

VALUE ENGINEERING REPORT

**SR 166 Bypass, Widening and Reconstruction
STP00-0021-01(024)(025); PI Nos. 0631300 & 0631310
Carroll County**

May 15, 2013

PROJECT OWNER:



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

VALUE ENGINEERING CONSULTANT:



AMEC Environment & Infrastructure, Inc.
1075 Big Shanty Road NW, Suite 100
Kennesaw, GA 30144

TABLE OF CONTENTS

VALUE ENGINEERING REPORT

SR 166 Bypass, Widening and Reconstruction
STP00-0021-01(024)(025); PI No. 0631300 & 0631310
Carroll County

Disclaimer	3
Executive Summary	4
Introduction	5
Results Obtained	6
Recommendation Summary	6
Summary Table	11
Study Identification	14
Team Member List	15
Project Description	15
Project Design Briefing	16
Project Location Map	23
Value Engineering Recommendations (STP00-0021-01[025])	24
Value Engineering Recommendations (STP00-0021-01[024])	73
Appendix	108
Sources	109
Cost Model / Distribution	111
FAST Diagram	113
Function Analysis	114
Creative Ideas / Idea Evaluation	116
VE Study Sign-in Sheet	119

Disclaimer

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

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

EXECUTIVE SUMMARY

Executive Summary

VALUE ENGINEERING STUDY

**SR 166 Bypass, Widening and Reconstruction
STP00-0021-01(024)(025); PI No.'s 0631300 & 0631310
Carroll County
April 29 – May 2, 2013**

Introduction

This report presents the results of a value engineering (VE) study conducted on the proposed design for the SR 166 Bypass, Widening and Reconstruction project in Carroll County. This project is required to accommodate projected future growth in this corridor by improving capacity and operations.

The total improvements are comprised of 2 projects: 1) the North Bowdon Bypass, STP00-0021-01(025), PI No. 0631310, from just east of Big Indian Creek, about 0.7 miles west of the western city limits of Bowdon, bypassing the city on new location to the north and tie into the existing W. Jonesville Road, continuing along SR 166 to the intersection of CR 828/Farmer's High Road for a project length of 6.2 miles and 2) Widening and Reconstruction of SR 166, STP00-0021-01(024), PI No. 0631300, from the limit of the previous project, CR 828/Farmer's Mill Road intersection to the existing 4-lane section just west of CR 11/Hays Mill Road for a project length of 5.2 miles. Both projects are entirely in Carroll County, and their total project length is 11.4 miles. The bypass section of the project will be a 2-lane roadway with rural shoulders, transition at the W. Jonesville Road intersection to a 5-lane section within a commercial area, a distance of about 5,200 feet and continue to a 4-lane, divided roadway with a 32 foot grassed median and rural shoulders. The traffic volumes are projected to double by the design year 2043 to an ADT of 6,280 at the western project limit to an ADT of 29,130 at the eastern project limit.

Major contract work items include asphalt paving earthwork bridges and erosion control measures. With contingencies and mark-ups, the total project cost for the "bypass" project is \$41,567,388 and includes \$11,542,000 for right of way and \$2,125,849 for utilities. The total cost for the "widening" project is \$39,282,754 and includes \$10,274,000 for right of way and \$478,536 for utilities. The combined project cost is \$80,850,142. The project is following the GDOT Plan Development Process (PDP). The current overall schedule for both projects is for R/W authorization in May 2016 and project letting in November 2018. The design is currently in the concept stage, preparing for final concept plans. The environmental document is not yet approved. The VE study was conducted April 29 – May 2, 2013, at the Georgia DOT Headquarters in Atlanta using a five 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 contains information about the project and the team. The Recommendations presents a detailed description and support information about each recommendation and are broken out for each project. 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.

Results Obtained

The VE team focused their efforts on the high cost items of the project. Using function analysis and brain storming techniques, the team generated 48 ideas with 38 identified for additional evaluation as possible recommendations or design considerations. The VE team developed a total of 16 independent recommendations with 4 alternative recommendations for both projects combined. A detailed write-up of each recommendation is contained in the respective portion of this report. The following is a summary of the recommendations.

Recommendation Summary

STP00-0021-01(025); PI No. 0631310

Idea A-7: Use urban shoulders within the commercial area.

Reducing the shoulder width by using an urban shoulder within the 4,000 foot commercial area will reduce overall right of way impacts and areas. It will also allow for easier future construction of potential sidewalks.

The total potential savings is \$640,000.

Idea A-8: Review the displacements at Adelee Road.

There are several affected residences that require displacements in this area. Reviewing and potentially incorporating minor grading modifications or constructing retaining walls could eliminate the displacements.

The total potential savings is \$59,000.

Idea B-3: Modify the bypass profile.

Increase the grades on the crest vertical curve to reduce earthwork. Use a maximum grade of 6%. Truck climbing/passing lane are already required and will not be affected.

The total potential savings is \$374,000

Idea B-4: Reduce the design speed of the corridor and incorporate a 20 foot, narrower, raised median.

This recommendation incorporates a lower design speed for the corridor, which is more suitable based on the projected traffic volumes and land use development.

The total potential savings is \$1,499,000

Idea B-5: Reduce the passing lanes at the crest vertical curve along the bypass.

Review the applicable design criteria and potentially reduce the magnitude and impacts of the passing lanes.

The total potential savings is \$184,000

Idea B-6: Reduce the shoulder paving width in designated areas.

This recommendation will use the 6 ½ foot paved, bicycle shoulders only at the areas designated by the bike lanes. Use a 4 foot paved shoulder at all other locations.

The total potential savings is \$128,000

Idea B-8: Shift the roundabout.

Shifting the roundabout slightly to the north will eliminate a R/W parcel and allow for easier construction of the roundabout with lesser traffic impacts.

The total potential savings is \$28,000.

Idea B-9: Incorporate a raised median between the roundabout and the signalized intersection.

There is an existing gas station/ convenience store located on the north side of SR 166 between the proposed roundabout at W. Jonesville Road and a signal at N. Jonesville Road. The distance between the 2 intersections is only about 400 feet which could have

operational problems during peak demands. Constructing a raised median will restrict some movements thereby improving the operations.

The total potential cost increase is (\$4,000).

Idea B-16: Reduce the pavement thickness at the medians and turning lanes to an appropriate thickness.

Since traffic volumes at the left turn lanes are much lower than the mainline, designing and incorporating an appropriate, reduced pavement in this area should be considered.

The total potential savings is \$217,000

Idea E-1: Reduce the depth of the main span for the bridge over Big Indian Creek.

This will reduce the earthwork and allow for a shorter main span crossing the creek.

The total potential savings is \$21,000

Idea H-3a: Review the re-use of the previously studied Alternate 2 for the bypass alignment.

This idea is proposed to address the potential operational concerns due to the 400 foot distance between the roundabout and the signalized intersection at W. and N. Jonesville Roads respectively. The historic conditions along the Alternate route 2 could potentially be mitigated and addressed. Also, the re-use of a portion of the existing W. Jonesville Road could be avoided.

The total potential cost increase is (\$376,000)

Idea H-3b: Use an alternate alignment to No. 2.

This recommendation is an alternate consideration to the previous idea, H-3a. It incorporates a different alignment avoiding some of the constraints in alternate 2 with the benefits of the previous idea.

The total potential cost increase is (\$188,000)

STP00-0021-01(024); PI No. 0631300

Idea B-4: Reduce the design speed of the corridor and incorporate a 20 foot, narrower, raised median.

This recommendation incorporates a lower design speed for the corridor, which is more suitable based on the projected traffic volumes and land use development.

The total potential savings is \$862,000

Idea B-6: Reduce the shoulder paving width in designated areas.

This recommendation will use the 6 ½ foot paved , bicycle shoulders only at the areas designated by the bike lanes. Use a 4 foot paved shoulder at all other locations.

The total potential savings is \$930,000

Idea B-16: Reduce the pavement thickness at the medians and turning lanes to an appropriate thickness.

Since traffic volumes at the left turn lanes are much lower than the mainline, designing and incorporating an appropriate, reduced pavement in this area should be considered.

The total potential savings is \$550,000

NOTE: Ideas E-3a, b and c apply to the Garrett Creek crossing. A final hydrology study and report is required and being developed by the design team. It will determine the specific conditions, proposed improvements and bridge selection.

Idea E-3a: Construct only a new WB bridge.

Retaining the existing culvert, and constructing a new WB bridge.

The total potential savings is \$813,000.

Idea E-3b: Remove the existing culvert.

Remove the existing culvert and construct a completely new, and properly aligned box culvert.

The total potential savings is \$925,000.

Idea E-3c: Construct a culvert extension.

Retain the existing culvert and construct an extension.

The total potential savings is \$1,141,000

Idea E-4a: Eliminate the median opening at Simonton Mill Road.

This will eliminate a significant amount of bridge widening required immediately adjacent to the median opening.

The total potential savings is \$1,080,000.

Idea E-4b: Provide only one-way access at the median opening.

Rather than completely eliminate of the median opening, restrict movements to only one-way. This will still reduce the amount of bridge construction while retaining some access for Simonton Mill Road.

The total potential savings is \$929,000.

SR 166 Bypass, Widening and Reconstruction

STP00-0021-01(025); PI No. 0631310

SUMMARY OF POTENTIAL COST SAVINGS

IDEA No.	RECOMMENDATION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS
A-7	Use urban shoulders in the commercial area	\$1,419,000	\$779,000	\$640,000	\$0	\$640,000
A-8	Review displacements at Adelee Road	\$197,000	\$138,000	\$59,000	\$0	\$59,000
B-3	Modify profile along bypass; use 6% maximum grade	\$374,000	\$0	\$374,000	\$0	\$374,000
B-4	Use 20 ft raised median; lower design speed	\$1,923,000	\$424,000	\$1,499,000	\$0	\$1,499,000
B-5	Reduce climbing/passing lane lengths	\$423,000	\$239,000	\$184,000	\$0	\$184,000
B-6	Shorten areas of 6 ½ foot bike-shoulder paving	\$133,000	\$5,000	\$128,000	\$0	\$128,000
B-8	Shift the roundabout to improve constructability and reduce R/W	\$28,000	\$0	\$28,000	\$0	\$28,000
B-9	Incorporate raised median at gas station	\$6,000	\$10,000	(\$4,000)	\$0	(\$4,000)
B-16	Use thinner pavement thickness at median openings and left-turn lanes	\$217,000	\$0	\$217,000	\$0	\$217,000
E-1	Reduce depth and length of main span, bridge No. 1	\$21,000	\$0	\$21,000	\$0	\$21,000
H-3a	Use alternate alignment for bypass segment; use No. 2	\$5,418,000	\$5,794,000	(\$376,000)	\$0	(\$376,000)

SR 166 Bypass, Widening and Reconstruction

STP00-0021-01(025); PI No. 0631310

SUMMARY OF POTENTIAL COST SAVINGS

IDEA No.	RECOMMENDATION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS
H-3b	Use alternate alignment for bypass segment	\$5,418,000	\$5,606,000	(\$188,000)	\$0	(\$188,000)

SR 166 Bypass, Widening and Reconstruction

STP00-0021-01(024); PI No. 0631300

SUMMARY OF POTENTIAL COST SAVINGS

IDEA No.	RECOMMENDATION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS
B-4	Use 20 ft raised median; lower design speed	\$1,862,000	\$1,000,000	\$862,000	\$0	\$862,000
B-6	Shorten areas of 6 ½ foot bike-shoulder paving	\$973,000	\$43,000	\$930,000	\$0	\$930,000
B-16	Use thinner pavement thickness at median openings and left-turn lanes	\$550,000	\$0	\$550,000	\$0	\$550,000
E-3a	Retain the existing culvert; construct only WB bridge	\$813,000	\$0	\$813,000	\$0	\$813,000
E-3b	Remove the existing culvert; construct a new, properly aligned culvert	\$1,626,000	\$701,000	\$925,000	\$0	\$925,000
E-3c	Retain the existing culvert; construct a skewed extension for WB lanes	\$1,626,000	\$485,000	\$1,141,000	\$0	\$1,141,000
E-4a	Eliminate the median opening; construct single bridge	\$3,382,000	\$2,302,000	\$1,080,000	\$0	\$1,080,000
E-4b	Use only one-way median opening; construct single bridge	\$3,231,000	\$2,302,000	\$929,000	\$0	\$929,000

STUDY IDENTIFICATION

Study Identification

Project: SR 166 Bypass, Widening and Reconstruction	Date: April 29 – May 2, 2013
Study Location: GDOT General Offices, Atlanta, GA	

VE Team Members

Name:	Discipline:	Organization:	Telephone:
Joe Wheeler, PE	Roadway Design	RS & H	678-528-7225
Lenor Bromberg, PE, AVS	Roadway Design	KEA	678-904-8591
DeWayne Ray, PE	Construction	KEA	850-499-7147
Greg Grant, PE, VPM	Structural Design	RS & H	678-429-7501
George Obaranec, PE, CVS	VE Team Facilitator	AMEC	770-421-3346

Project Description

This project is the bypass, widening and reconstruction of SR 166 in western Carroll County. The total improvements are comprised of 2 projects: 1) the North Bowdon Bypass, STP00-0021-01(025), PI No. 0631310, from just east of Big Indian Creek, about 0.7 miles west of the western city limits of Bowdon, bypassing the city on new location to the north and tie into the existing W Jonesville Road, continuing along SR 166 to the intersection of CR 828/Farmer’s High Road for a project length of 6.2 miles and 2) Widening and Reconstruction of SR 166, STP00-0021-01(024), PI No. 0631300, from the limit of the previous project, CR 828/Farmer’s Mill Road intersection to the existing 4-lane section just west of CR 11/Hays Mill Road for a project length of 5.2 miles. Both projects are entirely in Carroll County, and their total project length is 11.4 miles. The bypass section of the project will be a 2-lane roadway with rural shoulders, transition at the W. Jonesville Road intersection to a 5-lane section within a commercial area, a distance of about 5,200 feet and continue to a 4-lane, divided roadway with a 32 foot grassed median and rural shoulders. The traffic volumes are projected to double by the design year 2043 to an ADT of 6,280 at the western project limit to an ADT of 29,130 at the eastern project limit.

Major contract work items include asphalt paving earthwork bridges and erosion control measures. With contingencies and mark-ups, the total project cost for the “bypass” project is \$41,567,388 and includes \$11,542,000 for right of way and

\$2,125,849 for utilities. The total cost for the “widening” project is \$39,282,754 and include \$10,274,000 for right of way and \$478,536 for utilities. The combined project cost is \$80,850,142. The project is following the GDOT Plan Development Process (PDP). The current overall schedule for both projects is for R/W authorization in May 2016 and project letting in November 2018. The design is currently in the concept stage, preparing for final concept plans. The environmental document is not yet approved. The VE study was conducted April 29 – May 2, 2013, at the Georgia DOT Headquarters in Atlanta using a five person VE team.

Project Design Briefing

The VE team received a project briefing by the GDOT project design team represented Chandria Brown, the GDOT Project Manager and Dan Bodycomb, the consultant Project Manger with AECOM. In addition to the attached project notes presented by Mr. Bodycomb, the following information and comments were presented:

- The overall improvements are broken out into 2 construction projects commonly referred to as the “bypass” and the “widening”. They will widen and reconstruct SR 166 from Carrollton to Bowdon, from the SR 166 bypass to the intersection of West Jonesville Road, and construct a bypass around Bowdon from the West Jonesville Road intersection to just east of the Big Indian Creek for a total project length of 11.4 miles.
- The project is in the Concept Stage. The display plans are on aerial mapping. Additional detailed survey is required to fill some gaps in the mapping.
- The typical sections for the total project are comprised of 3 general sections: 1) the bypass alignment will be 2, 12-foot lanes with rural shoulders although the West Jonesville Road re-use area will have curb and gutter. This is to accommodate potential future sidewalks in the area. 2) the commercial area will be a 5-lane section with rural shoulders and 3) the existing 2-lane road will be widened to a divided, 4-lane roadway and includes an 11 ft left lane and a 12 ft right lane; a depressed, 32 ft median and a rural shoulders.
- A portion of the corridor is a county designated bike route and includes 6 ½ foot bicycle shoulders in each direction.
- The preferred alternative is to construct a roundabout at the W. Jonesville Road intersection and a signal at the N. Jonesville Road intersection. A display was provided for this scheme. An additional benefit of the roundabout is a gateway opportunity and a transition point for the City of Bowdon.
- This project will be a borrow job requiring additional embankment from outside the project limits. There should be ample sources relatively close.
- Truck climbing/passing lanes are required and proposed at the crest curve in the bypass alignment.
- There are several historic resources along the project that the proposed design will avoid and/or mitigate. The environmental document is being prepared and not yet approved. It will be one document for both projects.
- The project design history to this point reflected numerous studied alternatives

that have since been rejected and abandoned.

- The aerial display showed a county bike trail along the eastern portion of the project. This is an independent county project however it is being coordinated with this project.
- The detailed and final hydrology studies and being developed and not complete. The proposed designs and bridge spans reflect the current best known information and coordination with the bridge group.
- The project schedule is for R/W authorization in June 2014 and project letting in February 2017.

