2.4799$

Cost per Acre:

R/W = $\$2.61 / \text{SF} \times 43,560\text{ SF} / \text{AC} \times 2.4799 = \$281,943$ per acre Use $\$282,000 / \text{AC}$

Easement = $\$1.31 / \text{SF} \times 43,560\text{ SF} / \text{AC} \times 2.4799 = \$141,512$ per acre Use $\$142,000 / \text{AC}$

Sources

Approving/Authorizing Persons

Name:	Position:	Telephone:
Ron Wishon	Project Review Engineer	404-631-1753
Vinesha Pegram	Project Manager	404-631-1587

Personal Contacts

Name:	Telephone:	Notes:
Raju Shah	770-436-5070	Project design briefing
Sharilyn Meyers	404-631-1594	Discuss stream impacts and ability to shift ramps / streams.
Raju Shah	707-436-5070	Turn lane distances

Documents/Abstracts

Reference:	Reference:
Cost Estimate	Ecology Report
100 Scale Layout	Draft Environmental Assessment
50 Scale Layout	Design Concept Report
Road Profile	Alternate Interchange Designs
Roadway Cross-sections	

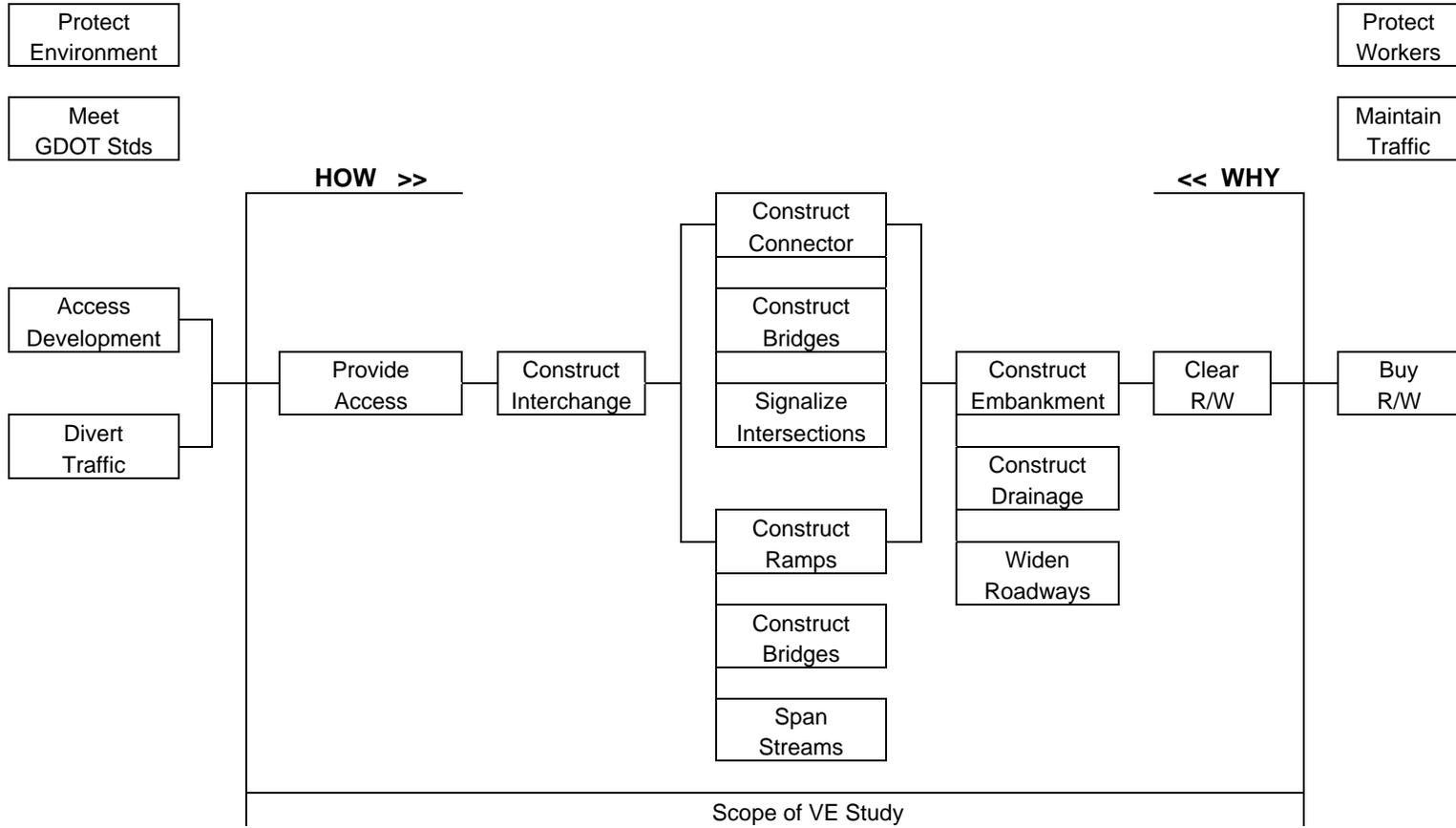
New I-985 Interchange – Hall County

Cost Model / Distribution

Item	Description	\$ Amount	% of Total Project
A	Bridge #1 \$ #2 & MSE Wall	\$3,424,000	21.9
B	Asphalt Pavement	\$2,802,000	17.9
C	Plain Concrete Pavement	\$2,246,000	14.3
D	Granular Aggregate Base	\$1,043,000	6.7
E	Borrow Excavation	\$878,000	5.6
F	Bridge #4 & MSE Wall	\$852,000	5.4
G	Miscellaneous	\$724,000	4.6
H	Unclassified Excavation	\$530,000	3.4
80% Line			
I	Erosion Control	\$480,000	3.1
J	Drainage	\$404,000	2.6
K	Curb & Gutter	\$400,000	2.6
L	Signing & Marking	\$399,000	2.5
M	Bridge #3 & MSE Wall	\$346,000	2.2
N	Guardrail TP W	\$312,000	2.0
O	Concrete Sidewalk	\$222,000	1.4
P	Traffic Control	\$200,000	1.3
Q	Clearing & Grubbing	\$200,000	1.3
R	Bottomless Bridge Culvert	\$186,000	1.2
	Construction Cost	\$15,658,000	100.0
	Engineering & Inspection 5%	\$783,000	
	Construction Contingency 3%	\$470,000	
	Fuel Adjustment	\$1,323,000	
	Liquid AC Adjustment	\$1,803,000	
	Construction with Contingencies	\$20,037,000	
	R/W	\$16,641,000	
	Utility Cost	\$376,000	
	Utility Contingency	\$489,000	
	Total Project Costs	\$37,543,000	

FAST DIAGRAM

Project: New I-985 Interchange – Hall County



INFORMATION PHASE – FUNCTION ANALYSIS

Project: New I-985 Interchange – Hall County

Function: Provide Access

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
A	Bridge #1 & #2 and MSE Walls	Separate	Grades	\$3,424,000	21.9%	Yes
