VALUE ENGINEERING REPORT

Bethelview Road Improvements
STP-2348(3), PI No 141880
Forsyth County

December 17, 2007

OWNER AND DESIGN TEAM:

Georgia Department of Transportation
No.2 Capitol Square
Atlanta, GA 30334

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Bethelview Road Improvements
STP-2348(3)
Forsyth County

VALUE ENGINEERING STUDY

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EXECUTIVE SUMMARY

Executive Summary

VALUE ENGINEERING STUDY

Bethelview Road Improvements
STP-2348(3)
Forsyth County

Introduction

This report summarizes the results of a value engineering (VE) study conducted on the Bethelview Road Improvement project in the southwestern part of Forsyth County, approximately three miles west of the City of Cumming. The project consists of the expansion and reconstruction of approximately 6 miles of Bethelview Road starting at SR 400 and extending north to SR 20 (Canton Highway). The estimated construction cost including Right of Way is $64.1 million. The design is currently 30% complete with the FONSI in the final stages of approval. The project is being designed by Moreland Altobelli Associates, Inc., of Norcross, Georgia. The study was conducted November 27-30, 2007 at the GDOT offices in Atlanta using a four person VE team.

This report presents the VE Team's recommendations and all back-up information for consideration by the decision-makers. This **Executive Summary** includes a brief description of each recommendation. The **Study Identification** section contains information about the project and the team. The **Recommendations** section presents a more detailed description and support information about each recommendation. Lastly, 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.

The Bethelview Road corridor serves both local access and commuter traffic. Significant residential and commercial growth in the Bethelview Road corridor has resulted in a failing level of service and an increase in the number of traffic accidents. Accident rates along Bethelview Road have exceeded statewide averages since 1996 and have seen an 85 percent increase between 1995 and 2005. This project is in the STIP and is also listed in Forsyth County's Major Transportation Plan as one of a number of projects requiring major upgrading to meet the transportation needs of the area. The proposed project would upgrade the existing two-lane rural roadway to a four-lane urban roadway with a raised median, protected left turn lanes, and improved signalized intersections at all major cross roads. Major contract work items include roadway grading, pavement, bridge construction, curb and gutter, the installation of storm drains, signalization improvements, and the construction of sidewalks.

Considerations

The project being evaluated under this VE study has an estimated construction cost (including E&C and Inflation) of $38.9 million. This project will require significant amounts of new ROW and ROW construction easements. Right of Way costs are estimated at $23.7 million. The

design of the project is being funded by Forsyth County. While the County will also provide some additional funding for the project, the majority of the construction and ROW costs will come from the State. No firm letting dates have been established at this time, but the State and County are looking at the possibility of splitting this project and letting the southern portion of the project in 2008 or 2009.

Results Obtained

The VE team focused their efforts on the high cost items of the project. The study generated 47 ideas with 25 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed seven independent recommendations and four alternative recommendations. The implementation of all seven independent recommendations (B-2, B-1, N-2, J-4, R-1, L-1, and P-1) has the potential to reduce the project cost by approximately $8.4 million. A detailed write-up of each recommendation and design suggestion is contained in the respective portion of this report. A summary of the recommendations follows.

Recommendation Highlights

Idea B-2, To reduce the overall roadway section by reducing the outside shoulder width from 16-feet to 12-feet.

The current project typical section includes four 12-foot lanes, a 20-foot wide raised median, and 16-foot wide outside shoulders throughout the entire project length. During project development and design, ROW costs have escalated significantly and are expected to continue to rise.

It is recommended that the 16-foot outside shoulders be reduced to 12 feet in width on both sides of the project throughout its entire length. A reduction of the outside shoulder width would narrow the overall roadway section, reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. The remaining 12-foot shoulder section would provide an adequate area to place a 5-foot sidewalk, especially if Type B sidewalk ramps are used at the driveways. This concept would result in significant cost savings without any changes to the current traffic lane / median widths.

The total potential savings if accepted is $2,762,000.

Idea B-1, To reduce the overall roadway section by using 11-foot travel lanes in-lieu-of 12-foot lanes while holding the left turn lane widths at 12 feet.

The current project typical section includes four 12-foot lanes, a 20-foot wide raised median, and 16-foot wide outside shoulders throughout the entire project length. During project development and design, ROW costs have escalated significantly and are expected to continue to rise.