Project Notes – Provided by AECOM – GDOT Design Consultant

- There are two different projects which are referred to as “The Bypass” and “The Widening”

- The Bypass

- Unit 25
- PI 631310
- Starts just west of Bowdon City Limits
- Ends at Farmers High Road

- The Widening

- Unit 24
- PI 631300
- Starts at Farmers High Road
- Ends at existing 4 lane section in Carrollton

- One environmental document

- Need logical termini for FHWA approval of environmental document
- Thus two projects are codependent

- Brief history of Southern Bypass Alignment

- GDOT approved concept reports March 1995

- AECOM started the project in August 2006
- AECOM refined the original concept layouts
- PIOH Meeting held April 2007
 - Attendance - 535
 - For – 24
 - Conditional – 22
 - Uncommitted – 5
 - Against – 641 (mostly from petition)
 - Met with Mayor Agan at GDOT in May 2007
- AECOM performed a screening of potential northern alignments Nov 2007
- Met with Mayor Watts and the City Manager, J. Meigs, to discuss northern alternates Dec 2007
- Second PIOH was schedule for May 2008 and later CANCELED when project stopped
- Project restarted summer 2011
- Second PIOH Meeting held Feb. 28, 2012
 - Attendance - 221
 - For - 25
 - Conditional – 17
 - Uncommitted – 6
 - Against – 28

The Bypass (PI 631310)

- Starts 0.7 miles west of the western city limits of Bowdon
- Extends north and then east about 1 mile outside the city limits
- Starting from existing SR166 to SR100 – **2.2 miles**
 - Two 12' travel lanes
 - 10' shoulder with 4' paved
 - **55 mph** design speed
- Bridge 1 – 15+88 to 19+08
 - Stream cuts back along property line, tried to make perpendicular crossing
 - Impact to Wetland 01 due to location of crossing of Stream 02
- Lovorn Mill - Climbing lanes (calculations included)
 - 1,600 feet at 4.65% in eastbound direction
 - 1,200 feet at 5.0% in westbound direction
 - Met requirements based upon
 - > 200 vehicles per hour
 - > 20 trucks per hour
 - > 10 mph reduction in speed
- Culvert at STA 78+00
 - Single 10 x 6 box
 - Given min and max roadway elevations for standard design
- Profile options from 78+00 to 103+00 (calculations included)
 - First option was to match existing ground as closely as possible
 - This resulted in a very high amount of borrow

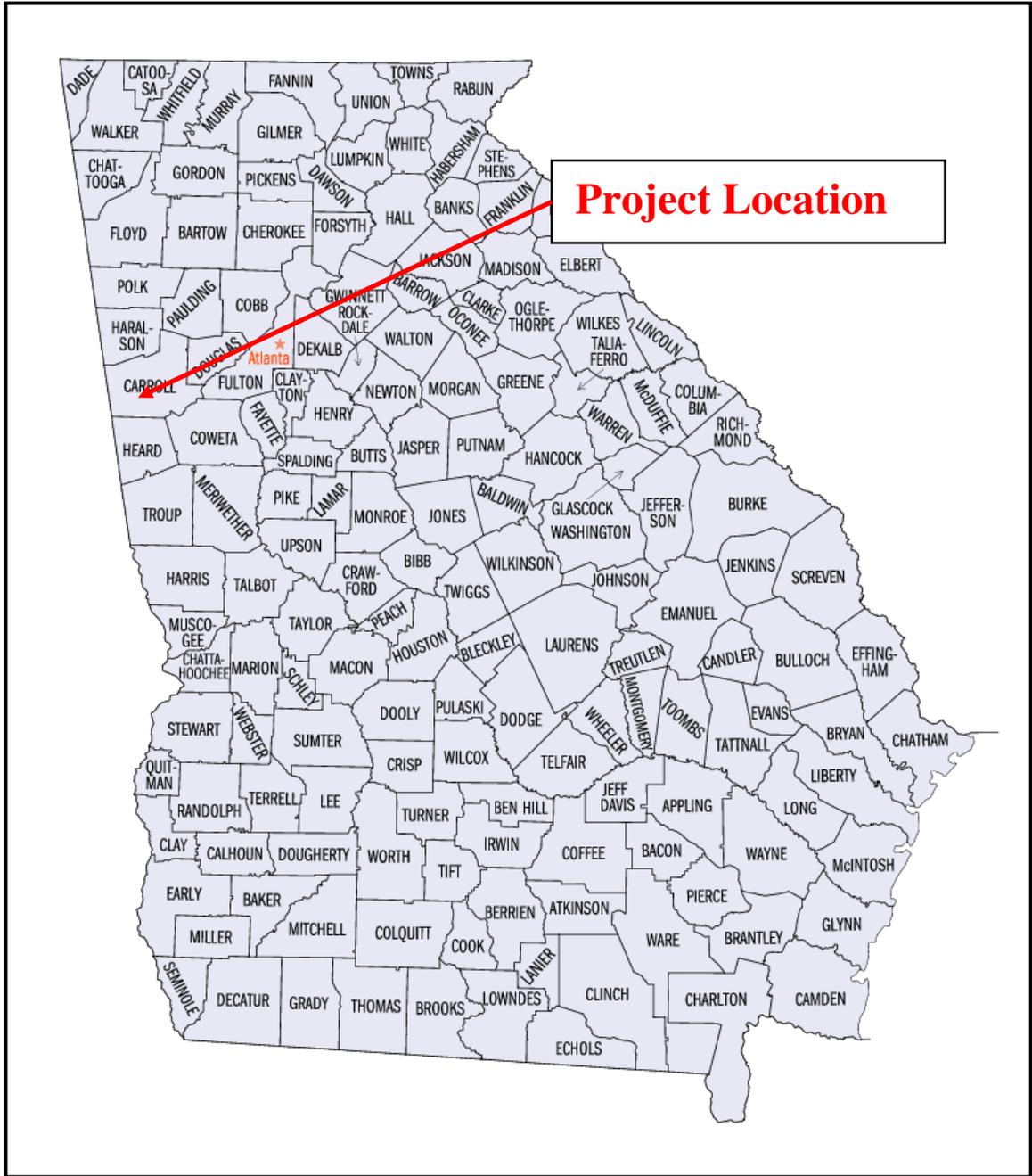
- Looked a ways to reduce borrow material
 - Lowered profile between 78+00 to 103+00
- Bridge 2 – STA 103+06 to 106+26
- SR100 Intersection
 - Identified as potential roundabout
 - Recommending a signal due to steep grades both on SR 100 and SR 166
- SR 100 to existing SR 166 – **1.1 miles**
 - Use of existing roadway that has a higher population density than surrounding area
 - Context sensitive design ideas
 - **45 mph** design speed
 - Curb and Gutter
 - Sidewalk considered – final determination not yet made
- West Jonesville Road Intersection
 - Warrants a traffic signal
 - Less than 600 feet from signal at North Jonesville
 - Roundabouts analyzed at these two intersections
 - Recommendation for single roundabout at West Jonesville Road
- North Jonesville to just west of Kuglar Road – **1.0 miles**
 - Highest concentration of businesses along the project corridor
 - This is a good area to transition to a slower speed (45 mph)
 - Roundabout can be a type of gateway into the City of Bowdon
 - Looked at multiple typical sections along this section

- Proposed five lane section with rural shoulders – **45 mph** design speed
 - Four 11' lanes
 - 14' center turn lane
 - Alternative 1: Five lane section w/ C&G
 - More costly drainage
 - Still unable to save parking lot in front of building
 - Alternative 2: Raised 20' median
 - Concern about access complaints
 - Still unable to save parking lot in front of building
 - Alternative 3: Four lane with 32' median
 - Concern about access complaints
 - Numerous displacements
 - **Kuglar Road to Farmers High Road – 1.8 miles**
 - Four lane section
 - 11' inside lane and 12' outside lane
 - 10' shoulder with 6.5' paved
 - 32' depressed median with 6:1 slopes
 - **55 mph** design speed
 - Tried to match existing grade where possible to provide for two lanes of overlay and two new lanes of construction
 - Couple of areas where vertical curves were substandard (sight distance issues)

- Side of the road to widen was determined by number of displacements, historical properties and ecological features

The Widening (PI 631300)

- Begins at Farmers High Road and extends to Maple Street – **4.6 miles**
 - Four lane section
 - 11' inside lane and 12' outside lane
 - 10' shoulder with 6.5' paved
 - 32' depressed median with 6:1 slopes
 - **55 mph** design speed
- Bridge 1 – STA 576+84 to STA 578+34
 - Replaces a triple 10 x 10 box culvert due to alignment of stream
 - Twin bridges
- Bridge 2 – STA 621+48 to 625+48
 - Widening of existing bridge
 - Single structure due to location of median opening
- Carrollton Bypass – **1.1 miles**



Project Location Map

VE RECOMMENDATIONS

STP00-0021-01(025), PI No. 0631310

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: A-7	Sheet No.: 1 of 3	CREATIVE IDEA: Use curb & gutter on 5-lane section: W. Jonesville Road to West of Kuglar Road
Comp By: D. Ray Date: 5/1/13		Checked By: GAO Date: 5/7/13

Original Concept: The project improvements from Sta 211+25 to Sta 257+00 (4,575 LF) will widen to a 5-lane section with rural shoulders and graded ditches.

Within this length of 5-lane construction, between stations 225+00 to 245+00, the proposed improvements require approximately 2 acres of commercial R/W and 1 acre of residential R/W.

Proposed Change: Use curb & gutter and an urban shoulder without sidewalk within this section of roadway widening in lieu of open graded ditches, reducing the amount of proposed R/W.

Justification: This alternative will reduce the R/W width approximately 24 feet, 12 feet on each side of SR 166, and save costs by eliminating the ditch/grade construction even with providing concrete curbing and a closed drainage system. This area was described as a commercial area and an urban section is appropriate, especially if considering future growth and additional development. This area is also designed and will be posted at 45 mph, due to its commercial nature and transition into downtown Bowdon.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$1,419,000		
Proposed	\$779,000		
Savings	\$640,000		\$640,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$640,000

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: A-7		
					CLIENT: GDOT		
Sheet 2 of 3							
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
12.5 mm Recycle	TN	210	85.95	18,024			
19.0 mm Recycle	TN	280	69.58	19,455			
25.0 mm Recycle	TN	419	74.89	31,409			
GAB Base	TN	2,002	13.55	27,128			
Unclas Excav	CY	2,000	3.53	7,060			
Borrow Savings	CY	1,000	3.17	3,170			
VE Recommendation							
Additional 18" conc pipe	LF		0.00		9,000	45.80	412,200
Additional curb inlets	EA		0.00		30	1,808.60	54,258
Additional c&g, type 2	LF		0.00		9,150	15.92	145,668
SUBTOTAL				106,246			612,126
Markup	27.28%			28,984			166,988
Right of Way - No Mark-up	LS	1	1,283,938	1,283,938			
TOTAL				1,419,167			779,114
TOTAL ROUNDED				1,419,000			779,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: A-7
Client: GDOT
Sheet 3 of 3**

R/W Cost:

Total cost of R/W, with mark-ups: \$11,542,000; w/o mark-ups - \$45,110,000

Breakdown:

Residential: 69.00 acres totaling \$3,615,000; weighted % = 70.74

Commercial: 2.00 acres totaling \$1,495,000; weighted % = 29.26

Residential

{ \$11,542,000 (0.7074) } / 69.00 ac = \$118,331 per acre = **\$2.7165 per sq ft**

Commercial

{ \$11,542,000 (0.2926) } / 2.00 ac = \$1,688,595 per acre = **\$38.7648 per sq ft**

Original Design

Between stations 225+00 to 245+00, the proposed R/W requires approximately 2 acres of commercial R/W and 1 acre of residential R/W.

Proposed Design

R/W Savings between Stations 225+00 to 245+00: assume approximately 2/3 of the R/W cost savings would be from commercial frontage and 1/3 residential:

R/W savings = (2000 LF X 2/3 X 24 ft X \$38.7648/SF) + (2000 LF X 1/3 X 24 ft X \$2.7165/SF)
= \$1,240,473.60 + \$43,464.00 = **\$1,283,938**

Estimated Construction Savings Stations 211+25 to 257+00 (4575 LF):

Asphalt Materials Saving 5 ft of "curb area":

12 MM: 5ft/71ft X 2,977.56 tons = 209.7 tons

19 MM: 5ft/71ft X 3,970.08 tons = 279.6 tons

25 MM: 5ft/71ft X 5,955.13 tons = 419.4 tons

GAB: 5ft/71ft X 28,429.11 tons = 2002.1 tons

Estimated Earthworks Reduction Savings:

Unclassified excavation: Approximately 2000 cy

Borrow: Approximately 1000 cy

Additional Items:

Curb & Gutter, type 2, Cost: 2 sides X 4,575 LF = 9,150 lf

Assume a drop inlet every 300 ft each (both sides): 30 new structures

Approximately 9,000 LF of 18" conc pipe

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: A-8	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce R/W impacts and eliminate displacements at Adalee Road intersection.
Comp By: JDW Date: 5/1/13		Checked By: GAO Date: 5/7/13

Original Concept: The concept layout shows displacement of three structures on the north side of SR 166, near the intersection with Adalee Road, two on the western side of the intersection, one on the eastern side. The proposed typical section uses a 10-foot shoulder, a 12-foot front slope, and a 4-foot ditch to incorporate the clear zone, a total of 26 feet.

There is also a thin, 28 foot wide parcel within this area without a structure.

Proposed Change: Modify the shoulder and reduce the right of way impacts by using a combination of V-gutter (Georgia Construction Detail D-33) and retaining walls. The right of way limit could be reduced from 75 feet (to centerline) to 65 feet (limit of clear zone).

Justification: The use of the V-gutter eliminates the need for the ditch. The ditch is creating a wider footprint that encroaches on the structures and necessitates their removal and displacement. The design team should review this area for design modifications that could eliminate displacements. This recommendation can also be applied to other areas of potential displacement. Additionally, the recommendation presented is only one alternative to reducing R/W width. The design team should review other alternate methods as suited to this location.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$197,000		
Proposed	\$138,000		
Savings	\$59,000		\$59,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$59,000

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: A-8	CLIENT: GDOT		
					Sheet 2 of 3			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE			
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost	
Original Design								
Unclassified Excavation	CY	994	3.53	3,510				
Conc. V Gutter	LF	-	0.00					
Drop Inlet Special Design	EA	-						
Class B Conc. Retaining Wall	CY	0.0						
Storm Drain Pipe, 18 In.	LF							
Guardrail Type T	LF							
Guardrail Anchorage Tp 12	EA							
VE Recommendation								
Relocations	LS				0	0.00		
Unclassified Excavation	CY				0			
Conc. V Gutter	LF				630	15.25	9,608	
Drop Inlet Special Design	EA				2	4,258.48	8,517	
Class B Conc. Retaining Wall	CY				26.6	474.71	12,627	
Storm Drain Pipe, 18 In.	LF				680	45.80	31,144	
Guardrail Type T	LF				21	54.27	1,140	
Guardrail Anchorage Tp 12	EA				1	1,993.97	1,994	
SUBTOTAL								
				3,510			65,029	
Markup	27.28%			958			17,740	
Right of Way - No Mark-up	SF	26,607	2.7165	72,278	20,352	2.7165	55,286	
Displacements	Unit	3	40,000	120,000				
TOTAL								
				196,746			138,056	
TOTAL ROUNDED								
				197,000			138,000	

CALCULATIONS

Idea No.: A-8
Client: GDOT
Sheet 3 of 3

Original Design

Parcels are numbered consecutively from west to east. All distances are scaled and are approximate.

Right of Way

Parcel 1 – (140 ft)(40 ft) = 5600 sq. ft.

Parcel 2 (no structure) – (28 ft.) (40 ft.) = 1120 sq. ft.

Parcel 3 – ((150 + 130)/2 ft.) (40 ft.) = 5600 sq. ft.

Parcel 4 – ((310 + 325)/2 ft.) (45 ft.) = 14287.5 sq. ft

Total R/W area; 5,600 + 1,120 + 5,600 + 14,287.5 = **26,607.5 sq ft**

Relocations – Residential Owner (assumed)

3 relocations x \$40,000 per relocation = \$120,000

Excavation for the ditch – 994.45 CY x \$3.53/CY = \$3510.41

Proposed Design

Right of Way

Parcel 1 – (140 ft.)(30 ft.) = 4,200 sq. ft

Parcel 2 (no structure) – (28 ft.)(30 ft.) = 840 sq. ft.

Parcel 3 – ((150 + 130)/2 ft.) (30 ft.) = 4,200 sq. ft.

Parcel 4 – ((310 + 325)/2 ft.)(35 ft.) = 11,112.5 sq. ft.

Total R/W area: 4,200 + 840 + 4,200 + 11,112.5 = **20,352.5 sq ft**

Cost of R/W:

Total cost of R/W, with mark-ups: \$11,542,000; w/o mark-ups - \$45,110,000

Breakdown:

Residential: 69.00 acres totaling \$3,615,000; weighted % = 70.74

Commercial: 2.00 acres totaling \$1,495,000; weighted % = 29.26

Residential

{ \$11,542,000 (0.7074) } / 69.00 ac = \$118,331 per acre = **\$2.7165 per sq ft**

Conc. V Gutter – (630 LF)(\$15.25/LF) = \$9607.50

Drop Inlet Group 1 Special Design (assume 2) – (2)(\$4258.48) = \$8516.96

Class B Concrete Retaining Wall – (26.6 CY)(\$474.71) = \$12627.29

Storm Drain Pipe 18 In. – (680 LF)(\$45.80/LF) = \$31144.00

Guardrail Type T – (21 LF)(\$54.27) = \$1139.67

Guardrail Anchorage Type 12 - \$1993.97

Earthwork for this option is considered to be negligible.

Assumptions

Unit prices used are the same as those used in the concept cost estimate that was provided for the study.

There could be some unforeseen consequential damages that will require closer, detailed review at each of the referenced parcels. Additionally, there could be other design options that the design team should consider in potentially eliminating these displacements.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-3	Sheet No.: 1 of 3	CREATIVE IDEA: Increase maximum grades for bypass profile
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Comp By: JW Date: 5/1/13 Checked By: GAO Date: 5/9/13

Original Concept: Use a maximum grade of 5% for the bypass profile. This is compatible with the 55 mph design speed.

Proposed Change: Use a maximum 6% grade, lowering the design speed to 45 mph as appropriate.

Justification: The bypass alignment has a large vertical crest curve over rolling terrain and new location requiring significant embankment and involving large project impacts. Using a 6% grade will reduce the earthwork required and well as reduce project impacts and the environmental footprint while conforming to the overall project purpose to improve mobility and construct a truck bypass route. Truck climbing lanes are warranted and proposed under the current alignment and would be included under the proposed modification. This recommendation will require a review and potentially reclassification of the bypass and/or a design exception.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$374,000		
Proposed	\$0		
Savings	\$374,000		\$374,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$374,000

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-3 CLIENT: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Earthwork	CY	92,593	3.17	293,520			
		-	0				
		-	0.00				
VE Recommendation							
					0	0.00	
					0		
SUBTOTAL				293,520			0
Markup	27.28%			80,072			0
TOTAL				373,592			0
TOTAL ROUNDED				374,000			0

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

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

Earthwork savings:

Average template width = 100 ft;

Length of profile modification: 1,000 ft, each approach grade

Average height difference: 15 ft upgrade, 10 ft downgrade.

$$100 \text{ ft} \{(1,000 (15) + 1,000 (10))\} = 2,500,000 \text{ cu ft} = \mathbf{92,593 \text{ cu yds}}$$

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-4	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce the design speed; incorporate applicable design criteria	
Comp By: LB	Date: 5/1/13	Checked By: GAO	Date: 5/8/13

Original Concept: The roadway classification of SR 166 is rural minor arterial west of Simonton Mill Road and urban principal arterial east of Simonton Road. This condition dictates the 55 mph design speed and the divided highway typical section.

Proposed Change: Review the corridor and incorporate a lower design speed of 45 mph. This will provide a more appropriate section and design flexibility.

Justification: SR 166 between Bowdon and Carrollton is primarily a residential corridor, although there is a short commercial section, about 4,000 In ft, just east of the West Jonesville Road intersection. In this area, the approach is for a 45 mph design speed and posted speed limit. The remainder of the corridor to the east, about 7 miles, comprises primarily residential, rural parcels. There are numerous driveways. The traffic volumes are projected to double by design year 2043. Reviewing the overall operations of the corridor and lowering the design speed will allow a 4 lane, divided roadway, with a 20 foot raised median to control left turns while continuing to incorporate the desirable design features of a divided and access permitted roadway. The 20 foot raised median would continue to provide space for left-turn lanes at the intersections, restrict cross-over movements and access for this corridor while lowering the design and operating speeds. If this area grows as projected, a 55 mph, rural median will not accommodate the area needs considering the numerous residential driveways and continued corridor development. A higher design and operating speed could be problematic. This recommendation will have a significantly smaller overall footprint with fewer right-of-way impacts, lower construction costs and less environmental affects while providing the same project function. If the design speed is reduced, other options could be incorporated, including a 5-lane section. However, this recommendation does not calculate the potential savings and impacts of that scenario. Our team was familiar with recent projects and conditions where this was considered with similar justifications, most notably the SR 11 Bypass in Social Circle, Walton County. This recommendation should be considered on an overall corridor approach and coordinated with Idea B-4 of the other section.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$1,923,000		
Proposed	\$424,000		
Savings	\$1,499,000		\$1,499,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$1,499,000

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-4		
					CLIENT: GDOT		
				Sheet 2 of 3			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
Right of way - residential	Acre	2.0000	118,331	236,662			
Right of way - commercial	Acre	0.7548	1,688,595	1,274,552			
VE Recommendation							
Concrete curbing	lf				20,000	15.92	318,400
Miscellaneous drainage	ls				1	15,000	15,000
SUBTOTAL				1,511,214			333,400
Markup 27.28%				412,259			90,952
TOTAL				1,923,473			424,352
TOTAL ROUNDED				1,923,000			424,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

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

This recommendation applies to the area from
Sta 255 to Sta 355 of the western project (025); length = 10,000 ft

Reduce 32 ft grassed median to 20 ft raised, grassed median, 12 foot reduction.
12 ft (10,000) = 120,000 sq ft = 2.7548 acres;
Assume **2.0000** acres residential, **0.7548** acre commercial

Total cost of R/W, with mark-ups: \$11,542,000; w/o mark-ups - \$45,110,000

Breakdown:

Residential: 69.00 acres totaling \$3,615,000; weighted % = 70.74

Commercial: 2.00 acres totaling \$1,495,000; weighted % = 29.26

Residential

$\{\$11,542,000 (0.7074)\} / 69.00 \text{ ac} = \mathbf{\$118,331}$ per acre = \$2.7165 per sq ft

Commercial

$\{\$11,542,000 (0.2926)\} / 2.00 \text{ ac} = \mathbf{\$1,688,595}$ per acre = \$38.7648 per sq ft

Additional elements:

Concrete curb; 2 x (10,000) = **20,000 ln ft**

Assume outside shoulders will be similar to current design

Assume earthwork and grassing in medians are comparable, only minor differences.