		Cross	Stream			
		Eliminate	Impacts			
		Minimize	Embankment			
		Cross	Interstate			
		Accommodate	Turn Lanes			
		Accommodate	Sidewalks			
B	Asphalt Pavement	Carry	Traffic	\$2,802,000	17.9%	Yes
		Pave	Approaches			
		Provide	Turn Lanes			
		Provide	Bike Lanes			
		Provide	Shoulders			
		Widen	Roadways			
C	Plain Concrete Pavement	Construct	Ramps	\$2,246,000	14.3%	Yes
		Carry	Ramp Traffic			
		Comply With	GDOT Policy			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: New I-985 Interchange – Hall County

Function: Provide Access

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
D	Granular Aggregate Base	Support	Loads	\$1,053,000	6.7%	Yes
		Drain	Pavement			
		Support	Asphalt Pav't			
		Support	Concrete Pav't			
E	Borrow Excavation	Construct	Embankment	\$878,000	5.6%	Yes
		Construct	Ramps			
		Construct	Typical Sect.			
		Widen	Roadway			
F	Bridge #4 and MSE Walls	Span	Stream	\$852,000	5.4%	Yes
		Carry	Traffic			
		Eliminate	Impact			
		Support	Abutment			
		Protect	Wet Lands			
G	Miscellaneous	Complete	Project	\$724,000	4.6%	No

INFORMATION PHASE – FUNCTION ANALYSIS

Project: New I-985 Interchange – Hall County

Function: Provide Access

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
H	Unclassified Excavation	Accommodate	Drainage	\$530,000	3.4%	Yes
		Establish	Template			
		Accommodate	Ramp Tapers			
		Construct	Ramps			
I	Erosion Control	Control	Sediment	\$480,000	3.1%	No
		Protect	Environment			
		Control	Erosion			
		Protect	Streams			
		Phase	Construction			
J	Drainage	Convey	Runoff	\$404,000	2.6%	Yes
		Drain	Pavement			
		Control	Spread			
		Convey	Flow			
		Cross	Roadway			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: New I-985 Interchange – Hall County

Function: Provide Access

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
K	Curb & Gutter	Control	Water	\$400,000	2.6%	Yes
		Delineate	Pavement			
		Support	Sidewalk			
		Define	Section			
		Define	Shoulder			
		Enclose	Drainage			
		Save	R/W			
		Reduce	Fill			
L	Signing & Marking	Guide	Traffic	\$399,000	2.5%	Yes
		Signalize	Intersections			
		Inform	Motorists			
M	Bridge #3 and MSE Walls	Support	Abutments	\$346,000	2.2%	Yes
		Span	Streams			
		Carry	Traffic			
		Avoid	Impacts			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: New I-985 Interchange – Hall County