It is recommended that 11-foot lanes be used in-lieu-of 12-foot lanes for the four travel lanes while maintaining a 12-foot width for all left-turn lanes. The overall 4-foot reduction in lane width would reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. The 11-foot travel lanes would accommodate the project traffic and provide adequate safety for this urban roadway with a design / posted speed of 45 MPH. This concept results in significant cost savings to the project.

The total potential savings if accepted is $2,222,000.

Idea N-1, To modify the 8-foot median in the left turn bay areas and use a 6-foot raised corrugated concrete median with 1-foot offsets in-lieu-of curb and gutter with concrete median paving.

The current project typical section includes four 12-foot lanes, a 20-foot wide raised median, and 16-foot wide outside shoulders throughout the entire project length. In the left turn areas (53.4%

of the project length), the median width is reduced to 8 feet. The baseline design for the 8-foot median consists of dual 2'-6" curb and gutters with the 3'-6" area between the curbs filled with concrete median paving.

It is recommended that the 8-foot-wide median in the left turn lane areas be constructed using a corrugated concrete (6-foot wide) median with 1-foot offsets from the inside edge of the adjacent lanes. Constructing the median with a raised 6-foot wide corrugated concrete strip (with 1-foot offsets) in-lieu-of dual curb and gutters with concrete median paving would improve project constructability and reduce construction time. The raised corrugated concrete median would present a clear visual and physical barrier and also reduce project cost.

The total potential savings if accepted is $100,000.

Idea N-2, To reduce the median width by 4 feet and use a 2-foot raised corrugated concrete median with 1-foot offsets in-lieu-of curb and gutter with concrete median paving.

The current project typical section includes four 12-foot lanes, a 20-foot wide raised median, and 16-foot wide outside shoulders throughout the entire project length. In the left turn areas (53.4% of the project length), the median width is reduced to 8 feet. The baseline design for the 8-foot median consists of dual 2'-6" curb and gutters with the 3'-6" area between the curbs filled with concrete median paving. During project development and design, ROW costs have escalated significantly and are expected to continue to rise.

It is recommended that the proposed 20-foot median width be reduced by 4 feet. This 4-foot overall reduction would result in a 4-foot wide median along the left turn lanes. It is further recommended that the 4-foot median be constructed using a corrugated concrete (2-foot wide) median with 1-foot offsets from the inside edge of the adjacent lanes. Reducing the median width 4-feet would reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. Constructing the median with a raised 2-foot wide corrugated concrete strip (with 1-foot offsets) in-lieu-of dual curb and gutters with concrete median paving would reduce cost, improve constructability, and reduce construction time. The raised corrugated concrete median would present a clear visual and physical barrier.

The total potential savings if accepted is $2,067,000.

Idea J-1, To reduce the width of the single Big Creek bridge by 4 feet to match the reduction in the roadway width if 11-foot lanes are constructed.

The current project typical section includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed single bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design uses AASHTO Type III PSC Beams for its superstructure. The proposed 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

It is recommended that the width of the Big Creek Bridge be reduced by 4 feet to match the revised roadway section if 11-foot lanes are constructed on Bethelview Road. Carrying 11-foot lanes across the bridge would result in a 4-foot reduction in the overall width of the structure. This concept would not change any other features (type of superstructure or center pier) of the bridge. Reducing the bridge width would result in cost savings.

The total potential savings if accepted is $54,000.

Idea J-2, To reduce the width of the single Big Creek bridge by 8 feet to match the revised roadway section if 11-foot lanes are constructed and the median width is also reduced by 4 feet.

The current project typical section includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed single bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design uses AASHTO Type III PSC Beams for its superstructure. The proposed 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

It is recommendation that the width of the Big Creek Bridge be reduced by 8 feet to match the revised roadway section if both 11-foot lanes are constructed and the median width is also reduced by 4 feet. Carrying 11-foot lanes and a 16-foot median across the bridge would result in an 8-foot reduction in the overall width of the structure. This concept would not change any other features (type of superstructure or center pier) of the bridge. Reducing the bridge width would result in cost savings.

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

Idea J-3, To construct dual bridges over Big Creek and reduce the overall bridge width 16 feet by eliminating the raised bridge median (12-foot lane alternate).