Most of the drainage will continue to flow to outside ditches; assume additional minor drainage at some locations: **USE \$15,000**

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-5	Sheet No.: 1 of 5	CREATIVE IDEA: Review/shorten the passing lane lengths.
Comp By: LMB Date: 5/2/13 Checked By: GAO Date: 5/7/13		

Original Concept: The original concept includes truck passing lanes to address the 4.65% grade from approximate STA 37+00 to STA 59+00 and the 4.99% grade from approximate STA 59+00 to STA 76+00. The highpoint of the 1100 LF crest vertical curve is at approximate STA 58+55.

The limit of eastbound full width (not including the transition taper) passing lane is from STA 47+00 to STA 66+00 (1900 LF); the widening taper is approximately 300 LF and the reduction taper is approximately 600 LF. The limit of westbound full width passing lane is from STA 54+00 to STA 66+00 (1200 LF); the widening taper is approximate 195 LF and the reduction taper is approximately 600 LF.

Proposed Change: Review the applicable design criteria for passing lanes and apply as follows: the limits of eastbound full width passing would be from STA 47+00 to STA 55+85 (1155 LF); the widening taper would be 300 LF and the reduction taper would be 660 LF. The limit of westbound full width passing lane is from STA 55+85 to STA 66+00 (745 LF); the widening taper would be 195 LF and the reduction taper would be 660 LF. No change is proposed to the grades or vertical curve as proposed under the original concept. No significant change is made to the widening or reduction taper lengths.

Justification: The eastbound steep upgrade would begin to taper off at STA 53+25 and the westbound steep upgrade would begin to taper off at STA 64+25. Using a conservative break point of the crest curve high point as the termini of the full width passing lane would allow a reduction in length of full passing lane width. This would result in a reduction in pavement, earthwork, and right-of-way within those limits.

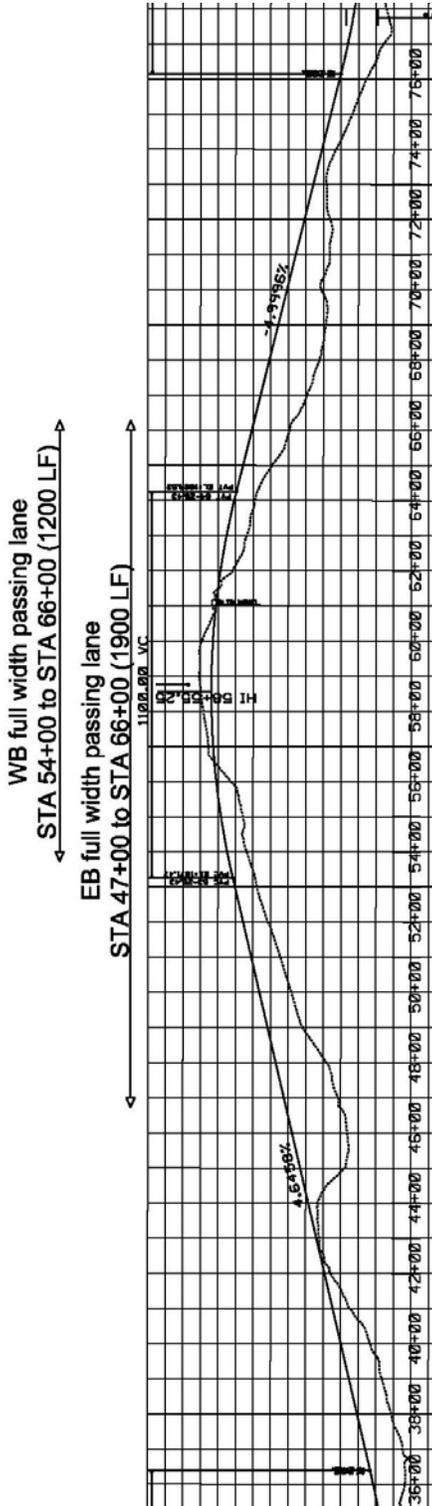
COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$423,000		
Proposed	\$239,000		
Savings	\$184,000		\$184,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$184,000

SKETCH

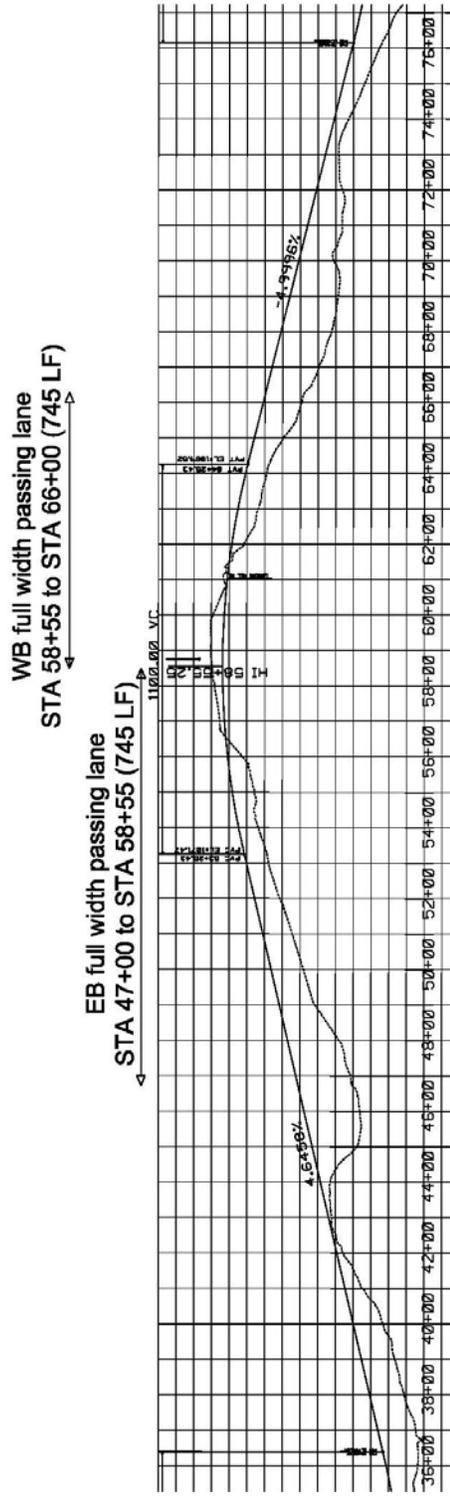
Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

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

ORIGINAL



PROPOSED



COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-5		
					CLIENT: GDOT		
				Sheet 3 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Full Depth Pavement	SY	4,133	55	227,333			
		-	0.00	0			
VE Recommendation							
Full Depth Pavement	SY	-	55.00		2,533	55	139,333
Earthwork - Excavation	CY	1,180	3.53	4,165	-	0.00	
Earthwork - Borrow	CY	6,760	3.17	21,429	-	0.00	
		-	0.00		0	0.00	
SUBTOTAL				252,928			139,333
Markup	27.28%			68,999			38,010
Right-of-way, residential	SF	37,200	2.72	101,184	22,800	2.72	62,016
TOTAL				423,111			239,359
TOTAL ROUNDED				423,000			239,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

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

Original Design

4.65% grade approx. STA 37+00 to STA 59+00
4.99% grade approx. STA 59+00 to STA 76+00.
Highpoint of 1100 LF crest vertical curve approx. STA 58+55.

Eastbound full width passing lane - STA 47+00 to STA 66+00 (1900 LF)
Westbound full width passing lane - STA 54+00 to STA 66+00 (1200 LF)

Full Depth Pavement cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)
(10.5 in/12 ft)(150#/CF)(1 Ton/2,000 #) = 0.065625 Ton/SF
(14 in/12 ft)(135#/CF)(1 Ton/@,000 #) = 0.07875 Ton/SF
Unit cost: Asphalt: \$75 per Ton; Stone (GAB) \$15.55 per Ton

Cost per SY:
(0.065625 Ton/SF x 9 SF/SY x \$75/Ton) + (0.07875 Ton/SF x 9 SF/SY x \$13.55/Ton)
44.30 + 9.60 = \$53 per SY **USE \$55 per SY**

R/W cost: Total cost of R/W, with markups: \$11,542,000

Breakdown:

Residential: 69.00 ac totaling \$3,615,000; weighted % = 70.74

Commercial: 2.00 ac totaling \$1,495,000; weighted % = 29.26

Residential:

{ \$11,542,000 x 0.7074 } / 69.00 ac = \$118,331 per ac = \$2.7165 per SF **USE \$2.72 per SF**
{ \$11,542,000 x 0.2926 } / 2.00 ac = \$1,688,595 per ac = \$38.7648 per SF **USE \$38.76 per SF**

Original Roadway:

(1900 LF+1200 LF) x 12 FT x SY/9 SF x \$55/SY = \$227,333

Original R/W:

All residential

(1900 LF+1200 LF) x 12 FT x \$2.72 per SF = \$101,184

CALCULATIONS

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

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

Proposed Design

Eastbound fill width passing lane - STA 47+00 to STA 58+55 (1155 LF)

Westbound full width passing lane - STA 58+55 to STA 66+00 (745 LF)

Proposed Roadway:

$$(1155 \text{ LF} + 745 \text{ LF}) \times 12 \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$139,333$$

Proposed R/W: All residential

$$(1155 \text{ LF} + 745 \text{ LF}) \times 12 \text{ FT} \times \$2.72 \text{ per SF} = \$62,016$$

Earthwork reduction:

Excavation – $(1155 \text{ LF} \times 12 \text{ FT} \times \text{avg } 3 \text{ FT cut depth}) \times \text{CY}/27 \text{ CF} \times \$3.53 \text{ per CY} = \$4,165$

Borrow – $(745 \text{ LF} \times 12 \text{ FT} \times \text{avg } 15 \text{ FT fill depth}) \times \text{CY}/27 \text{ CF} \times \$3.17 \text{ per CY} = \$21,450$

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-6	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce paved shoulder width
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Comp By: JDW Date: 4/30/13 Checked By: GAO Date: 5/8/13

Original Concept: Use of 6.5 ft. full depth paved shoulders from Antioch Church Road (Sta. 315+50) to Farmers High Road (Sta. 355+00). The overall width of the graded shoulder is 10 ft.

Proposed Change: Reduce the width of the paved shoulder from 6.5 ft. to 4 ft. in designated areas.

Justification: Carroll County has designated a 3.6-mile segment of SR 166 between CR 70/Tarpley Avenue (outside of project limits) to CR 73/Antioch Church Road as a recreational bike route. The portion of the project that is within these limits is required to have a 6.5 ft. paved shoulder to accommodate the bicycles. The typical sections show a continuation of the 6.5 ft. paved shoulder from Antioch Church Road to Farmers High Road (end of project.). Reduce the width of the paved shoulder maintaining the overall width of the graded shoulder at 10 feet.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$133,000		
Proposed	\$5,000		
Savings	\$128,000		\$128,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$128,000

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-6		
					CLIENT: GDOT		
Sheet 2 of 3							
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
12.5 mm Superpave	TN	158	85.95	13,593	0	85.95	0
19 mm Superpave	TN	316	69.58	22,009	0	69.58	0
25 mm Superpave	TN	633	74.89	47,376	0	74.89	0
Graded Aggregate Base	TN	1,547	13.55	20,966	0	13.55	0
Bituminous Tack Coat	GL	134	2.90	389	0	2.90	0
VE Recommendation							
Borrow Excavation	CY	0	3.17		1303	3.17	4,132
					0	0.00	
					0		
SUBTOTAL				104,333			4,132
Markup	27.28%			28,462			1,127
TOTAL				132,796			5,259
TOTAL ROUNDED				133,000			5,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: B-6
Client: GDOT
Sheet 3 of 3**

Original Design

Length of section = 3,450 ft.

Area = 3,450 ft. x 2.5 ft. x 2 sides = 17,250 sq. ft. = 1,916.67 sq. yds. Use 1,917 sq. yds..

Asph. Conc. 12.5 mm Superpave = 1,917 sq. yd x 165 lbs./sq. yd = 316,305 lbs. = 158.15 tons

Asph. Conc. 19 mm Superpave = 1,917 sq. yd. x 330 lbs./sq.yd = 632,610 lbs. = 316.31 tons

Asph. Conc. 25 mm Superpave = 1,917 sq. yd. x 660 lbs./sq. yd. = 1,265,220 lbs = 632.61 tons

Graded Aggr. Base = 17,250 sq. ft. x 1.17 ft. = 20,182.5 cu. ft. = 747.5 cu. yd. x 2.07 tons/cu. yd..= 1,547.33 tons.

Bituminous tack coat = 1,917 sq. yd x 0.035 gal./sq. yd. x 2 coats = 134.19 gal.

Proposed Design

Total depth of section = 24.5 in. = 2.04 ft.

Additional borrow = 2.04 ft. x 17,250 sq. ft. = 31590 cu. ft. = 1,303.33 cu. yd.

Assumptions

Unit prices used are the same as those used in the concept cost estimate that was provided for the study.

The pavement section matches the ones provided for the study in the draft typical sections. Cost savings would vary depending on the final approved pavement section.

No allowances (exceptions) were made for intersecting side streets or driveways.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-8	Sheet No.: 1 of 3	CREATIVE IDEA: Shift Roundabout construction @ intersection of SR 166 and W. Jonesville RD
Comp By: D. Ray Date: 5/1/13 Checked By: GAO Date: 5/7/13		

Original Concept: Construct a new roundabout at the intersection of SR 166, W. Jonesville Road and Dixon RD. The current aerial display shows this roundabout located near the approximate center of the existing roadway intersection.

Proposed Change: Shift the alignment of the proposed roundabout to the northeast. This shift would allow about 80% of the roundabout to be constructed "in-the-clear".

Justification: A moderate shift of the roundabout, about 50 feet to the northeast would allow most of it to be constructed with fewer impacts and minimal disruption to the existing roadway traffic, reducing MOT and eliminating a small R/W parcel at the corner of Dixon Road and SR 166.

The new roundabout construction would be predominately within currently available R/W, while existing intersection traffic patterns could be maintained with minimal temporary widening (south side of roundabout) and MOT. Once the majority of the roundabout is complete, it could be utilized for lane shifts designed to allow for the rest of the roundabout to be completed.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$28,000		
Proposed	\$0		
Savings	\$28,000		\$28,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$28,000

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-8 CLIENT: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
MOT	LS	1	20,000	20,000			
VE Recommendation							
SUBTOTAL				20,000			0
Markup	27.28%			5,456			0
R/W - No mark-up	SF	787.5	2.7165	2,139			
TOTAL				27,595			0
TOTAL ROUNDED				28,000			0

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: B-8
Client: GDOT
Sheet 3 of 3**

Reduced R/W: $\frac{1}{2} (35 \times 45) = 787.5$ sq ft

Cost of R/W:

Total cost of R/W, with mark-ups: \$11,542,000; w/o mark-ups - \$45,110,000

Breakdown:

Residential: 69.00 acres totaling \$3,615,000; weighted % = 70.74

Commercial: 2.00 acres totaling \$1,495,000; weighted % = 29.26

Residential

$\{\$11,542,000 (0.7074)\} / 69.00 \text{ ac} = \$118,331 \text{ per acre} = \2.7165 per sq ft

Assume a lump sum savings of \$20,000 for reduced MOT.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-9	Sheet No.: 1 of 3	CREATIVE IDEA: Raised Median at Gas Station at Intersection of Bypass with W. Jonesville Road
Comp By: JDW Date: 5/1/13		Checked By: GAO Date: 5/6/13

Original Concept: As currently proposed, there is nothing to prohibit left turns into and out of the gas station on the westbound approach between the roundabout at W. Jonesville Road and the signalized intersection at N. Jonesville Road. This distance is currently about 400 feet and could present operational deficiencies during peak hours.

Proposed Change: Install a raised concrete island to prohibit left turns into the gas station. Convert the driveway to the gas station to a right in/right out driveway.

Justification: Due to the proximity of the roundabout to the gas station, left turns could interfere with the operations of the roundabout. In addition, left turns from the gas station could interfere with the operation of the left turn lane that is being developed for the intersection with N. Jonesville Road. It should be noted that the gas station has full access from N. Jonesville Road.

This recommendation is a project cost increase however it is an option for consideration to improve the operations within the short area from the roundabout to the signalized intersection. The costs included does not account for any access impacts to the gas station/convenience store.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$6,000		
Proposed	\$10,000		
Savings	(\$4,000)		(\$4,000)
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			(\$4,000)

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-9 CLIENT: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Concrete median	SY	93.3	50	4,665			
VE Recommendation							
Concrete median	SY				155.5	50	7,775
					0		
SUBTOTAL				4,665			7,775
Markup	27.28%			1,273			2,121
TOTAL				5,938			9,896
TOTAL ROUNDED				6,000			10,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: B-9
Client: GDOT
Sheet 3 of 3**

Original Design

Conc. Median 6 In. – $((4+20)/2 \text{ ft.})(70 \text{ ft.}) = 840 \text{ Sq. Ft.} = 93.3 \text{ SY}$
 $93.3 \text{ SY} \times \$50/\text{SY} = \4665

Proposed Design

Extend Conc. Median approximately 90 feet to prohibit left turns into the gas station.
Conc. Median 6 In. – $((4+220)/2 \text{ ft.})(70 \text{ ft.}) + (4 \text{ ft.})(90 \text{ ft.}) = 1200 \text{ Sq. Ft.} = 133.3 \text{ SY}$
 $133.3 \text{ SY} \times \$50/\text{SY} = \$6665$

Add Conc. Island (6 In.) at Gas Station

Size is assumed

$((16+4)/2 \text{ ft.})(20 \text{ ft.}) = 200 \text{ Sq. Ft.} = 22.2 \text{ SY}$
 $22.2 \text{ SY} \times \$50/\text{SY} = \1110

Total additional concrete median: $133.3 + 22.2 = 155.5 \text{ SY}$

Assumptions

Concrete Median is 6 inches.

The mean unit price in the GDOT Item Mean Summary that was provided used a price of \$46.74 per square yard. The price was rounded to \$50 for estimating purposes.

The size of the island at the gas station is estimated. No turning template was used to determine the island size.

It may be necessary to provide a small amount of additional pavement (widening to the north side) in order to accommodate the extended median. It appears that this could be done within the right of way as shown on the aerial layout of the roundabout.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Bypass, Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: B-16	Sheet No.: 1 of 3	CREATIVE IDEA: Use reduced pavement thickness for median openings
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Comp By: JW Date: 5/1/13 Checked By: GAO Date: 5/10/13

Original Concept: Use full depth pavement thickness throughout all areas of the project, including the median openings and left turn lanes.

Proposed Change: Develop and appropriately design a reduced pavement thickness for the medians and left turn lane areas.