Function: Provide Access

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
N	Guardrail	Protect	Motorists	\$312,000	2.0%	Yes
		Reduce	Embankment			
		Minimize	R/W			
		Protect	Abutment			
O	Concrete Sidewalk	Accommodate	Pedestrians	\$222,000	1.4%	Yes
		Complete	Urban Section			
		Meet	Policy			
P	Traffic Control	Protect	Motorists	\$200,000	1.3%	No
		Stage	Construction			
		Improve	Safety			
Q	Clearing & Grubbing	Allow	Construction	\$200,000	1.3%	No
		Remove	Material			
R	Bottomless Culvert	Convey	Water	\$186,000	1.2%	Yes
		Meet	Env. Regs			
		Minimize	Impacts			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	CREATIVE IDEA	COMMENTS	IDEA RATING
A	Bridge #1 & #2 and MSE Walls		
A-1	Realign the stream and combine bridge 1 and bridge 2 into a single bridge.	Cost reduction if total bridge length is reduced, Requires a major stream relocation	✓
A-2	Eliminate bridge 1 and construct a box culvert.	Reduce cost, Negative stream impacts	✓
A-3	Reduce the size of the bridge 1 & 2 beams to reduce the height of the roadway.	Reduce cost due to smaller beams, reduce bridge height, reduce embankment	✓
A-4	Reduce the width of bridges by reducing the width of the median	Reduce bridge cost	✓
A-5	Reduce the width of the bridge by reducing the width of the sidewalks.	Reduce bridge cost, negative impact to pedestrians	✓
A-6	Reduce the overall height of the bridge to provide only 17 feet of clearance.	Current design provides more clearance than required, reduce embankment height	✓
A-7	Reduce the number of turn lanes on the bridges	Dual turn lanes required for traffic	X
A-8	Reduce the bridge width by constructing 11-foot lanes.	See Idea X-7	X
A-9	Replace Bridge # with a box culvert	Reduce cost	✓
B	Asphalt Pavement		
B-1	Reduce the number of turn lanes & storage on SR 13	Reduce cost, Speed construction	✓
✓ = 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
B-2	Reduce the width of the Industrial Connector west of Thurmon Tanner Parkway	See Idea X-5	X
B-3	Reduce the number of lanes on Thurmon Tanner Parkway	Reduce cost, Speed construction	✓
B-4	Reduce the median width on the Martin Road extension (8 feet to 4 feet)	See Idea X-6	X
B-5	Shift the east side ramps in to reduce R/W	Less R/W impact, reduce intersection distance	✓
B-6	Reconsider Alternate 1 alignment to simplify drainage	Reduce superelevation, Simplify Drainage	✓
B-7	Reduce the number of lanes on the Martin Road Extension. (east side)	See Idea X-6	X
B-8	Eliminate the bike lanes on SR 13 and Martin Road (east of SR 13)	See Idea X-4	X
C	Plain Concrete Pavement		
C-1	Use asphalt pavement in-lieu-of concrete pavement on ramps.	Reduce cost, Speed construction, LCC impacts	✓
C-2	Use asphalt shoulders in-lieu-of concrete shoulders on ramps.	Reduce cost	✓
✓ = 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-3	Use concrete pavement between the approaches for bridges 1 & 2.	Constructability issues	X
C-4	Verify the depth of the aggregate base course under the concrete pavement and the need for the asphalt layer.	Reduce cost, Simplify construction	DS
C-5	Shift ramp gores out to accommodate future I-985 lane widening to the outside.	Increase initial cost but reduce lift-cycle cost for ramp gores when I-985 is widened	✓
E	Borrow Excavation		
E-1	Compress the east side ramps to save R/W	See Idea B-5	X
E-2	Reduce the paved shoulder width on the ramps to 6 feet	Reduce cost, Speed construction	✓
F	Bridge #4 and MSE Walls		
F-1	Construct the bridge on a skew to reduce the deck area.	Reduce impacts to stream	✓
F-2	Replace the bridge with a box culvert.	Reduce cost, increase stream impacts	✓
✓ = 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
J	Drainage		
J-1	Connect the bottomless culvert to existing box under I-985 to reduce headwall opening in gore area.	See Idea R-1	X
J-2	Construct a bottomless culvert at the NB off ramp.	Higher Cost	X
J-3	Reduce the size of the bottomless culvert.	Reduce cost, Simplify construction, Impacts	DS
K	Curb and Gutter		
K-1	Eliminate the raised median between the Interchange intersections and use a painted median / line.	See Idea X-6	X
K-2	Reduce / Eliminate the raised median between the ramp intersections and use striping.	See Idea X-6	X
L	Signing and Marking		
L-1	Increase the cost for the signalization of the intersections.	Increase cost, More realistic cost	DS
L-2	Interconnect the signals at the four intersections.	Improve phasing	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
M	Bridge #3 and MSE Walls		
M-1	Construct the bridge on a skew to reduce the deck area.	Reduce size and cost	✓
M-2	Replace the bridge with a box culvert.	Reduce cost, increase stream impacts	✓
M-3	Question why bridge #3 is narrower than bridge #1	Proper sizing of bridges crossing same stream	DS
M-4	Use single-span bridge in-lieu-of 3-span bridge.	Less impacts, possible higher cost	X
N	Guardrail		
N-1	Use cable barrier in lieu of Type W guardrail	Suitability issues	X
O	Concrete Sidewalk		
O-1	Eliminate the sidewalk throughout the project	Reduce cost, Industrial area,	✓
O-2	Construct sidewalk on only one side of the roadways.	Reduce cost, Industrial area	✓
R	Bottomless Culvert		
R-1	Replace with a standard box culvert	Reduce cost, increased stream impacts	✓
✓ = 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
R-2	Tie Bottomless culvert to existing box culvert under I-985 to eliminate hazard in gore area.	Eliminate need to install guardrail around inlet opening in gore area	DS
X	General Comments and Ideas		
X-1	Standardize the shoulder width on the Martin Road extension to 12 feet	See Idea X-9	✓
X-2	Reduce the typical section median width by 4 feet (reduce from 32 feet to 28 feet)	Reduce R/W costs, Reduce project cost	X
X-3	Construct 11-foot left turn lanes	Reduce cost	✓
X-4	Eliminate the dual bike lanes along SR 13 and East Martin Road and construct a single multi-purpose trail on the east side of SR 13.	Reduce cost, Keep bikers off roadway and on a separate trail	✓
X-5	Shorten the Industrial Connector to end at White Road	Reduce cost, Simplify construction	✓
X-6	Revise the typical section for the Martin Road Extension to reduce the median width.	Reduce cost, Reduce bridge widths	✓
X-7	Construct 11-foot lanes on the Martin Road Extension	Reduce cost	✓
X-8	Revise the sidewalks along the Martin Road Extension	See Idea O-1	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
X-9	Construct a uniform 12-foot shoulder along the Martin Road Extension.	Maintain same shoulder throughout Martin Road	✓
X-10	Reduce the length of the turn lane storage areas to the lengths shown in the traffic study report.	Reduce cost	✓
X-11	Construct only single left turn lanes and delay construction of the second left turn lane until it is needed.	Reduce cost	✓
X-12	Reduce R/W acquisition and buy slope easements.	Reduce cost	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