The current project typical section includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed single bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design uses AASHTO Type III PSC Beams for its superstructure. The proposed 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

It is recommended that dual bridges be constructed over Big Creek in-lieu-of a single width bridge. Concept J-3 would be used for a roadway section with 12-foot lane widths. Constructing dual bridges over Big Creek would allow for a 16-foot reduction in the overall bridge width resulting in dual 36.83’ x 150’ bridges. The 16-foot width reduction results from eliminating the raised concrete median on the original structure. With no left turn lanes on the bridge, there is no need to carry the full width raised concrete median across the structure. Constructing two separate bridges would result in a significant cost savings.

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

Idea J-4, To construct dual bridges over Big Creek and reduce the overall bridge width by 20 feet by eliminating the bridge median and constructing 11-foot lanes.

The current project typical section includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed single bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design uses AASHTO Type III PSC Beams for its superstructure. The proposed 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

It is recommended that dual bridges be constructed over Big Creek in-lieu-of a single width bridge. Concept J-4 would be used for a roadway section with 11-foot lane widths. Constructing dual bridges over Big Creek would allow for a 20-foot reduction in the overall bridge width resulting in dual 34.83' x 150' bridges. The 20-foot width reduction results from eliminating the raised concrete median on the structure and constructing 11-foot lanes. With no left turn lanes on the bridge, there is no need to carry the full width raised concrete median across the structure. Constructing two separate bridges would result in a significant cost savings.

The total potential savings if accepted is $216,000.

Idea R-1, To replace the existing double 10' x 9' Box Culvert with a three span concrete "T" beam or PSC 17" box beam bridge.

The current design extends the existing double 10 ft x 9 ft box culvert by 112 ft. and adds an extra 189-foot long, 10 ft x 9 ft barrel to accommodate the new wider roadway section at station 308+53.

It is recommended that a three-span, 90-foot long concrete "T" Beam or PSC 17" Box Beam bridge with pile bents be constructed in-lieu-of constructing a new triple 10 ft x 9 ft box culvert. The construction of a short 90-foot three-span bridge would reduce the cost of the project. This concept also removes the obstruction from the waterway by removing the existing old culvert.

The total potential savings if accepted is $91,000.

Idea L-1, To eliminate the 5-foot concrete sidewalks along selected areas in the Bethelview Road corridor.

The current project typical section includes four 12-foot lanes, a 20-foot raised median, and 16-foot outside shoulders with 5-foot wide concrete sidewalks throughout the entire length of the project.

It is recommended that the designer be requested to only place sidewalks in areas where there are existing commercial or residential buildings. This project was originally being developed as an urban / rural roadway. Much of the area is still undeveloped and there is no need to place sidewalks through undeveloped areas. This concept would reduce the amount of sidewalk and reduce the project cost. As the area continues to develop and more commercial /residential

properties are built, the County should require the developers to install the sidewalks along the roadway.

The total <u>potential savings</u> if accepted is $670,000.

Idea P-1, To reduce the roadway width four to eight feet which would reduce the size or eliminate the various retaining walls.

The baseline concept provides for six retaining walls. The walls are all in situations where the roadway shoulder is higher than a paved parking area adjacent to the roadway. Most wall sections are less than five feet in height between the back of the roadway shoulder and the proposed ground elevations at the back of the wall.

It is recommended that the roadway width be reduced by four to eight feet to reduce the height of the proposed retaining walls. A four to eight foot reduction can be obtained by using 11-foot lanes (Idea B-1) and reducing the width of the outside shoulders (B-2). Narrowing the roadway will result in reduced retaining wall requirements and costs. The amount of savings for retaining walls depends on how much the proposed roadway is narrowed. The recorded savings assumes an eight-foot reduction in the typical section however a reduction of up to 16 feet can be achieved if all the recommendations regarding the typical section are implemented.

The total <u>potential savings</u> if accepted is $350,000.