Justification: Traffic volumes at the medians and left turn lanes are significantly lower than the mainline and designing an appropriate, reduced pavement thickness can provide the similar project function and reduce construction and material costs, without any sacrifice in overall pavement longevity. This calculation assumes a 4-foot full depth pavement structure abutting the mainline for support.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$217,000		
Proposed	\$0		
Savings	\$217,000		\$217,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$217,000

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: B-16 CLIENT: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Pavement - per median opening	Loc	3	56,928	170,784			
VE Recommendation							
SUBTOTAL				170,784			0
Markup	27.28%			46,590			0
TOTAL				217,374			0
TOTAL ROUNDED				217,000			0

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: B-16
Client: GDOT
Sheet 3 of 3**

Assume about 1/3 reduction in pavement thickness and costs; designed specifically for the reduced traffic volumes.

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

$$(10.5 \text{ in} / 12 \text{ ft}) (150 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.065625 \text{ Ton} / \text{SF}$$

$$(14 \text{ in} / 12 \text{ ft}) (135 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.07875 \text{ Ton} / \text{SF}$$

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

$$(0.065625 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$75/\text{ton}) + (0.07875 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$13.55/\text{ton}) = 44.30 + 9.60 = \$53.90 \text{ per SY}$$

Use \$53.90 x 0.33 = \$17.79 reduction for median openings

For each median opening:

Total length: Assume 32 ft median; effective pavement width is $32 - 8 = 24$ ft

1,200 feet long, both approaches

$$24 \text{ ft} \times 1,200 \text{ ft} = 28,800 \text{ sq ft} = 3,200 \text{ sq yds for each median opening}$$

$$3,200 \text{ sq yds} \times \$17.79 = \mathbf{\$56,928} \text{ per median opening location}$$

Median opening locations:

Sta. 270+50 Craven Road

Sta. 279+25 Garrett Circle

Sta. 315+75 Garrett Circle

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: E-1	Sheet No.: 1 of 9	CREATIVE IDEA: Reduce the depth of the main span of Bridge 1 to lower the profile
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Comp By: GCG Date: 04/30/13 Checked By: GAO Date: 04/06/13

Original Concept: The original concept for Bridge 1 over Big Indian Creek is a 6 span bridge composed of three 40 ft approach spans (from the west) a 120 ft long main span and two 40 ft spans (to the east) for an overall bridge length of 320 ft.

Spans (in feet) are 40 – 40 – 40 – 120 – 40 - 40 = 320 feet. The 120 ft main span crosses the Big Indian Creek stream channel. The beam proposed in this span is a 63” Bulb Tee pre-stressed beam.

Proposed Change: Use spans (in feet) of 30 – 40 – 40 – 40 – 90 – 40 - 40 = 320 feet. The 90 ft main span will cross the Big Indian Creek stream channel. The beam proposed in this span is a 63” Bulb Tee pre-stressed beam.

Justification: The depth of the main span beam controls the profile grade line of the road across the bridge. Using a shorter span across the Big Creek Stream Channel will allow use of a shallower beam so the profile grade of the bridge and approach roadway can be lowered in this area to reduce earthwork.

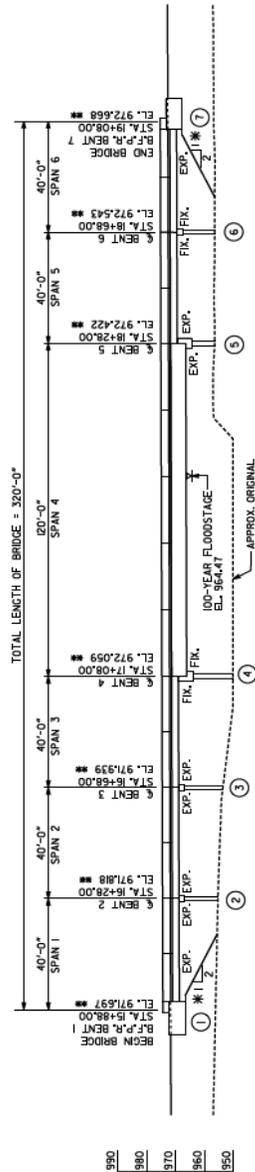
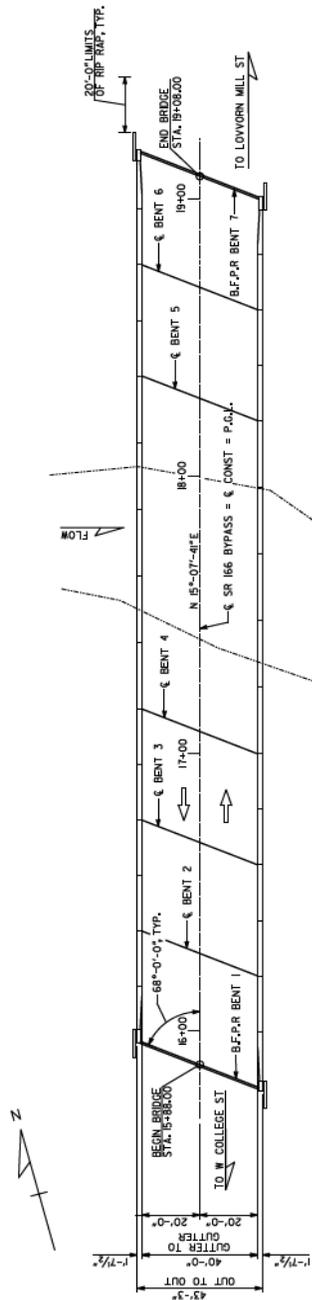
Using the GDOT Bridge Design Manual, the minimum setback from the top of bank, the bents (10 foot minimum clear) will allow the main span to be reduced to 90 feet.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$21,000		
Proposed	\$0		
Savings	\$21,000		\$21,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$21,000

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

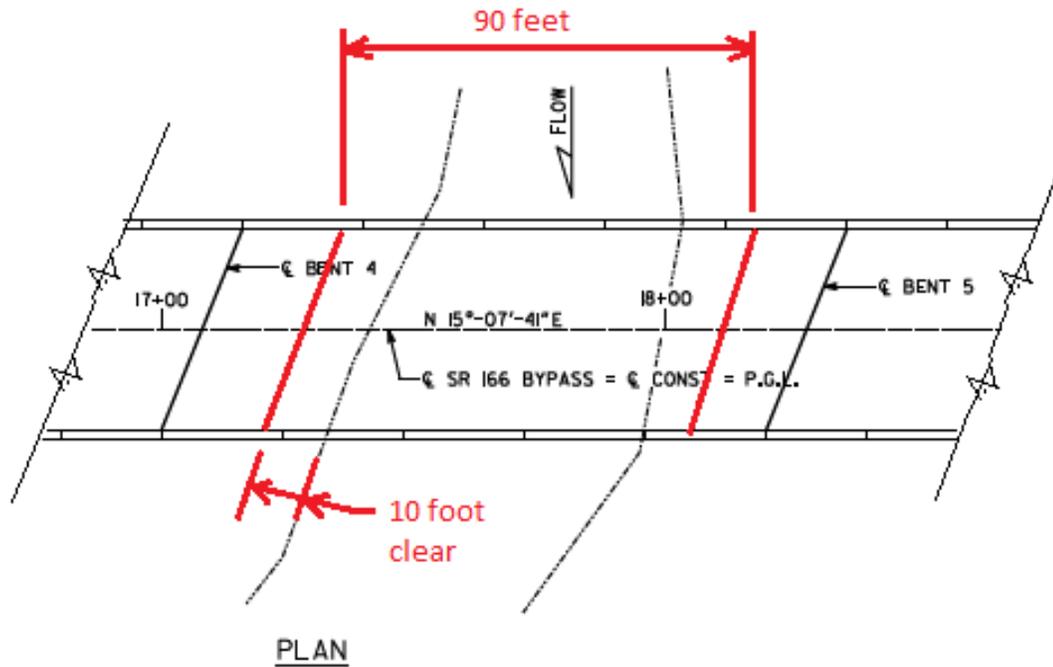
Idea No.: E-1
Client: GDOT
Sheet 2 of 9



SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
Sheet 3 of 9



Note:

New bents for main span set at 10 foot minimum clear from top of stream banks.

CALCULATIONS

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
 Sheet 5 of 9

Original Design

320 ft long x 43.25 ft wide x \$110/ft² = \$1,522,400

Beam depth of main span = 63" (63" Bulb Tee)

63" Bulb Tee Beam

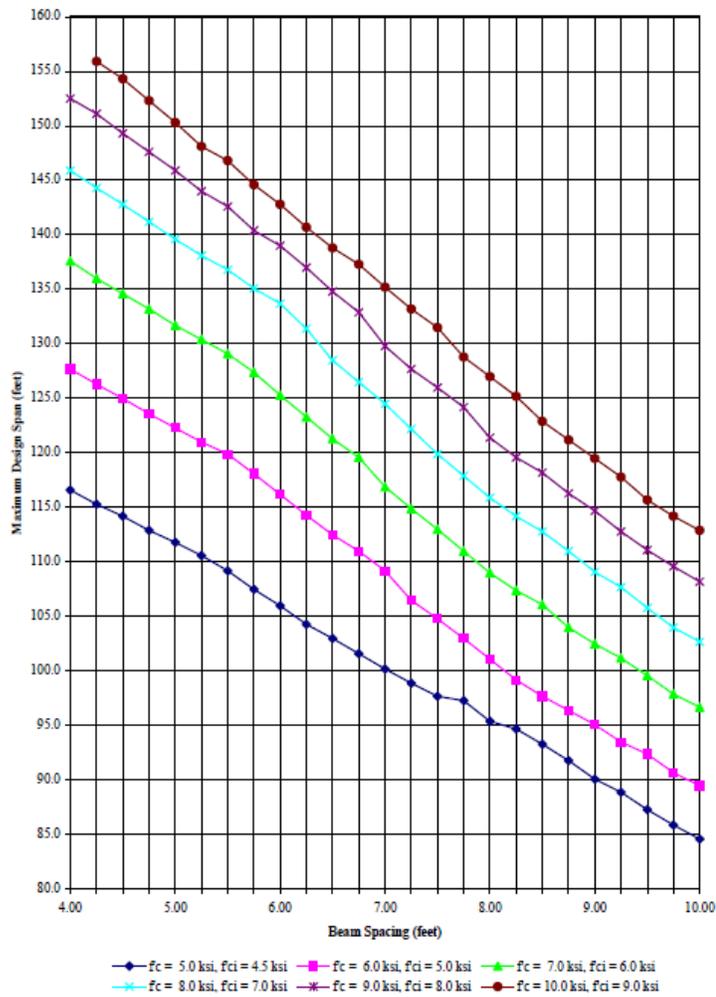


Figure 3-9

All strands are .8" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

CALCULATIONS

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
 Sheet 6 of 9

Proposed Design

320 ft long x 43.25 ft wide x \$110/ft² = \$1,522,400
 Beam depth of main span = 45" (AASHTO III)

Type III PSC Beam

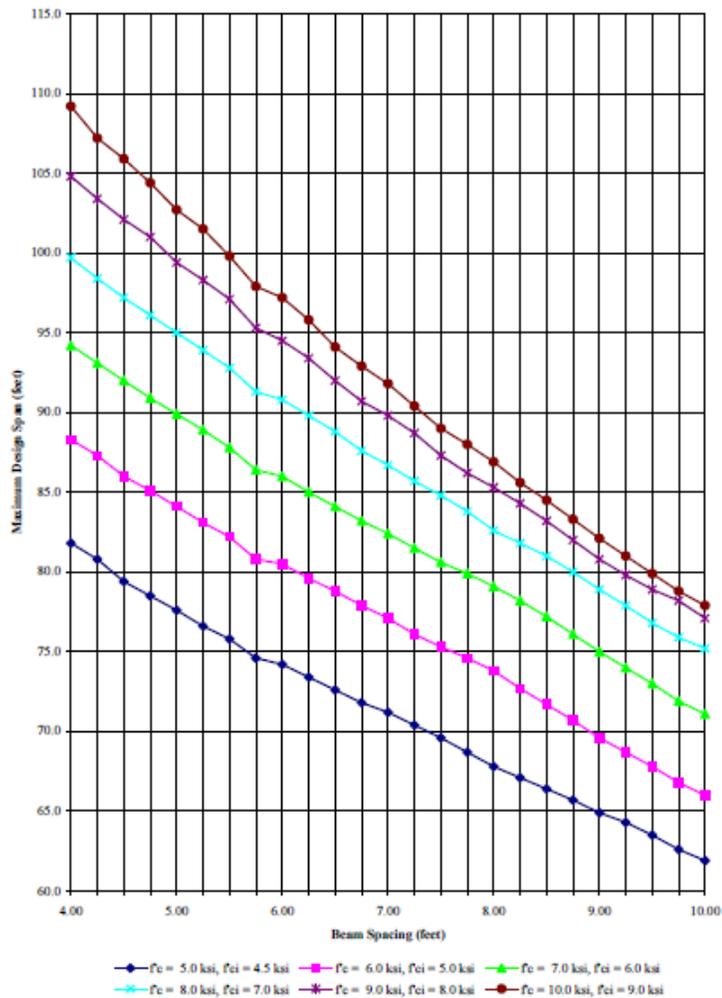


Figure 3-6

All strands are 1/2" diameter low relaxation strands each stressed to 33,818 pounds.

CALCULATIONS

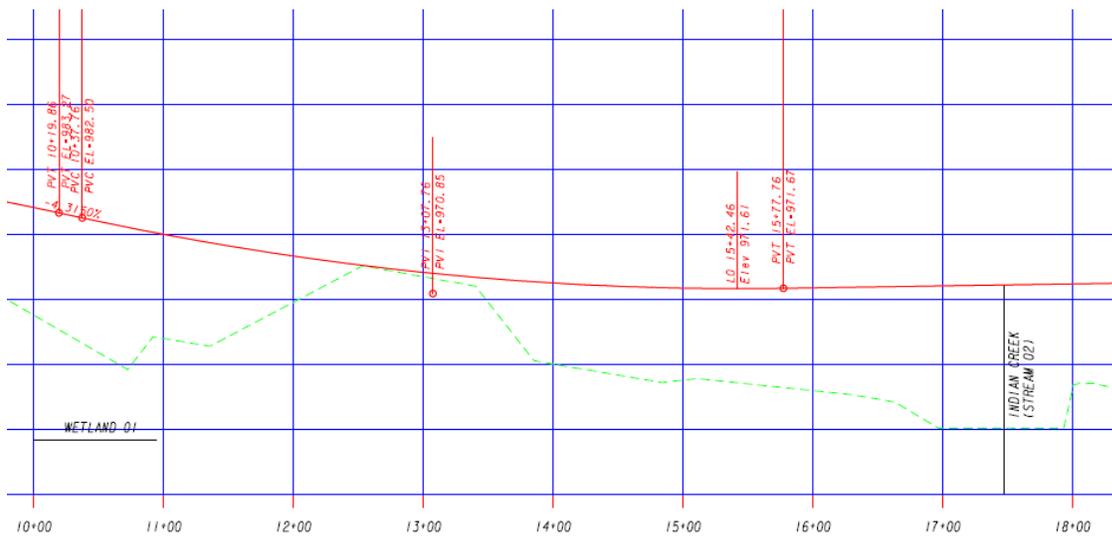
Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
Sheet 7 of 9

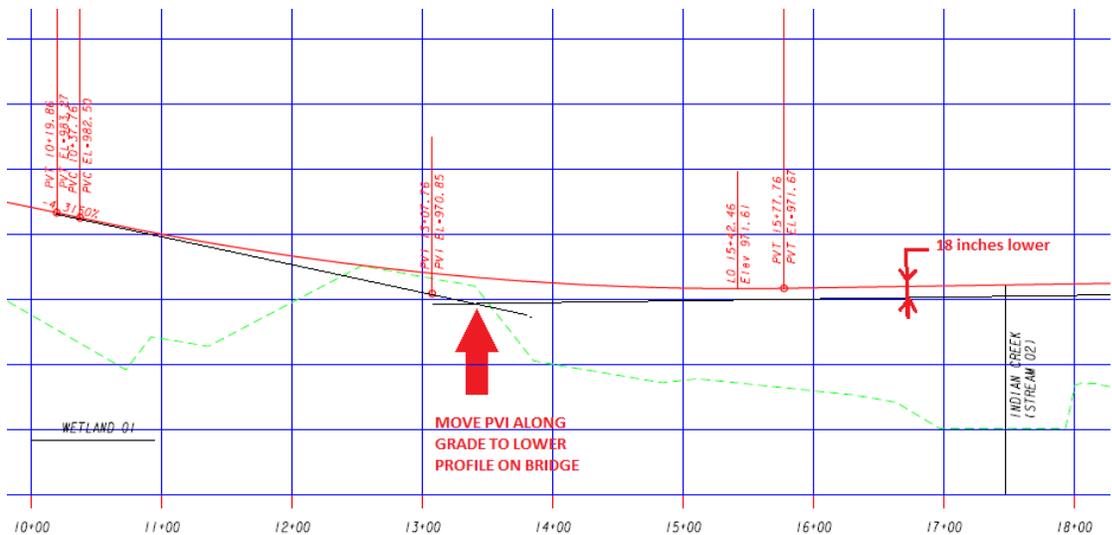
Proposed Design

While the AASHTO Type III cross section requires an extra beam line, the beam depth is reduced from 63 inches to 45 inches. This will allow the grade in the area to be lowered about 18 inches.

Changes required to the profile are as follows:



Original Profile



Proposed Profile

CALCULATIONS

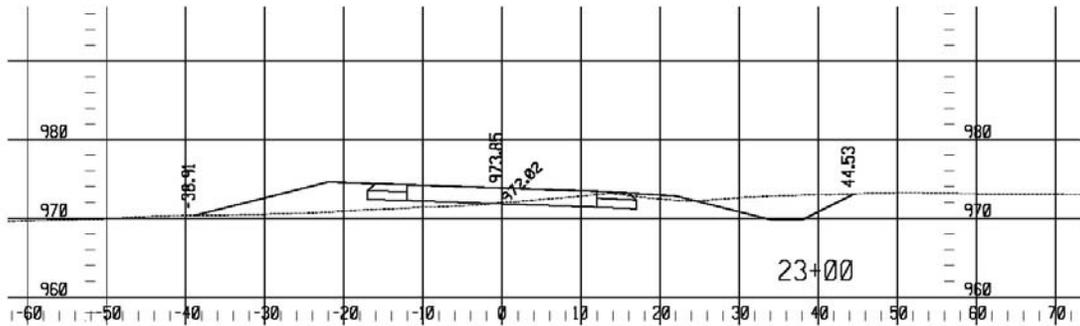
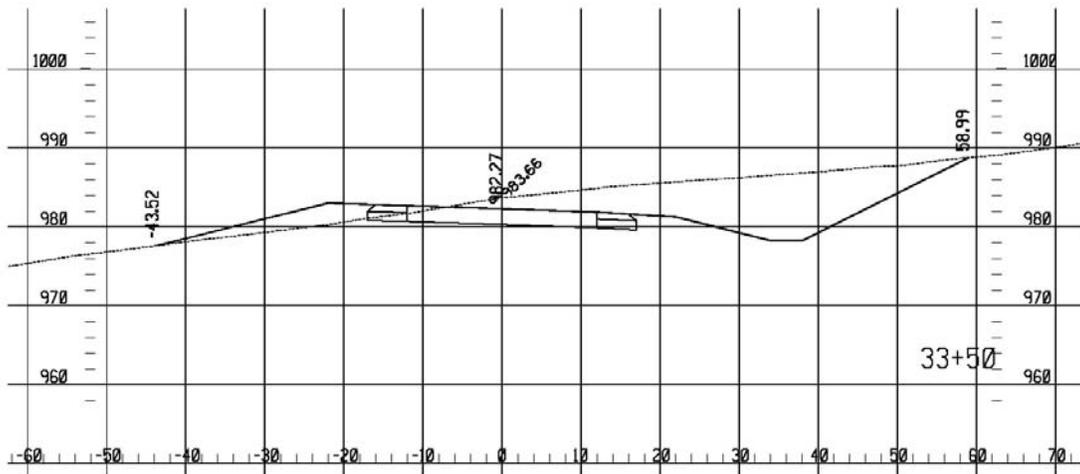
Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
Sheet 8 of 9

Proposed Design

Lowering the grade across the bridge increases the cut in the area from station 23+00 to approximately 33+50

Here are the two cross sections:



CALCULATIONS

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: E-1
Client: GDOT
Sheet 9 of 9

station 23+00 to approximately 33+50

$3350 - 2300 = 1050$ feet

Width of cross section at 23+00 = 80 feet wide

Width of cross section at 33+50 = 100 feet wide

Increase in cut = 18" = 1.5 feet

Volume = $1050 \times (80 + 100) / 2 \times 1.5$ feet deep / 27 ft³/yd³ = 5,250 yd³

The volume = a reduction in Borrow for the project

Cost of Borrow = \$3.17 /yd³

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: H-3a	Sheet No.: 1 of 5	CREATIVE IDEA: Review Ability to Use Alternate 2 for Bypass Route	
Comp By: LMB		Date: 04-30-13	Checked By: GAO Date: 5/8/13

Original Concept: The original concept proposes a two-lane rural new location roadway (DS=55 mph) from SR 166 west of Bowdon around the northwest of Bowdon city limits to just east of SR 100. The alignment then continues east along existing W. Jonesville Road (a two-lane rural local road) and would provide a two-lane urban roadway (DS=45 mph) for approximately 600 feet to tie into existing SR 166 north of Bowdon.