VE STUDY SIGN-IN SHEET

Project No.: NH500-0000-00(425)
CSNHS-0008-00(796)(797)

County: Hall

PI No.: 0000425, 0008796
0008797

Date: Feb. 1-4, 2010

Days

1	4	NAME	EMPLOYEE ID NO.	DOT 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
		James K. Magnus		Construction	404-631-1971	jmagnus@dot.ga.gov
		Ken Werho		Traffic Operations	404-635-8144	kwerho@dot.ga.gov
	✓	Ron Wishon		Engineering Services	404-631-1753	rwishon@dot.ga.gov
✓		RENARD JOHNSON	N/A	R. K. SHAH & ASSOC.	770-436-5070	RENARD.JOHNSON@R.K.SHAH.COM
✓	✓	Steve Britney	N/A	Street Smarts	(770) 813-0882	steve@street-smarts.us
✓	✓	ARUNA SASTRY	N/A	SASTRY AND ASSOC.	678-366-9375	Sast9375@bellsouth.net
✓	✓	Keith Borkenhagen	N/A	MACTEC	623-556-1875	kborkenhagen@msn.com
⊙		Kamran		MACTEC	770-436-5070	kkamran@dot.ga.gov
✓		Nabil Raad		Traffic Operations	404-635-8126	nraad@dot.ga.gov
✓	✓	GEORGE GARDNER		MACTEC	770-421-3346	GARDNER@MACTEC.COM
✓	✓	RAJU SHAH	N/A	R.K. SHAH & ASSOC.	770-436-5070	RAJU.SHAH@R.K.SHAH.COM
✓		Stanley Hill		OPD	404-631-1560	sthill@dot.ga.gov
✓	✓	Vincenta P. Kim		"	4-631-1887	v.p.kim@dot.ga.gov
✓	✓	Stanley Kim		Bridge Design	4-631-1895	skim@dot.ga.gov
✓		Emmanuella Myrthil		Environmental Svc	4-631-1185	emmyrthil@dot.ga.gov

Check days that apply
 Attended Project Overview (Day 1)
 Attended Project Presentation (Day 4)