Bethelview Road Improvement

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	SAVINGS POTENTIAL (%)
	Recommendations						
B-2	To Reduce the Roadway Section by Reducing the Outside Shoulder Width from 16Feet to 12 Feet	$2,762,000	$0	$2,762,000	N/A	$2,762,000	100%
B-1	To Use 11-Foot Travel Lanes While Holding the Turn Lanes at 12 Feet	$2,222,000	$0	$2,222,000	N/A	$2,222,000	100%
N-1	To Modify the Medians in the Left Turn Bay Areas from Curb & Gutter to 6-foot Corrugated Concrete with 1-Foot Offsets	$1,218,000	$1,118,000	$100,000	N/A	$100,000	100%
N-2	To Reduce the Median Width by 4 Feet (Provides 4-Foot Median @ Turn Lanes and 16-Foot Median @ Remainder) and Use 2-foot Corrugated Concrete with 1-Foot Offset	$2,587,000	$520,000	$2,067,000	N/A	$2,067,000	100%
J-1	To Reduce the Big Creek Bridge Width 4 Feet to accommodate 11-Foot Travel Lanes in-lieu-of 12-Foot Travel Lanes	$1,172,000	$1,118,000	$54,000	N/A	$54,000	100%
J-2	To Reduce the Big Creek Bridge Width 8 Feet to accommodate 11-Foot Travel Lanes and a reduced 16-Foot Median	$1,172,000	$1,063,000	$109,000	N/A	$109,000	100%

Bethelview Road Improvement

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	SAVINGS POTENTIAL (%)
J-3	To Construct Dual Structures with 12-Foot Lanes and Eliminate 16 Feet of the Raised Concrete Bridge Median	$1,172,000	$1,010,000	$162,000	N/A	$162,000	100%
J-4	To Construct Dual Structures with 11-Foot Lanes and Eliminate 16 Feet of the Raised Concrete Bridge Median	$1,172,000	$956,000	$216,000	N/A	$216,000	100%
R-1	To Replace the Multi Cell Box Culvert With a 3-Span Bridge	$530,000	$439,000	$91,000	N/A	$91,000	100%
L-1	To Eliminate Sidewalk in Areas Where there are No Commercial / Residential Buildings	$670,000	$0	$670,000	N/A	$670,000	100%
P-1	To Reduce the Width of the Roadway Section and Reduce or Eliminate Project Retaining Walls	$690,000	$340,000	$350,000	N/A	$350,000	50%
	* Note: Savings potential represents how much of an individual item, exclusive of any overlapping dependent items, can be implemented.						

STUDY IDENTIFICATION

Study Identification

Project: Bethelview Road Improvements	**Date:** November 27-30, 2007
Location: GDOT Headquarters, Atlanta, Georgia	

VE Team Members

Name:	Title:	Organization:	Telephone:
Keith Borkenhagen	VE Team Facilitator	MACTEC	623-556-1875
Dan Cogan	Construction	Kennedy Engineering & Associates Group LLC	678-904-8591
James Chambers	Design	Street Smarts	770-813-0882
Aruna Sastry	Bridge	Sastry and Associates, Inc.	678-366-9375

Project Description

This project involves Bethelview Road located in the southwestern part of Forsyth County, about three miles west of the City of Cumming. The project consists of the expansion and reconstruction of approximately 6 miles of Bethelview Road starting at SR 400 and extending north to SR 20 (Canton Highway). The Bethelview Road corridor serves both local access and commuter traffic. Significant residential and commercial growth in the Bethelview Road corridor has resulted in a failing level of service and an increase in the number of traffic accidents. Accident rates along Bethelview Road have exceeded statewide averages since 1996 and have seen an 85 percent increase between 1995 and 2005.

The estimated construction cost including Right of Way is $64.1 million. The proposed project would upgrade the existing two-lane rural roadway to a four-lane urban roadway with a raised median, protected left turn lanes, and improved signalized intersections at all major cross roads. Major contract work items include roadway grading, pavement, bridge construction, curb and gutter, the installation of storm drains, signalization improvements, and the construction of sidewalks.