Proposed Change: Use Alternate 2 as shown on the February 28, 2012 PIOH exhibit and referred to as a sub-alternate to the preferred in the Concept Report. Alternate 2 proposes a two-lane rural new location roadway (DS=55 mph) from SR 166 west of Bowdon around the northwest of Bowdon city limits to cross SR 100 approximately 1,650 feet south of the original concept crossing and continue east to tie into existing SR 166 north of Bowdon and approximately 1,350 feet south of the original concept. The primary driver for consideration of this recommendation is to improve the operations between the W. and N. Jonesville Road intersections. This analysis and cost summary does not include any damages that could be required to the gas station between the 2 intersections.

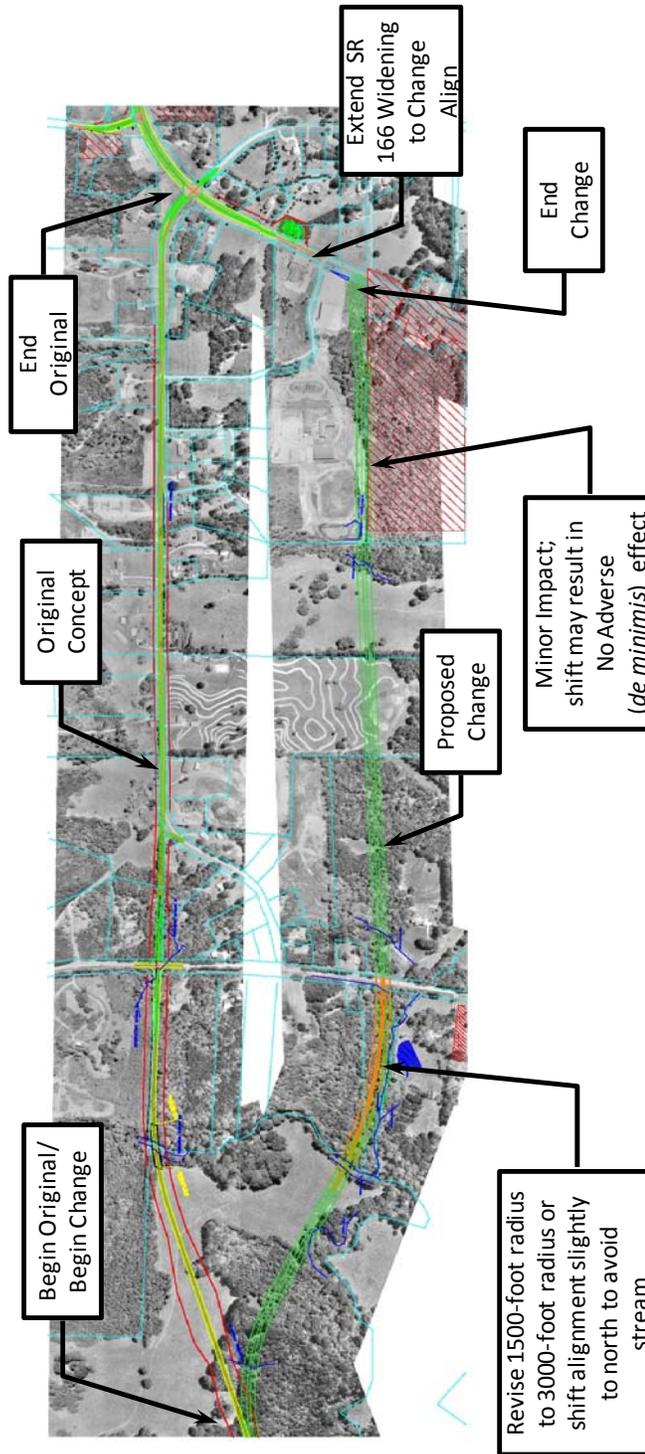
Justification: Alternate 2 was removed from consideration because of concerns for adverse 4(f) impacts to a potentially historic resource located at the proposed intersection of the bypass with SR 166 north of Bowdon. Based on information provided, it appears that this alignment is a viable option. It appears the alignment could be designed such that any required acquisition from the eligible resource would result in a No Adverse Effect (*de minimis*) determination. Utilizing Alternate 2 would provide additional 1,300 feet of intersection separation from N. Jonesville Road, thereby significantly improving the operations at that area. Using Alternate 2 would eliminate the 45 mph truck bypass through a highly residential area along an existing 40 mph rural local W. Jonesville Road. By removing the re-use of this section of W. Jonesville Road, there will be improvements and efficiencies to the MOT for this area also. Increasing the radius west of the SR 100 intersection to 3000 feet should eliminate longitudinal impacts to the perennial stream.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 5,418,000		
Proposed	\$ 5,794,000		
Savings	(\$376,000)		\$0
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			(\$376,000)

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: H-3a
Client: GDOT
Sheet 2 of 5



COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: H3-a		
					CLIENT: GDOT		
				Sheet 3 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Full Depth Pavement	SY	28,862	55.00	1,587,422			
Curb & Gutter	LF	11,460	16	182,443			
Storm drain pipe, 18-in	LF	2,000	45.80	91,600			
Storm drain pipe, 24-in	LF	1,200	40.60	48,720			
Storm drain pipe, 36-in	LF	600	64.50	38,700			
Drop inlets	EA	10	1,808.60	18,086			
Right-of-way, residential	SF	841,821	2.72	2,289,753			
VE Recommendation							
Full Depth Pavement	SY	-	55.00		36,502	55.00	2,007,622
Curb & Gutter	LF	-	16		-	16	
Storm drain pipe, 18-in	LF	-	45.80		-	45.80	
Storm drain pipe, 24-in	LF	-	40.60		-	40.60	
Storm drain pipe, 36-in	LF	-	64.50		-	64.50	
Drop inlets	EA	-	1,808.60		-	1,808.60	
Right-of-way, residential	SF	-	2.72		935,415	2.72	2,544,329
SUBTOTAL				4,256,725			
Markup 27.28%				1,161,234			
TOTAL				5,417,959			
TOTAL ROUNDED				5,418,000			

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: H-3a
Client: GDOT
Sheet 4 of 5

Original Design

Length of original alignment under evaluation = 9550 LF
 Two lane, 12-foot lanes, 4-foot full-depth paved shoulders = 3820 LF
 Two lane, 12-foot lanes, curb & gutter = 5730 LF
 Drainage pipe and inlets (2,000 LF 18-in; 1,200 LF 24-in; 600 LF 36-in; 10 drop inlets)
 Approximate R/W acquisition = 841,821 SF (all residential) [measured in MicroStation]

Full Depth Pavement cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)
 $(10.5 \text{ in}/12 \text{ ft})(150\#/\text{CF})(1 \text{ Ton}/2,000 \#) = 0.065625 \text{ Ton}/\text{SF}$
 $(14 \text{ in}/12 \text{ ft})(135\#/\text{CF})(1 \text{ Ton}/@,000 \#) = 0.07875 \text{ Ton}/\text{SF}$
 Unit cost: Asphalt: \$75 per Ton; Stone (GAB) \$15.55 per Ton

Cost per SY:
 $(0.065625 \text{ Ton}/\text{SF} \times 9 \text{ SF}/\text{SY} \times \$75/\text{Ton}) + (0.07875 \text{ Ton}/\text{SF} \times 9 \text{ SF}/\text{SY} \times \$13.55/\text{Ton})$
 $44.30 + 9.60 = \$53 \text{ per SY}$ **USE \$55 per SY**

R/W cost: Total cost of R/W, with markups: \$11,542,000

Breakdown:

Residential: 69.00 ac totaling \$3,615,000; weighted % = 70.74
 Commercial: 2.00 ac totaling \$1,495,000; weighted % = 29.26

Residential:

$\{\$11,542,000 \times 0.7074\}/69.00 \text{ ac} = \$118,331 \text{ per ac} = \2.7165 per SF **USE \$2.72 per SF**
 $\{\$11,542,000 \times 0.2926\}/2.00 \text{ ac} = \$1,688,595 \text{ per ac} = \38.7648 per SF **USE \$38.76 per SF**

Original Roadway:

Rural - $3820 \text{ LF} \times 32 \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$747,022$
 Urban - $5730 \text{ LF} \times 24 \text{ FT} \times \$55 \text{ per SY} = \$840,400$
 C&G – $5730^* \text{ LF} \times 2 \times 15.92 = \$182,443$

* Note: cost estimate provided indicates a quantity of 1,520 LF of C&G; however the limits of curb and gutter per the typical section limits is 5,750 LF (or 11,500 LF of C&G)

Drainage: From cost estimate (all storm drain pipe and inlets) = \$197,142

Original R/W: $841,821 \text{ SF} \times \$2.72 \text{ per SF} = \$2,289,753$

Total Original Cost: \$4,256,760

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

**Idea No.: H-3a
Client: GDOT
Sheet 5 of 5**

Proposed Design

Length of proposed alignment under evaluation = 8960 LF

Two lane, 12-foot lanes, 4-foot paved shoulders = 8960 LF

Length of additional widening along exist SR 166 = 1100 LF (convert 2-lane to 5-lane)

Approximate R/W acquisition = 21.5 acres (all residential) [measured in MicroStation]

Proposed Roadway:

Rural - $8960 \text{ LF} \times 32 \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$1,752,178$

Rural - $1100 \text{ LF} \times (62-24) \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$255,444$

Proposed R/W: $935,415 \text{ SF} \times \$2.72 \text{ per SF} = \$2,544,329$

Total Original Cost: \$4,551,952

Additional Assumptions:

- (1) Terrain is similar between two alignments so earth work would be comparable
- (2) Major stream crossings generally match; there may be one additional stream crossing on the proposed alignment.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: H-3b	Sheet No.: 1 of 5	CREATIVE IDEA: Use a Variation of Alternate 2 for Bypass Route	
Comp By: LMB		Date: 05-01-13	Checked By: GAO Date: 5/8/13

Original Concept: The original concept proposes a two-lane rural new location roadway (DS=55 mph) from SR 166 west of Bowdon around the northwest of Bowdon city limits to just east of SR 100. The alignment then continues east along existing W. Jonesville Road (a two-lane rural local road) and would provide a two-lane urban roadway (DS=45 mph) for approximately 600 feet to tie into existing SR 166 north of Bowdon.

Proposed Change: Use a variation, as shown on the following sketch, of Alternate 2 as shown on the February 28, 2012 PIOH exhibit that crosses SR 100 approximately 870 feet south of the original concept. Alternate 2 proposes a two-lane rural new location roadway (DS=55 mph) from SR 166 west of Bowdon around the northwest of Bowdon city limits to cross SR 100 approximately 750 feet south of the original concept crossing and continue east to tie into existing SR 166 north of Bowdon and approximately 675 feet south of the original concept. The primary driver for consideration of this recommendation is to improve the operations between the W. and N. Jonesville Road intersections. This analysis and cost summary does not include any damages that could be required to the gas station between the 2 intersections.

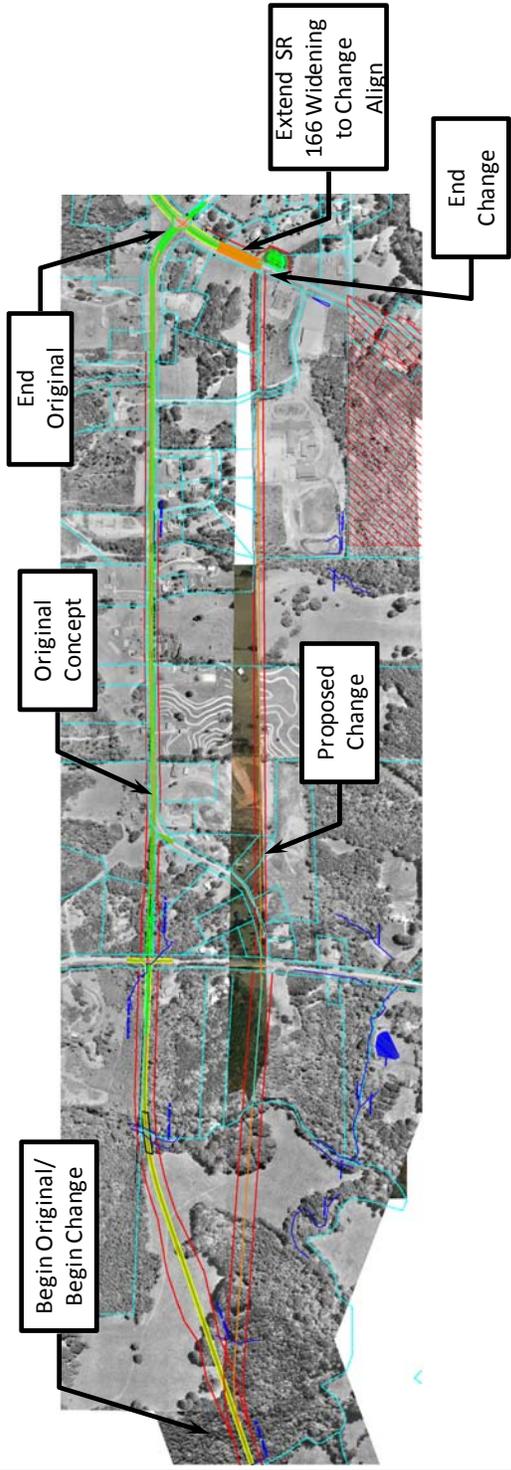
Justification: Based on information provided, it appears that this alignment is a viable option. It would eliminate the 4(f) concerns with the previously considered Alternate 2 and would provide an additional 675 feet of intersection separation from N. Jonesville Road. Using this alternate would eliminate the 45 mph truck bypass through a highly residential area along existing 40 mph rural local W. Jonesville Road. By removing the re-use of this section of W. Jonesville Road, there will be improvements and efficiencies to the MOT for this area also.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 5,418,000		
Proposed	\$ 5,606,000		
Savings	(\$188,000)		\$0
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			(\$188,000)

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310

Idea No.: H-3b
Client: GDOT
Sheet 2 of 5



COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(025); PI No. 0631310				ITEM No: H3-b		
					CLIENT: GDOT		
				Sheet 3 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Full Depth Pavement	SY	28,862	55.00	1,587,422			
Curb & Gutter	LF	11,460	16	182,443			
Storm drain pipe, 18-in	LF	2,000	45.80	91,600			
Storm drain pipe, 24-in	LF	1,200	40.60	48,720			
Storm drain pipe, 36-in	LF	600	64.50	38,700			
Drop inlets	EA	10	1,808.60	18,086			
Right-of-way, residential	SF	841,821	2.72	2,289,753			
VE Recommendation							
Full Depth Pavement	SY	-	55.00		33,918	55.00	1,865,478
Curb & Gutter	LF	-	16		-	16	
Storm drain pipe, 18-in	LF	-	45.80		-	45.80	
Storm drain pipe, 24-in	LF	-	40.60		-	40.60	
Storm drain pipe, 36-in	LF	-	64.50		-	64.50	
Drop inlets	EA	-	1,808.60		-	1,808.60	
Right-of-way, residential	SF	-	2.72		933,491	2.72	2,539,096
SUBTOTAL				4,256,725			
Markup 27.28%				1,161,234			
TOTAL				5,417,959			
TOTAL ROUNDED				5,418,000			

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: H-3b
Client: GDOT
Sheet 4 of 5

Original Design

Length of original alignment under evaluation = 9550 LF
 Two lane, 12-foot lanes, 4-foot full-depth paved shoulders = 3820 LF
 Two lane, 12-foot lanes, curb & gutter = 5730 LF
 Drainage pipe and inlets (2,000 LF 18-in; 1,200 LF 24-in; 600 LF 36-in; 10 drop inlets)
 Approximate R/W acquisition = 841,821 SF (all residential) [measured in MicroStation]

Full Depth Pavement cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)
 $(10.5 \text{ in}/12 \text{ ft})(150\#/\text{CF})(1 \text{ Ton}/2,000 \#) = 0.065625 \text{ Ton}/\text{SF}$
 $(14 \text{ in}/12 \text{ ft})(135\#/\text{CF})(1 \text{ Ton}/@,000 \#) = 0.07875 \text{ Ton}/\text{SF}$
 Unit cost: Asphalt: \$75 per Ton; Stone (GAB) \$15.55 per Ton

Cost per SY:
 $(0.065625 \text{ Ton}/\text{SF} \times 9 \text{ SF}/\text{SY} \times \$75/\text{Ton}) + (0.07875 \text{ Ton}/\text{SF} \times 9 \text{ SF}/\text{SY} \times \$13.55/\text{Ton})$
 $44.30 + 9.60 = \$53 \text{ per SY}$ **USE \$55 per SY**

R/W cost: Total cost of R/W, with markups: \$11,542,000

Breakdown:

Residential: 69.00 ac totaling \$3,615,000; weighted % = 70.74
 Commercial: 2.00 ac totaling \$1,495,000; weighted % = 29.26

Residential:

$\{ \$11,542,000 \times 0.7074 \} / 69.00 \text{ ac} = \$118,331 \text{ per ac} = \2.7165 per SF **USE \$2.72 per SF**
 $\{ \$11,542,000 \times 0.2926 \} / 2.00 \text{ ac} = \$1,688,595 \text{ per ac} = \38.7648 per SF **USE \$38.76 per SF**

Original Roadway:

Rural - $3820 \text{ LF} \times 32 \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$747,022$
 Urban - $5730 \text{ LF} \times 24 \text{ FT} \times \$55 \text{ per SY} = \$840,400$
 C&G – $5730^* \text{ LF} \times 2 \times 15.92 = \$182,443$

* Note: cost estimate provided indicates a quantity of 1,520 LF of C&G; however the limits of curb and gutter per the typical section limits is 5,750 LF (or 11,500 LF of C&G)

Drainage: From cost estimate (all storm drain pipe and inlets) = \$197,142

Original R/W: $841,821 \text{ SF} \times \$2.72 \text{ per SF} = \$2,289,753$

Total Original Cost: \$4,256,760

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(025); PI No. 0631310**

Idea No.: H-3b
Client: GDOT
Sheet 5 of 5

Proposed Design

Length of proposed alignment under evaluation = 9100 LF
Two lane, 12-foot lanes, 4-foot paved shoulders = 9100 LF
Length of additional widening along exist SR 166 = 370 LF (convert 2-lane to 5-lane)
Approximate R/W acquisition = 21.4 acres (all residential) [measured in MicroStation]

Proposed Roadway:

Rural - $9100 \text{ LF} \times 32 \text{ FT} \times \text{SY}/9 \text{ SF} \times \$55/\text{SY} = \$1,779,556$
Rural - $370 \text{ LF} \times (62-24) \text{ FT} \times \text{SY}/9\text{SF} \times \$55/\text{SY} = \$85,922$

Proposed R/W: $933,491\text{SF} \times \$2.72 \text{ per SF} = \$2,539,096$

Total Original Cost: \$4,404,573

Additional Assumptions:

- (1) Terrain is similar between two alignments so earth work would be comparable
- (2) Major stream crossings generally match; there may be one additional stream crossing on the proposed alignment.