Project Constraints

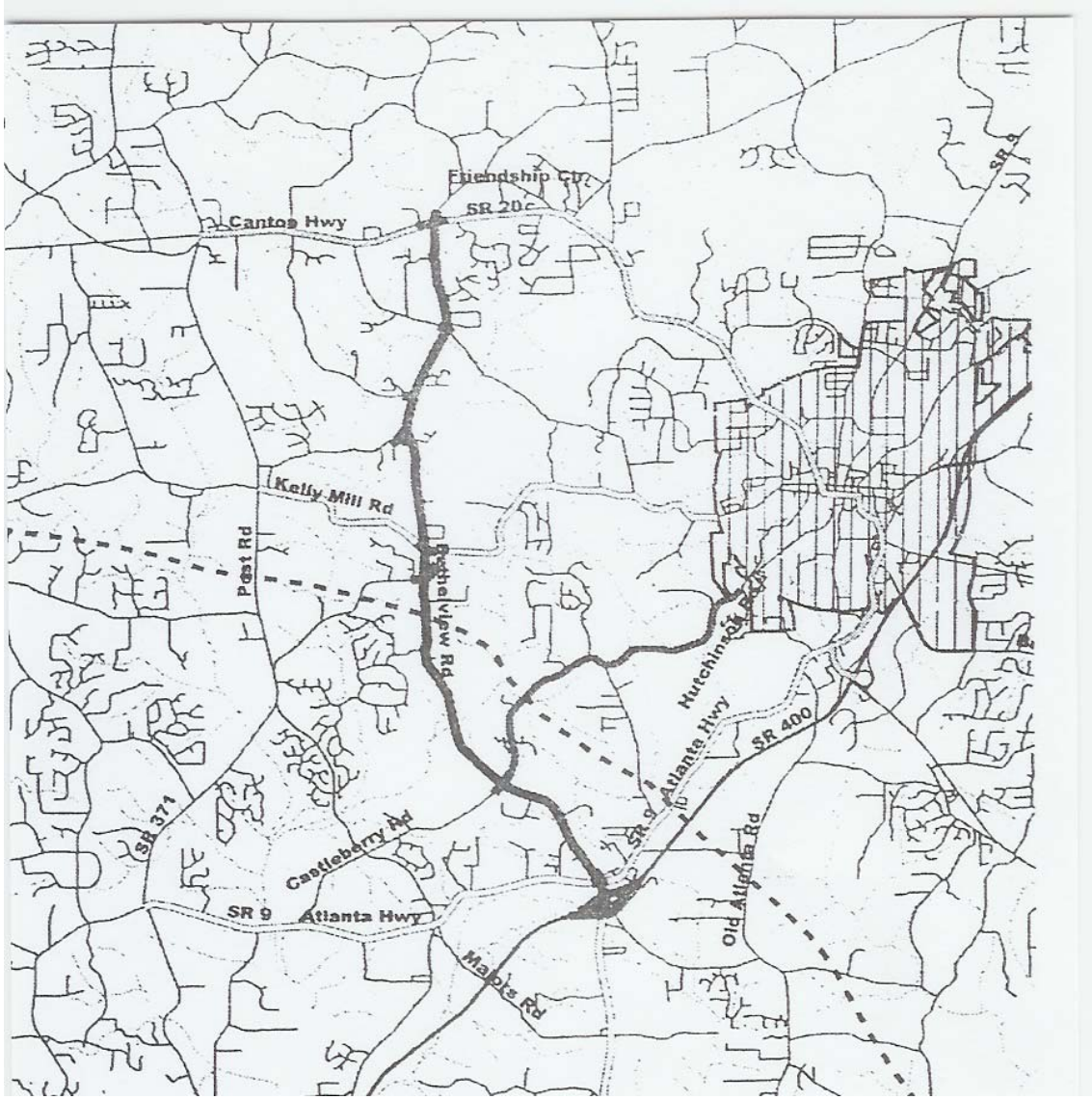
The VE team was not given any specific constraints for this project. The project will require significant ROW acquisition and construction easements so efforts were made to develop ideas that would reduce the amount of ROW required to construct this project.

Project Briefing

Prior to beginning work, Mr. Bradley Hale, P.E., project engineer for the design firm Moreland Altobelli Associates, Inc. briefed the VE team on the design status of the project. The following items were discussed:

- The project design is being done for Forsyth County.
- The proposed project will widen the two-lane Bethelview Road to a four-lane urban arterial with a 20-foot raised median.
- The current design includes sidewalks along both sides of the new roadway. However, the project does not include a bike lane in either the roadway or on a multi-use paved trail.
- The project's ROW costs have gone up significantly during the past few years and they are expected to continue to rise sharply in the future. There are no historic properties along the roadway.
- There are existing "wetlands" along Big Creek, but this is not a "wetland" replacement project.
- The project was originally developed in sections with both urban and rural sections. The current design is for the entire section to be an urban highway design.
- Construction letting dates for this project have not been set. There is some discussion going about splitting the project into two construction sections with the south section being let sooner (because of its impact to the SR 400 Interchange area) than the northern section.
- The high cost of the project may also contribute to splitting it into two construction projects. A likely point to split the project is at Castleberry Road. This would help tie in the proposed four-lane Bethelview Road section with the six-lane section coming off the SR 400 Interchange.
- While the original Bethelview Road is a County Road, it has been temporarily added to the State System. While the County will pick-up some of the project cost, the State is expected to pay for the project's construction and ROW.
- The existing facility has a high accident rate.
- There are no specific constraints to be considered while performing the VE study.

Project Sketch Map



RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: B-2	**Sheet No.:** 1 of 3	**CREATIVE IDEA:** Reduce Roadway Section - Reduce Both Outside Shoulder Widths from 16-feet to 12-feet.

Comp By: D.P.C. Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes, a 20-foot wide raised median, and 16-foot wide outside shoulders throughout the entire project length. During the development and design of this project, ROW costs have escalated significantly and are expected to continue to rise at a very high rate.

Proposed Change:

It is recommended that the 16-foot outside shoulders be reduced to 12 feet in width on both sides of the project throughout its entire length.

Justification:

The reduction of outside shoulder width would narrow the overall roadway section. This shoulder width reduction would reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. The remaining 12-foot shoulder section would still provide an adequate area to place a 5-foot sidewalk, especially if Type B sidewalk ramps are used at the driveways.

This concept results in significant cost savings (ROW) to the project without any changes to the current traffic lane / median widths.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$2,762,000		
- Proposed	$0		
- Savings	$2,762,000		$2,762,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$2,762,000**

COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: B-2 CLIENT: GADOT Sheet 2of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Reduction in ROW:							
31,303 ft x 8 ft = 250,424	SF	250,424	$9.28	$2,323,835	0	0	$0
Embankment: (8' Reduction)							
10,215 x 2 = 20,430	CY	20,430	$4.90	$100,108	0	0	$0
Storm Drain System:							
NB 4-foot shoulder reduction							
40 drain lines x 4' of 18" pipe	LF	160	$45.96	$7,354	0	0	$0
5 drain. lines x 4' of 24" pipe	LF	20	$54.17	$1,083	0	0	$0
6 drain. lines x 4' of 30" pipe	LF	24	$70.50	$1,692	0	0	$0
1 drain. lines x 4' of 36" pipe	LF	4	$86.79	$347	0	0	$0
SB 4-foot shoulder reduction							
33 drain. lines x 4' of 18" pipe	LF	132	$45.96	$6,067	0	0	$0
6 drain. lines x 4' of 24" pipe	LF	24	$54.17	$1,300	0	0	$0
7 drain. lines x 4' of 30" pipe	LF	28	$70.50	$1,974	0	0	$0
1 drain. lines x 4' of 36" pipe	LF	4	$86.79	$347	0	0	$0
SUBTOTAL				$2,444,138			$0
Includes E&C, Inflation, & Utilities							
MARK-UP (13%)				$317,740			$0
TOTAL				$2,761,878			$0
TOTAL ROUNDED				**$2,762,000**			**$0**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: B-2 CLIENT: GADOT Sheet 3 of 3

ROW calculations:

ROW cost estimate:
Commercial Area = 182,158 SF
Residential Area = 893,809 SF
Com. Easements = 282,647 SF
Res. Easements = 1,191,774 SF
Total Area = 2,550,384 SF

Total ROW Cost = $23,663,857
Estimated ROW Cost / SF = $23,663,857 / 2,550,384 = $9.28

Project length is calculated from begin centerline station 111+62 to 424+65 = 31,303 LF. A roadway section reduction of 4-foot for both shoulders equates to a total combined project section width reduction of 8 feet. 8 ft x 31,303 ft = 250,424 SF x $9.28 = $2,323,935

Embankment Estimates:

Current design has 340,504 CY of embankment
Current roadway section has a 100-foot minimum width (to edge of shoulders) plus variable widths (easements) on both sides for cuts and / or fills.

For recommendation estimating purposes the VE team will assume a 3% reduction in embankment for each 4-foot reduction in roadway section.

4-Foot reduction = 3% of Project Total = 340,504 CY x .03 = 10,215 CY
For 8-Foot Reduction 10,215 CY x 2 + 20,430 CY x $4.90 = $100,108

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:** To Use 11-Foot Through Traffic Lanes While Holding Turn Lane Widths at 12 feet.
B-1	1 of 3	

Comp By: D.P.C. Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. During the development and design of this project, ROW cost have escalated significantly and are expected to continue to rise at a very high rate.