VE RECOMMENDATIONS STP00-0021-01(024), PI No. 063130

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: B-4	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce the design speed; incorporate applicable design criteria	
Comp By: LB	Date: 5/1/13	Checked By: GAO	Date: 5/8/13

Original Concept: The SR 166 roadway classification is rural minor arterial west of Simonton Mill Road and urban principal arterial east of Simonton Road. This condition dictates the 55 mph design speed and the divided highway typical section.

Proposed Change: Review the corridor and incorporate a lower design speed of 45 mph. This will provide a more appropriate section and design flexibility.

Justification: SR 166 between Bowdon and Carrollton is primarily a residential corridor, although there is a short commercial section, about 4,000 In ft, just east of the West Jonesville Road intersection. In this area, the approach is for a 45 mph design speed and posted speed limit. The remainder of the corridor to the east, about 7 miles, comprises primarily residential, rural parcels. There are numerous driveways. The traffic volumes are projected to double by design year 2043. Reviewing the overall operations of the corridor and lowering the design speed will allow a 4 lane, divided roadway, with a 20 foot raised median to control left turns while continuing to incorporate the desirable design features of a divided and access permitted roadway. The 20 foot raised median would continue to provide space for left-turn lanes at the intersections, restrict cross-over movements and access for this corridor while lowering the design and operating speeds. If this area grows as projected, a 55 mph, rural median will not accommodate the area needs considering the numerous residential driveways and continued corridor development. A higher design and operating speed could be problematic. This recommendation will have a significantly smaller overall footprint with fewer right-of-way impacts, lower construction costs and less environmental affects while providing the same project function. If the design speed is reduced, other options could also be incorporated, including a 5-lane section. However, this recommendation does not calculate the potential savings and impacts of that scenario. Our team was familiar with recent projects and conditions where this was considered with similar justifications, most notably the SR 11 Bypass in Social Circle, Walton County. This recommendation should be considered on an overall corridor approach and coordinated with Idea B-4 of the other section.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$1,862,000		
Proposed	\$1,000,000		
Savings	\$862,000		\$862,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$862,000

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: B-4		
					CLIENT: GDOT		
				Sheet 2 of 3			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
Right of way	Acre	6.1983	233,144	1,445,096			
VE Recommendation							
Concrete curbing	lf				45,000	15.92	716,400
Miscellaneous drainage	ls				1	60,000	60,000
SUBTOTAL				1,445,096			776,400
Markup	28.82%			416,477			223,758
TOTAL				1,861,573			1,000,158
TOTAL ROUNDED				1,862,000			1,000,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

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

This recommendation applies to the area from
Sta 500 to Sta 725 for the eastern project (024); length = 22,500 ft

Reduce 32 ft grassed median to 20 ft raised, grassed median, 12 foot reduction.
12 ft (22,500) = 270,000 sq ft = **6.1983 acres**; assume all residential.

Total cost of R/W, with mark-ups: \$10,274,000; w/o mark-ups - \$4,556,500
Breakdown:

Residential: 21.02 acres totaling \$2,174,000; weighted % = 47.7

Commercial: 6.58 acres totaling \$2,381,000; weighted % = 52.3

Residential

{ \$10,274,000 (0.477) } / 21.02 ac = **\$233,144 per acre** = \$5.35226 per sq ft

Additional elements:

Concrete curb; 2 x (22,500) = **45,000 ln ft**

Assume outside shoulders will be similar to current design

Assume earthwork and grassing in medians are comparable, only minor differences.

Most of the drainage will continue to flow to outside ditches; assume additional minor
drainage at some locations: **USE \$60,000**

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: B-6	Sheet No.: 1 of 3	CREATIVE IDEA: Reduce paved shoulder width	
Comp By: JDW Date: April 30, 2013		Checked By: GAO Date: 5/8/13	

Original Concept: Use of 6.5 ft. paved shoulders. The overall graded shoulder width is 10 ft.

Proposed Change: Reduce the width of the paved shoulder from 6.5 ft. to 4 ft. this project is not designated as a bicycle route and does not require the bike shoulder.

Justification: The overall shoulder width of 10 feet does not change. The shoulder will adequately provide refuge for vehicles. The reduction in the width of the full depth asphalt section for the length of the project will provide a cost savings.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$973,000		
Proposed	\$43,000		
Savings	\$930,000		\$930,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$930,000

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: B-6		
					CLIENT: GDOT		
Sheet 2 of 3							
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Asph. Conc. 12.5 mm Superpave	TN	1,277	85.95	109,795			
Asph. Conc. 19 mm Superpave	TN	2,555	69.58	177,767			
Asph. Conc. 25 mm Superpave	TN	5,110	74.89	382,667			
Graded Aggregate Base	TN	6,039	13.55	81,822			
Bituminous Tack Coat	GL	1,084	2.90	3,143			
Borrow Excavation	CY	0.0	3.17				
VE Recommendation							
Asph. Conc. 12.5 mm Superpave	TN				0	85.95	
Asph. Conc. 19 mm Superpave	TN				0	69.58	
Asph. Conc. 25 mm Superpave	TN				0	74.89	
Graded Aggregate Base	TN				0	13.55	
Bituminous Tack Coat	GL				0	2.90	
Borrow Excavation	CY				10529	3.17	33,376
SUBTOTAL				755,194			33,376
Markup 28.82%				217,647			9,619
TOTAL				972,841			42,995
TOTAL ROUNDED				973,000			43,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

**Idea No.: B-6
Client: GDOT
Sheet 3 of 3**

Original Design

Length of project – 24,450 ft. (SR 166) + 4,400 ft. (Carrollton Bypass) = 28,850 ft. x 2 sides = 57,700 ft.

Exceptions – 2 bridges @ 320 feet = 640 feet x 2 sides = 1,320 feet

Exceptions – side streets – assume 40 feet (radius return to radius return) x 16 streets = 640 feet.

Total exceptions – 1,960 feet.

Total length = 55,740 feet

Area = 55,740 x 2.5 = 139,350 sq. ft. = 15,483.33 sq. yd. **Use 15,484 sq. yd.**

Asph. Conc. 12.5 mm Superpave = 15,484 sq. yd. x 165 lbs./sq. yd = 2,554,860 lbs. = 1,277.43 tons.

Asph. Conc. 19 mm Superpave = 15,484 sq. yd. x 330 lbs./sq. yd = 5,109,720 lbs. = 2,554.86 tons.

Asph. Conc. 25 mm Superpave = 15,484 sq. yd. x 660 lbs./sq. yd. = 10,219,440 = 5,109.72 tons

Graded Aggregate Base = 139,350 sq. ft. x 1.17 ft. = 163,039.50 cu. ft. = 6,038.5 cu. yd.

Bituminous Tack Coat = 15,484 sq. yd. x 0.035 gal/sq. yd. x 2 coats = 1,083.88 gal.

Proposed Design

Total depth of section = 24.5 in. = 2.04 ft.

Additional borrow = 2.04 ft. x 139350 sq. ft. = 284274 cu. ft. = 10528.67 cu. yd.

Assumptions

Unit prices used are the same as those used in the concept cost estimate that was provided for the study.

The pavement section matches the ones provided for the study in the draft typical sections. Cost savings would vary depending on the final approved pavement section.

No allowances (exceptions) were made for driveways.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 By-pass, Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: B-16	Sheet No.: 1 of 3	CREATIVE IDEA: Use full depth pavement thickness for the median openings.
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Comp By: JW Date: 5/1/13 Checked By: GAO Date: 5/9/13

Original Concept: Use full depth pavement thickness throughout all areas of the project, including the median openings and left turn lanes.

Proposed Change: Develop and appropriately design a reduced pavement thickness for the medians and left turn lane areas.

Justification: Traffic volumes at the medians and left turn lanes are significantly lower than the mainline and designing an appropriate, reduced pavement thickness can provide the similar project function and reduce construction and material costs, without any sacrifice in overall pavement longevity. This calculation assumes a 4-foot full depth pavement structure abutting the mainline for support.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$550,000		
Proposed	\$0		
Savings	\$550,000		\$550,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$550,000

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: B-16 CLIENT: GDOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Pavement - per median opening	LOC	7.5	56,928	426,960			
VE Recommendation							
SUBTOTAL				426,960			0
Markup	28.82%			123,050			0
TOTAL				550,010			0
TOTAL ROUNDED				550,000			0

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

**Idea No.: B-16
Client: GDOT
Sheet 3 of 3**

Assume about 1/3 reduction in pavement thickness and costs; designed specifically for the reduced traffic volumes.

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

$$(10.5 \text{ in} / 12 \text{ ft}) (150 \# / \text{CF}) (1 \text{ Ton} / 2,000 \#) = 0.065625 \text{ Ton} / \text{SF}$$

$$(14 \text{ in} / 12 \text{ ft}) (135 \# / \text{CF}) (1 \text{ Ton} / 2,000 \#) = 0.07875 \text{ Ton} / \text{SF}$$

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

$$(0.065625 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$75/\text{ton}) + (0.07875 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$13.55/\text{ton}) = 44.30 + 9.60 = \$53.90 \text{ per SY}$$

Use \$53.90 x 0.33 = \$17.79 reduction for median openings

For each median opening:

Total length: Assume 32 ft median; effective pavement width is $32 - 8 = 24$ ft
1,200 feet long, both approaches

$$24 \text{ ft} \times 1,200 \text{ ft} = 28,800 \text{ sq ft} = 3,200 \text{ sq yds for each median opening}$$

$$3,200 \text{ sq yds} \times \$17.79 = \mathbf{\$56,928} \text{ per median opening location}$$

Median opening locations:

Sta. 355+00	Farmers High Road
Sta. 538+25	Old Bowen Road
Sta. 605+75	Burwell Road
Sta. 627+50	Simonton Road; bridge location, apply only half
Sta. 650+25	Ballard Bridge Road
Sta. 693+50	Timber Ridge Trail
Sta. 723+50	Tyus-Carrollton Road
Sta. 738+25	SR 166

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3a	Sheet No.: 1 of 5	CREATIVE IDEA: Retain Existing Culvert for EB roadway and Build WB Bridge
Comp By: GCG Date: 04/30/13 Checked By: GAO Date: 5/7/13		

Original Concept: The original concept replaces the existing culvert under what will become the new east bound roadway with a new bridge.

Proposed Change: Retain the existing culvert and construct only the westbound bridge

Justification: The existing culvert has a sufficiency rating of 86.07. It is not structurally in need of replacement. The proposed westbound bridge is of sufficient length to tie in to the existing roadway side slopes near the proposed bridge ends.

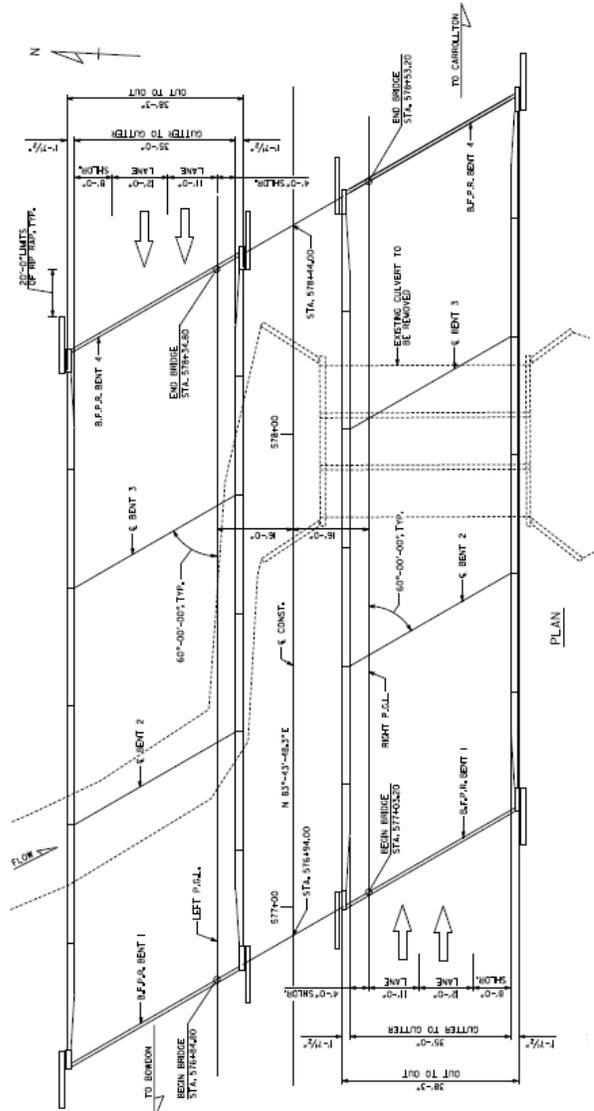
Saving the existing culvert in this area will also eliminate the need for new bridge and foundation construction immediately adjacent to an existing lake and berm.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 813,000		
Proposed	\$0		
Savings	\$ 813,000		\$813,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$ 813,000

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-3a
Client: GDOT
Sheet 2 of 5

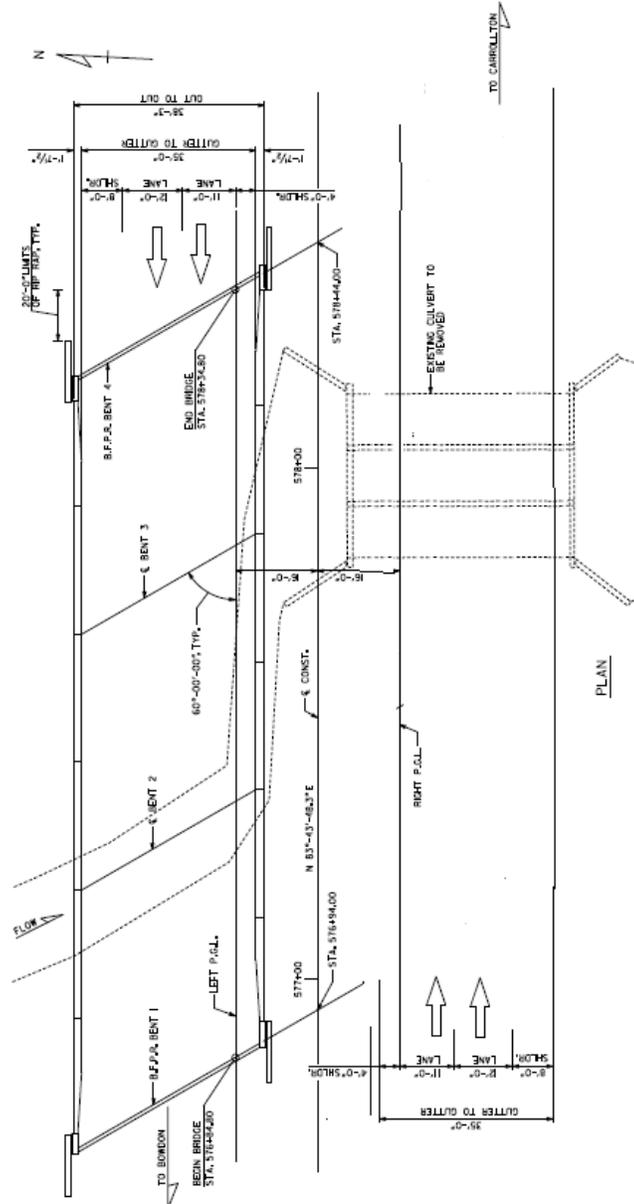


ORIGINAL CONCEPT

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-3a
Client: GDOT
Sheet 3 of 5



PROPOSED CHANGE

COST WORKSHEET

PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: E-3a CLIENT: GDOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Original Design							
Bridge area	SF	5,738	110	631,180			
VE Recommendation							
SUBTOTAL				631,180			0
Markup	28.82%			181,906			0
TOTAL				813,086			0
TOTAL ROUNDED				813,000			0

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3a
Client: GDOT
Sheet 5 of 5

Original Design

Cost of East Bound Bridge:

150 feet long x 38.25 ft wide = 5,738 sq ft

Proposed Design

No structural cost to retain the existing culvert.

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3b	Sheet No.: 1 of 5	CREATIVE IDEA: Remove the existing culvert completely and construct a new culvert along the skew
Comp By: GCG Date: 04/30/13 Checked By: GAO Date: 5/7/13		

Original Concept: The current plans show 2 new parallel bridges over Garrett Creek. Each bridge is composed of three, 50 ft spans.

Proposed Change: Remove the existing culvert completely and construct a new culvert along the skew of the original stream alignment.

The northern, upstream section of the original stream was severely re-graded and rerouted to accommodate the construction of the current culvert. This poses an undesirable hydraulic condition, however re-grading to the stream's original alignment would require significant stream impacts.

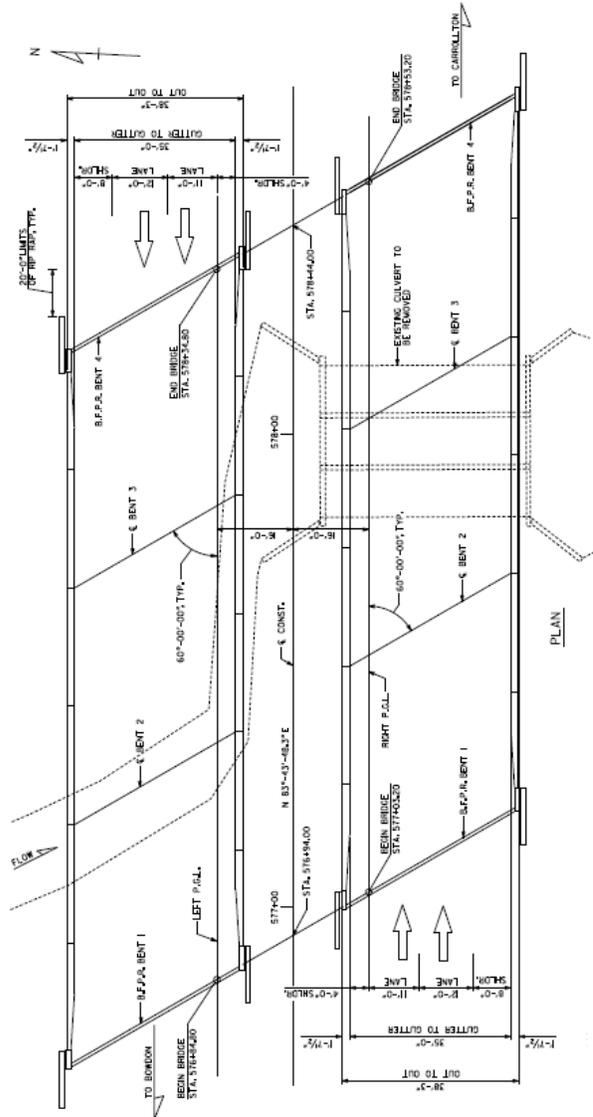
Justification: The detailed hydraulic study will determine the opening requirements at this location however, there were no apparent or discussed flooding problems thereby inferring the existing box culvert is adequate for hydraulic capacity. This analysis assumes an additional cell for a new 4-cell culvert. This recommendation would eliminate the poor stream alignment developed when the original culvert was constructed with a new, properly aligned structure. Some re-grading of the existing stream would be required however this recommendation eliminates 2 new bridges at a significant project cost savings and reduced future maintenance.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 1,626,000		
Proposed	\$ 701,000		
Savings	\$ 925,000		\$925,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$ 925,000

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-3b
Client: GDOT
Sheet 2 of 5

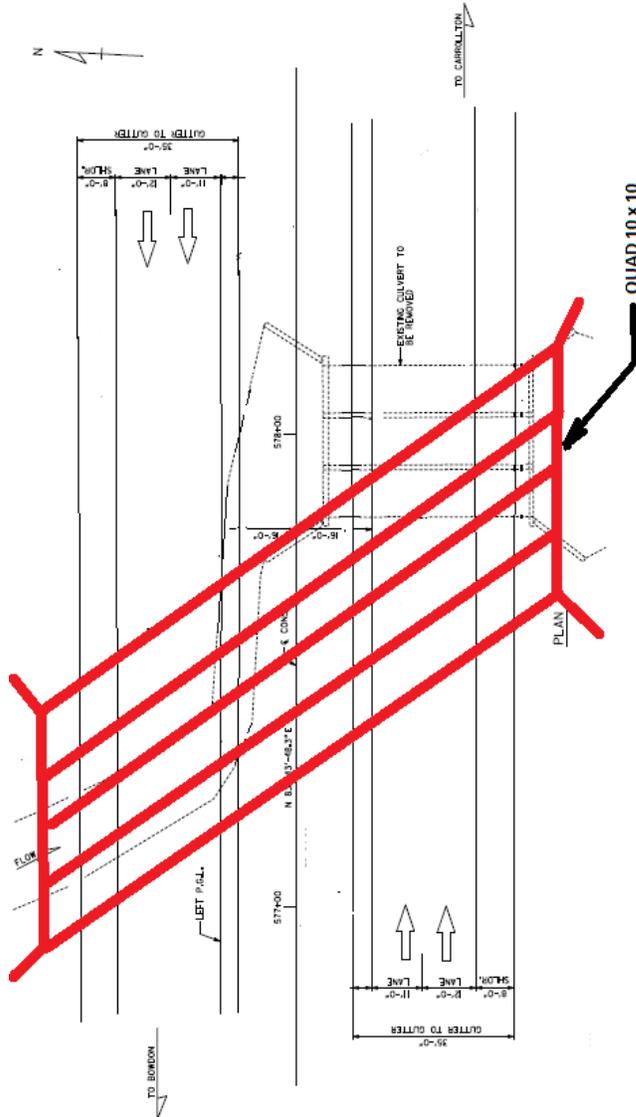


ORIGINAL CONCEPT

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-3b
Client: GDOT
Sheet 3 of 5



PROPOSED CHANGE

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: E-3b		
					CLIENT: GDOT		
				Sheet 4 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
Bridge area	SF	11,475	110	1,262,250			
VE Recommendation							
Concrete	CY				790.5	529.67	418,678
Reinforcing steel	LB				81524	0.82	66,850
Asphalt pavement	SY				700	55	38,500
Earthwork	LS				1	20,000	20,000
SUBTOTAL				1,262,250			544,027
Markup	28.82%			363,780			156,789
TOTAL				1,626,030			700,816
TOTAL ROUNDED				1,626,000			701,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3b
Client: GDOT
Sheet 5 of 5

Original Design

Two bridges: $2 \times 38.25 \text{ ft} \times 150 \text{ ft} = 11,475 \text{ SF}$

Proposed Design

No hydro information is available, use one quad 10×10

Culvert would be approximately 140 ft long; Headwalls would be skewed at 60 deg.

From GA DOT standard 2319B:

Concrete for the barrels = 4.8715 yd³/lin ft $4.8715 \times 140 = 682 \text{ yd}^3$

Rebar per foot of barrels = 515 lbs/ft $515 \times 140 = 72,100 \text{ lb}$

Quad 10x10 quantities not found; Use Triple box quantities and multiply 1.333

For a Triple 10x10 use

Location	concrete	reinforcement	
Wings & Parapets (each side)	61.71 yd ³	5,627 lb	Standard 2331
Apron	19.65 yd ³	1,443 lb	Standard 2332

So use

For a Triple 10x10 use

Location	concrete	reinforcement	
Wings & Parapets (each side)	82.26 yd ³	7,500 lb	Standard 2331
Apron	26.19 yd ³	1,924 lb	Standard 2332

Total Concrete; barrels, apron, wings and parapet
 $682 + 26.19 + 82.26 = 790.45 \text{ CY}$

Total Reinforcing Steel; barrels, apron, wings and parapet
 $72,100 + 1,924 + 7,500 = 81,524 \text{ LB}$

Additional asphalt pavement required;

existing bridge is 150 ft long, assume 4 cell box culvert to be 50 ft; $150 - 50 = 100 \text{ ft}$
total roadway width, each side is $2 + 11 + 12 + 6.5 = 31.5 \text{ ft}$; $2 \times 31.5 = 63 \text{ ft}$

$100 \times 63 = 6,300 \text{ sq ft} = 700 \text{ sq yds}$

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

$(10.5 \text{ in} / 12 \text{ ft}) (150 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.065625 \text{ Ton} / \text{SF}$

$(14 \text{ in} / 12 \text{ ft}) (135 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.07875 \text{ Ton} / \text{SF}$

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

$(0.065625 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$75/\text{ton}) + (0.07875 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$13.55/\text{ton}) =$
 $44.30 + 9.60 = \$53.90 \text{ per SY}$

USE: \$55 per SY

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3c	Sheet No.: 1 of 5	CREATIVE IDEA: Retain and extend existing culvert, re-align stream to tie in
--------------------------	-----------------------------	---

Comp By: GCG Date: 04/30/13 Checked By: GAO Date: 5/7/13

Original Concept: The original concept replaces the existing culvert and constructs two bridges.

Proposed Change: Retain the existing triple 10x10 concrete culvert and construct a skewed extension under westbound SR 166. This will realign the upstream opening with the current stream alignment but require an angle point at the culvert transition. It will also require stream re-grading and impacts.

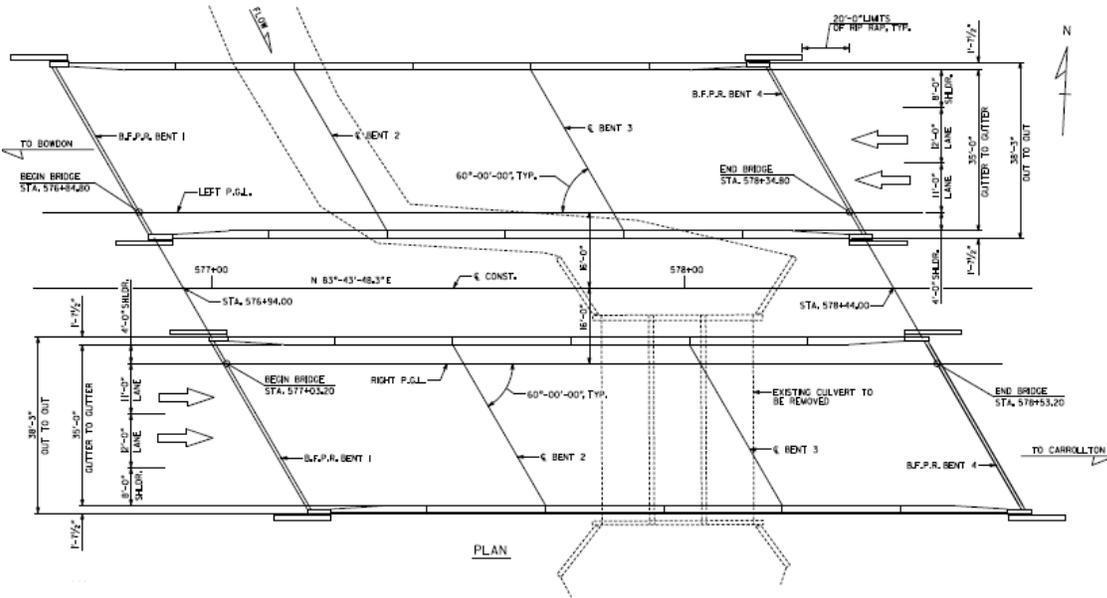
Justification: The detailed hydraulic study will determine the opening requirements at this location however, there were no apparent or discussed flooding problems thereby inferring the existing box culvert is adequate for hydraulic capacity. Inspection and documentation review shows that the existing culvert is structurally sound. This recommendation would retain the existing culvert and construct a conventional extension, although it would be skewed to align with the original location of the stream. This will also eliminate any structural or foundation construction in the area adjacent to the existing lake.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 1,626,000		
Proposed	\$ 485,000		
Savings	\$ 1,141,000		\$1,141,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$ 1,141,000

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

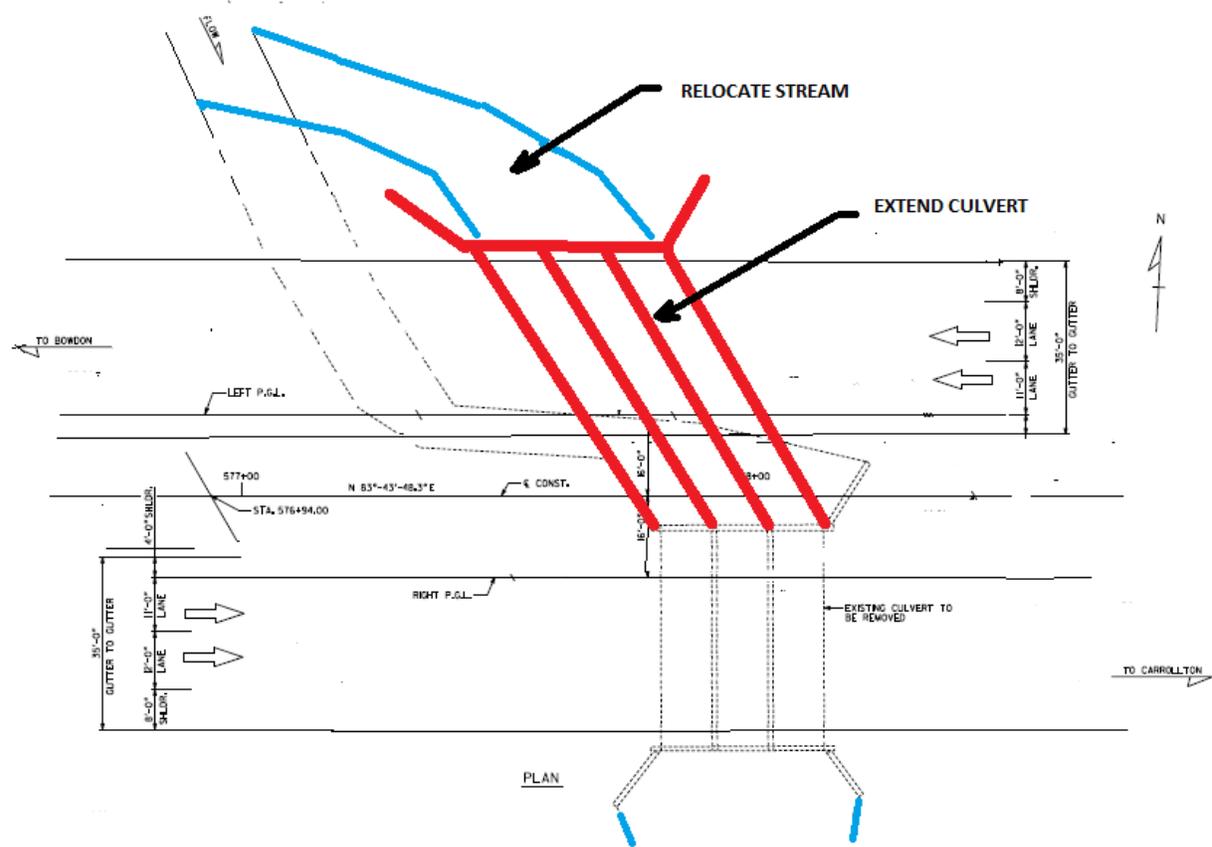
Idea No.: E-3c
Client: GDOT
Sheet 2 of 5



SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-3c
Client: GDOT
Sheet 3 of 5



COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: E-3c		
					CLIENT: GDOT		
				Sheet 4 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
Bridge area	SF	11,475	110	1,262,250			
VE Recommendation							
Concrete	CY				462.8	529.67	245,121
Reinforcing steel	LB				53,510	0.82	43,878
Structural cost at angle point	LS				1	25,000	25,000
Asphalt pavement	SY				385	55	21,175
Earthwork	LS				1	20,000	20,000
SUBTOTAL				1,262,250			355,174
Markup	28.82%			363,780			102,361
TOTAL				1,626,030			457,535
TOTAL ROUNDED				1,626,000			458,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-3c
Client: GDOT
Sheet 5 of 5

Original Design; Construct two new bridges

$$2 \times 38.25 \text{ ft wide} \times 150 \text{ feet long} = 11,475 \text{ sq ft}$$

Proposed Design: Extend the Triple 10x10 at a skew; approximately 90 feet

For a Triple 10x10 use

Location	concrete	reinforcement	
Wings & Parapets (each side)	61.71 yd3	5627 lb	Standard 2331
Apron	19.65 yd3	1443 lb	Standard 2332
Culvert /linear ft	4.238 yd3 /lf	516 lb	Standard 2327

Concrete (yd3)

$$\text{Barrel} = 4.238 \times 90 = 381.42$$

$$\text{Apron} = 19.65$$

$$\text{Wings \& Parapets} = 61.71$$

$$\text{Total} = 462.78 \text{ yd3}$$

Rebar (lb)

$$\text{Barrel} = 516 \times 90 = 46,440$$

$$\text{Apron} = 1443$$

$$\text{Wings \& Parapets} = 5627$$

$$\text{Total} = 53,510 \text{ yd3}$$

Assume an additional lump sum cost of **\$25,000** for structural work at the angle point of the transition.

Additional asphalt pavement required;

existing bridge is 150 ft long, assume 3 cell box culvert to be 40 ft; $150 - 40 = 110$ ft total roadway width, each side is $2 + 11 + 12 + 6.5 = 31.5$ ft

$$110 \times 31.5 = 3,465 \text{ sq ft} = 385 \text{ sq yds}$$

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

$$(10.5 \text{ in} / 12 \text{ ft}) (150 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.065625 \text{ Ton} / \text{SF}$$

$$(14 \text{ in} / 12 \text{ ft}) (135 \text{ \#} / \text{CF}) (1 \text{ Ton} / 2,000 \text{ \#}) = 0.07875 \text{ Ton} / \text{SF}$$

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

$$(0.065625 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$75/\text{ton}) + (0.07875 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$13.55/\text{ton}) = 44.30 + 9.60 = \$53.90 \text{ per SY}$$

USE: \$55 per SY

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-4a	Sheet No.: 1 of 5	CREATIVE IDEA: Eliminate the median opening at Simonton Mill Road and reduce bridge construction at the Little Tallapoosa River crossing
--------------------------	-----------------------------	---

Comp By: GCG Date: 05/01/13 Checked By: GAO Date: 5/8/13

Original Concept: The original concept provides a median opening at Simonton Mill Road. Due to the proximity of the bridge crossing over the Little Tallapoosa River, about 200 feet to the west, a wider structure to accommodate the turning lanes and tapers is required. The current plans provide for a single, combined bridge widening.

Proposed Change: Eliminate this median opening. This will result in constructing only the typical, parallel bridge at the crossing. The existing bridge can remain, as currently proposed with only the side barrier improvements.

Justification: Due to the proximity of the median opening to the crossing at Little Tallapoosa River, the bridge widening required to accommodate the roadway is larger than conventionally required. Rather than constructing the conventional parallel bridge, the current design is to widen the existing bridge, which has a sufficiency rating of 80.27 however is about 45 years old.

Eliminating the median opening will return the bridge improvements to the standard parallel bridge construction. Another factor under the current bridge widening alternative is that the widened portion of the bridge will be tied to a 45 year old structure, even though it is structurally sound and has an acceptable sufficiency rating. This could pose long-term, future maintenance cycle offsets.

Simonton Mill Road has a southern access route and continued connectivity via Tyus Carrollton Road. The nearest openings on SR 166 are about 2,000 feet both directions.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 3,382,000		
Proposed	\$ 2,302,000		
Savings	\$ 1,080,000		\$1,080,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$ 1,080,000

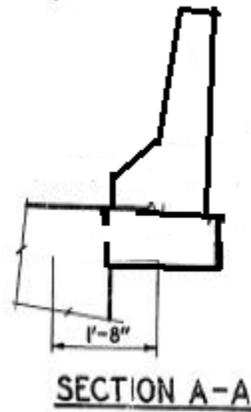
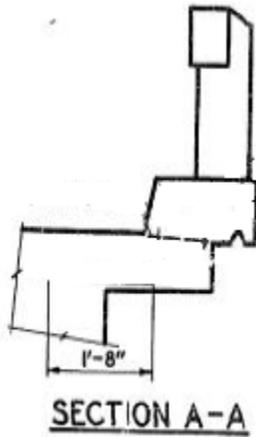
SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

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

ORIGINAL CONCEPT

Reconstruct Side barrier on 1 side of existing bridge



Width of new bridge constructed

From cost estimate; use 53'-8"

SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

Idea No.: E-4a
Client: GDOT
Sheet 3 of 5

PROPOSED CHANGE

Reconstruct side barrier on existing bridge.



Side Barrier on existing bridge will be replaced with “jersey” style barrier.

Area of reconstruction on each side is 3 ft wide.

Width of Westbound Bridge:

1.625 ft barrier
8 ft shoulder
12 ft lane
11 ft lane
4 ft shoulder
1.625 ft barrier

Total = 38.25 ft

Length = 400 ft

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: E-4a		
					CLIENT: GDOT		
				Sheet 4 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
widen existing bridge	SF	21,468	115	2,468,820			
		-	0				
roadway pavement	SY	2,844	55	156,420			
VE Recommendation							
New parallel bridge	SF				15,300	115	1,759,500
T-beam	LF				60	54.27	3,256
W-beam guide rail	LF				950	16.71	15,875
Type 12 anchor	Each				4	1,993.97	7,976
SUBTOTAL				2,625,240			1,786,607
Markup	28.82%			756,594			514,900
TOTAL				3,381,834			2,301,507
TOTAL ROUNDED				3,382,000			2,302,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-4a
Client: GDOT
Sheet 5 of 5

Original Design: Widen existing bridge to accommodate proposed improvements:
WB roadway and tapers, turn lanes for median opening.

53'-8" wide x 400 feet long = **21,468 sf**

Median asphalt pavement for opening:

800 ft x 32 ft = 25,600 sq ft = **2,844 sq yds**

Cost of asphalt, full-depth pavement:

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

(10.5 in / 12 ft) (150 # / CF) (1 Ton / 2,000 #) = 0.065625 Ton / SF

(14 in / 12 ft) (135 # / CF) (1 Ton / 2,000 #) = 0.07875 Ton / SF

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

(0.065625 ton/sf x 9 sf/sy x \$75/ton) + (0.07875 ton/sf x 9 sf/sy x \$13.55/ton) =
44.30 + 9.60 = \$53.90 per SY **USE: \$55 per SY**

Proposed Design: Construct a new west bound parallel bridge

38.25 ft wide x 400 ft long = **15,300 sf**

Reconstruct Side Barrier on existing bridge; one side only, the other side will require reconstruction/improvements under both schemes.

400 ft long x 3 ft wide = **1,200 sq ft**

Additional guardrail required for median at the bridges:

T-Beam 30 LF x 2 sides = **60 ft @ \$ 54.27/ft**

W-Beam 475 LF x 2 sides = **950 ft @ \$ 16.71/lf**

Type 12 Anchor 2 x 2 sides = **4 @ \$ 1993.97**

DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-4b	Sheet No.: 1 of 5	CREATIVE IDEA: Restrict the median opening at Simonton Mill Road to one direction and reduce bridge construction at the Little Tallapoosa River crossing
--------------------------	-----------------------------	---

Comp By: GCG Date: 05/01/13 Checked By: GAO Date: 5/8/13

Original Concept: The original concept provides a median opening at Simonton Mill Road. Due to the proximity of the bridge crossing over the Little Tallapoosa River, about 200 feet to the west, a wider structure to accommodate the turning lanes and tapers is required. The current plans provide for a single, combined bridge widening.

Proposed Change: Restrict the access at this location to the east only. Eliminate western access. This will essentially only eliminate u-turn movements by eastbound traffic. This will result in constructing only the typical, parallel bridge at the crossing. The existing bridge can remain, as currently proposed with only the side barrier improvements.

Justification: Due to the proximity of the median opening to the crossing at Little Tallapoosa River, the bridge widening required to accommodate the roadway is larger than conventionally required. Rather than constructing the conventional parallel bridge, the current design is to widen the existing bridge, which has a sufficiency rating of 80.27 however is about 45 years old.

Restricting the median access to the east only will continue to provide most of the access required at this location and only eliminate EB u-turns. This will also return the bridge improvements to the standard parallel bridge construction. Another factor under the current bridge widening alternative is that the widened portion of the bridge will be tied to a 45 year old structure, even though it is structurally sound and has an acceptable sufficiency rating. This could pose long-term, future maintenance cycle offsets.

Simonton Mill Road traffic will continue to access at this median opening.

COST SUMMARY	INITIAL COST	FUTURE COST	TOTAL L. C. COST SAVINGS
Original	\$ 3,231,000		
Proposed	\$ 2,302,000		
Savings	\$ 929,000		\$929,000
FUTURE COST: – Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$ 929,000

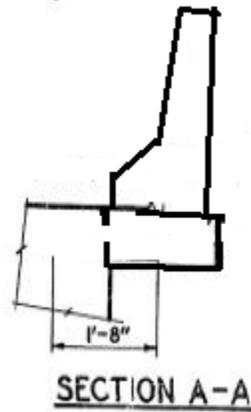
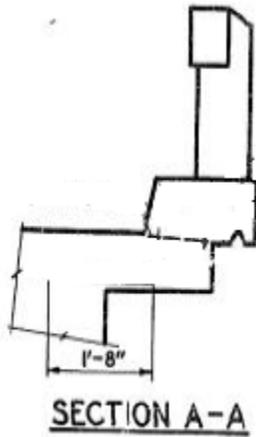
SKETCH

Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300

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

ORIGINAL CONCEPT

Reconstruct Side barrier on 1 side of existing bridge



Width of new bridge constructed

From cost estimate; use 53'-8"

SKETCH

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-4b
Client: GDOT
Sheet 3 of 5

PROPOSED CHANGE

Reconstruct side barrier on existing bridge.



Side Barrier on existing bridge will be replaced with “jersey” style barrier.

Area of reconstruction on each side is 3 ft wide.

Width of Westbound Bridge:

1.625 ft barrier
8 ft shoulder
12 ft lane
11 ft lane
4 ft shoulder
1.625 ft barrier

Total = 38.25 ft

Length = 400 ft

COST WORKSHEET							
PROJECT:	SR 166 Widening and Reconstruction STP00-0021-01(024); PI No. 0631300				ITEM No: E-4b		
					CLIENT: GDOT		
				Sheet 4 of 5			
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			VE ESTIMATE		
ITEM	Units	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design							
widen existing bridge	SF	21,468	115	2,468,820			
		-	0				
roadway pavement	SY	711	55	39,105			
VE Recommendation							
New parallel bridge	SF				15,300	115	1,759,500
T-beam	LF				60	54.27	3,256
W-beam guide rail	LF				950	16.71	15,875
Type 12 anchor	Each				4	1,993.97	7,976
SUBTOTAL				2,507,925			1,786,607
Markup	28.82%			722,784			514,900
TOTAL				3,230,709			2,301,507
TOTAL ROUNDED				3,231,000			2,302,000

CALCULATIONS

**Project: SR 166 Widening and Reconstruction
STP00-0021-01(024); PI No. 0631300**

Idea No.: E-4b
Client: GDOT
Sheet 5 of 5

Original Design: Widen existing bridge to accommodate proposed improvements:
WB roadway and tapers, turn lanes for median opening.

$$53'-8'' \text{ wide} \times 400 \text{ feet long} = \mathbf{21,468 \text{ sf}}$$

Median asphalt pavement for opening:

$$200 \text{ ft} \times 32 \text{ ft} = 6,400 \text{ sq ft} = \mathbf{711 \text{ sq yds}}$$

Cost of asphalt, full-depth pavement:

Pavement Cost: 10.5 inches of asphalt over 14 inches of stone base (GAB)

$$(10.5 \text{ in} / 12 \text{ ft}) (150 \# / \text{CF}) (1 \text{ Ton} / 2,000 \#) = 0.065625 \text{ Ton} / \text{SF}$$

$$(14 \text{ in} / 12 \text{ ft}) (135 \# / \text{CF}) (1 \text{ Ton} / 2,000 \#) = 0.07875 \text{ Ton} / \text{SF}$$

Unit Cost: Asphalt: \$75 per ton; Stone (GAB) \$13.55 per ton

Cost per SY:

$$(0.065625 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$75/\text{ton}) + (0.07875 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$13.55/\text{ton}) = \\ 44.30 + 9.60 = \$53.90 \text{ per SY} \quad \mathbf{USE: \$55 \text{ per SY}}$$

Proposed Design: Construct a new west bound parallel bridge

$$38.25 \text{ ft wide} \times 400 \text{ ft long} = \mathbf{15,300 \text{ sf}}$$

Reconstruct Side Barrier on existing bridge; one side only, the other side will require reconstruction/improvements under both schemes.

$$400 \text{ ft long} \times 3 \text{ ft wide} = \mathbf{1,200 \text{ sq ft}}$$

Additional guardrail required for median at the bridges:

$$\text{T-Beam } 30 \text{ LF} \times 2 \text{ sides} = \mathbf{60 \text{ ft}} \text{ @ } \$ 54.27/\text{ft}$$

$$\text{W-Beam } 475 \text{ LF} \times 2 \text{ sides} = \mathbf{950 \text{ ft}} \text{ @ } \$ 16.71/\text{lf}$$

$$\text{Type 12 Anchor } 2 \times 2 \text{ sides} = \mathbf{4} \text{ @ } \$ 1993.97$$

APPENDIX

Approving/Authorizing Persons

Name:	Position:	Telephone:
Chandria Brown	Project Manager Office of Program Delivery	404-631-1580
Lisa Myers	State Project Review Engineer Office of Engineering Services	404-631-1770

Personal Contacts

Name:	Position:	Notes:
Clayton Carter 770.986.1364	GDOT – Office of Transportation Data	Roadway classification process

Documents/Abstracts

Reference:	Reference:
Concept aerial plans and profiles	Concept R/W Cost Estimates
Concept Cost Estimates	VE Study constraints worksheet
Draft Concept Reports	DVD with information shown as on following sheet;

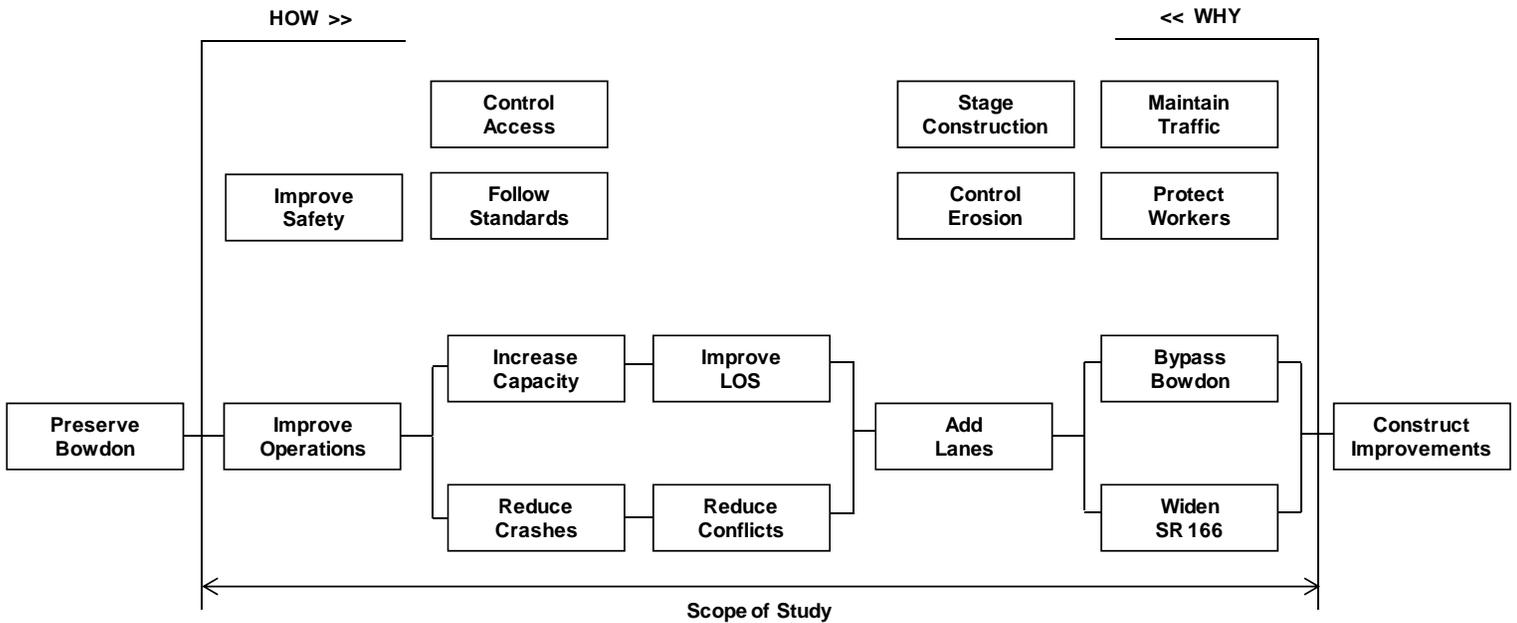
Contents of DVD
From AECOM – GDOT Design Consultant

FOLDER CONTENTS

- 01 – Aerial Layouts
 - Roll plots of aerial photo coverage of the project
 - Alternatives considered aerial map
- 02 – Typical Sections
 - Cover Sheets
 - Typical sections
- 03 – Traffic Data
 - Draft Traffic Study including:
 - Traffic information used in the conceptual decisions
 - Accident data for any area with significant amount of incidents
 - Carroll County Bike Plan
 - Need and Purpose/Logical Termini
 - Draft Roundabout Analysis Reports
- 04 – Right of Way
 - Cost Estimate from 3/27/2013
- 05 – Bridge Layouts
 - Draft Preliminary Bridge Layouts
 - Copies of Existing Bridge Plans
 - SIA Reports
- 06 - Earthwork
 - Earthwork Summary of Quantities
 - PI 631310 - profile comparison
- 07 – Pavement and Exist Plans
 - Pavement Design (proposed design – not approved)
 - Existing Roadway Plans
- 08 - Utilities
 - Reimbursable Utility Estimate
- 09 – Cost Estimates
 - Cost Estimate with summary of quantities
 - Fuel Price Adjustment worksheets
- 09 – DGN Files
 - PI 631300
 - PI 631310
 - HMR files
- Not available
 - Copy of the Environmental Document (Draft copy is acceptable)
 - Soil Survey and BFI (if either has been completed)

SR 166 Widening and Reconstruction STP00-0021-01(024)(025); PI No.'s 0631300 & 0631310

FAST DIAGRAM



INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 166 Bypass, Widening and Reconstruction

Basic Function: Improve Operations

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
A	Right of Way	store	project	\$22,816,000	34%	Yes
		avoid	history (APE)			
		obtain	permit (basins)			
		divert	trucks			
		coordinate balance	earthwork			
B	Asphalt pavement	support	loads	\$13,699,665	22%	Yes
		access	properties			
		retain	pavement			
		follow	criteria			
		allow	passing			
C	Earthwork	support	load	\$9,801,450	15%	Yes
		acquire	r/w			
		avoid	constraints (APE)			
		establish	grade			
		match	existing grade			
		follow	criteria			
		construct	climbing lane			
D	Utilities	service	customers	\$3,604,385	6%	Yes
		replace	existing			
		follow	policy			
E	Bridges	separate	grade	\$6,863,960	10%	Yes
		avoid	impacts			
		span	stream			
		follow	criteria			
		maintain	flow			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 166 Bypass, Widening and Reconstruction

Basic Function: Improve Operations

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/ Save
F	Temporary erosion control	control	erosion	\$1,821,986	3%	No
		treat	run-off			
		acquire	r/w			
		protect	environment			
		obtain	permit			
G	Drainage	convey	water	\$1,762,860	3%	No
		collect	run-off			
		maintain	driveways			
		prevent	ponding			
H	Traffic control	guide	motorists	\$1,427,800	2%	Yes
		stage	construction			
		protect	public			
		establish	workzone			
I	Miscellaneous Items	complete	Project	\$773,826	1%	No
		appease	locals (bike trail)			
J	Signing/Striping/ Signals	inform	motorists	\$828,310	1%	No
		control	traffic			
		follow	standards			
K	Permanent Erosion Control	control	erosion	\$748,502	1%	No
		obtain	permit			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	CREATIVE IDEA	COMMENTS	IDEA RATING
A	Right of Way		
A-1	Review profiles, optimize grades		✓
A-2	Shift widening to optimize terrain		✓
A-3	Re-use existing roadway template		✓
A-4	Split profiles		✓
A-5	Use roadside ditches in-lieu of sediment basins		✓
A-6	Use easements for R/W	To be incorporated into final plans	X
A-7	Use curb and gutter in commercial area		✓
A-8	At Adelle Road, review displacements; use alternate grading, walls		✓
B	Asphalt Pavement		
B-1	Review Lovvorn Mill Road alignment		✓
B-2	Widen downtown route to 3 lanes; eliminate bypass		✓
B-3	Review bypass profile		✓
B-4	Review roadway classification/design speed.	Lower design speed has more design flexibility	✓
B-5	Review passing lane layout		✓
B-6	Review limits of 6 ½ foot paved, bike shoulder		✓
B-7	Review section limits; 3/4/5 lanes	Alternate typical section and median options developed under B-4	X
B-8	Shift roundabout to improve constructability		✓
B-9	Incorporate raised median at gas station	Restricts/controls access	✓
B-10	Use a narrower, raised median; 24/28 feet	Alternate median options developed under B-4	X

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	CREATIVE IDEA	COMMENTS	IDEA RATING
B-11	Reduce design speed; use narrower median		✓
B-12	Reduce design speed; use urban shoulders		✓
B-13	Review widening impacts on utilities		✓
B-14	Change through movement at east project terminus; SR 166 Bypass	Major impact to existing co-generation facility	X
B-15	Eliminate Simonton Road median opening	See E-4	✓
B-16	Use shallower depth pavement at median openings		✓
B-17	Use curb and gutter for 5-lane section	See A-7	✓
B-18	Use more or Jonesville Road; follow alignment		✓
C	Earthwork		
	See categories A & B		
D	Utilities		
D-1	Shift widening location to minimize impacts	Other impacts could not be completely determined; concept	X
D-2	Leave utilities in-place	Does not follow policy; not enough details developed	X
E	Bridges		
E-1	Reduce depth of main span, bridge 1		✓
E-2	Reduce depth of main span, bridge 2		✓
E-3	Garrett Creek crossing		✓
E-3a	Retain existing culvert; construct new WB bridge		✓

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	CREATIVE IDEA	COMMENTS	IDEA RATING
E-3b	Remove existing culvert; construct new culvert at skew		✓
E-3c	Extend existing culvert at a skew		✓
E-3d	Realign/regrade stream	Environmental permit impacts	✓
E-3e	Shift bridges further from lake	Better stream alignment	DC
E-4	Little Tallapoosa Creek crossing		✓
E-4a	Eliminate median opening	Narrower bridge	✓
E-4b	Use narrow median; 20 ft	Roadway implications – See B-4	
F	Temporary erosion control		
F-1	Use ditches in lieu of sediment basins	Details not yet developed	DC
G	Drainage		
G-1	Eliminate curb and gutter in Jonesville Road re-use area	See H-3	✓
G-2	Use curb and gutter in select areas	Could reduce R/W width; See A-7	✓
H	Traffic control		
H-1	Jonesville Road MOT		✓
H-1a	Close road; use detour	No feasible detour route	X
H-1b	One-way operation	Potentially confusing scheme	X
H-1c	Consider 3-lane	Cost implications; See H-3	X
H-2	Shift roundabout	See B-8	✓
H-3	Review Alt-2, improve Jonesville MOT	See H-3	✓
I	Miscellaneous Items		
J	Signing/Striping/Signals		
K	Permanent Erosion Control		

VE STUDY SIGN-IN SHEET

Project No.: STP00-0021-01(024)(025)

County: Carroll PI No.: 631300- & 631310- Date: April 29 - May 2, 2013

Days

FIRST	LAST	NAME	GDOT OFFICE OR COMPANY NAME	PHONE NUMBER	EMAIL ADDRESS
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Matt Sanders	Engineering Services	404-631-1752	msanders@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Nabil Raad	Traffic Operations	404-635-2854	nraad@dot.ga.gov
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Bill DuVall	Bridge Design	404-631-1883	bduvall@dot.ga.gov
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Robert Reid Jr.	Engineering Services	404-631-1754	rreid@dot.ga.gov
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Joe Wheeler	RS&H	678-528-7225	joe.wheeler@rsandh.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	George Obaranec	AMEC	770-421-3346	george.obaranec@amec.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Lenor Bromberg	KEA Group	404-805-8244	lbromberg@keagroup.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DeWayne Ray	KEA Group	850-499-7147	dray@keagroup.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Dan Bodycomb	AECOM	404-965-9629	dan.bodycomb@aecom.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Greg Grant	RS&H	678-429-7501	greg.grant@rsandh.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chandria Brown	Program Delivery	404-631-1580	chbrown@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Anthony Tate	Environmental Services	404-631-1155	atate@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sean Diehl	Environmental Services	404-631-1197	sdiehl@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Iris Hernandez	Environmental Services	404-631-1190	ihernandez@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sam Pugh	Environmental Services	404-631-1167	spugh@dot.ga.gov
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Scott Moore	Jacobs	404-290-2730	scott.moore@jacobs.com
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Victor Dang	FHWA	404-562-3654	victor.dang@dot.gov
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Joe Carpenter	Director of Engineering	404-631-1519	jcarpenter@dot.ga.gov
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Carla Benton-Hooks	Environmental Services	404-631-1415	Cbenton-hooks@dot.ga.gov
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Patrick Bowers (Via Video)	D6 Construction Engineer	770-387-3609	pbowers@dot.ga.gov

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