Proposed Change:

It is recommended that 11-foot lanes be used in-lieu-of 12-foot lanes on the four through travel lanes while maintaining the 12-foot width for all left-turn lanes.

Justification:

Reduction of 4-feet of roadway section reduces pavement section, drainage system, retaining wall, earthwork, and right-of-way acquisition costs.

The 4-foot reduction in lane width would reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. The 11-foot through lanes would accommodate the project traffic and provide adequate safety for this urban roadway with a design / posted speed of 45 MPH. This concept may require additional adjustments to the outside lane at intersections for U-Turns.

This concept results in significant cost savings to the project.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	$2,222,000		
- Proposed	$0		
- Savings	$2,222,000		$2,222,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$2,222,000**

COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: B-1 CLIENT: GADOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Pavement Section:							
Full depth section including 12" GAB, 25mm base, 19mm intermediate level, and 12.5mm top-coarse.	SF	124,082	$6.00	$744,492	0	0	$0
Reduction in ROW:							
31,303 ft x 4 ft = 125,212	SF	125,212	$9.28	$1,161,967	0	0	$0
Embankment: (4' Reduction)							
For 4' reduction	CY	10,215	$4.90	$50,054	0	0	$0
Storm Drain System:							
NB 2-foot shoulder reduction							
40 drain. lines x 2' of 18" pipe	LF	80	$45.96	$3,677	0	0	$0
5 drain. lines x 2' of 24" pipe	LF	10	$54.17	$542	0	0	$0
6 drain. lines x 2' of 30" pipe	LF	12	$70.50	$846	0	0	$0
1 drain. lines x 2' of 36" pipe	LF	2	$86.79	$174	0	0	$0
SB 2-foot shoulder reduction							
33 drain. lines x 2' of 18" pipe	LF	66	$45.96	$3,033	0	0	$0
6 drain. lines x 2' of 24" pipe	LF	12	$54.17	$650	0	0	$0
7 drain. lines x 2' of 30" pipe	LF	14	$70.50	$987	0	0	$0
1 drain. lines x 2' of 36" pipe	LF	2	$86.79	$174	0	0	$0
SUBTOTAL				$1,966,596			$0
Includes E&C, Inflation, & Utilities							
MARK-UP (13%)				$255,657			$0
TOTAL				$2,222,253			$0
TOTAL ROUNDED				$2,222,000			$0

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: CLIENT: GADOT Sheet 3 of 3

Roadway lane reduction calculations:

Lane length's calculated from begin station 111+62 to 422+00 for (4) lanes and lane lengths from station 422+00 to 424+65 for (2) lanes at transition point.

111+62 – 422+00 = 30,888' (minus 150' bridge structure) x 4' = 123,552 SF
422+00 – 424+65 = 265' x 2' = 530 SF at transition point.

Total 124,082 SF x $6.00 SF = $744,492

ROW calculations:

Total ROW Cost = $23,663,857
Estimated ROW Cost / SF = $23,663,857 / 2,550,384 = $9.28

Project length is calculated from begin centerline station 111+62 to 424+65 = 31,303 LF. A roadway section reduction of 4feet = 31,303 ft x 4 ft = 125,212 SF x $9.28 = $1,161,967

Embankment Estimates:

Current design has 340,504 CY of embankment
Current roadway section has a 100-foot minimum width (to edge of shoulders) plus variable widths (easements) on both sides for cuts and / or fills.

For recommendation estimating purposes the VE team will assume a 3% reduction in embankment for each 4-foot reduction in roadway section.

4-Foot reduction = 340,504 CY x .03 = 10,215 CY x $4.90 = $50,054

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: N-2	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To use a 6-foot raised corrugated concrete median with 1-foot offsets in-lieu-of curb and gutter with concrete median paving.

Comp By: J.R.C. Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. In areas (53.4% of the project length) where there is a left turn lane, the median width is reduced to 8 feet. The baseline design for this 8-foot median consists of dual 2'-6" curb and gutters with the 3'-6" area between the curbs filled with concrete median paving.

Proposed Change:

It is recommended that the 8-foot-wide median in the left turn areas be constructed using a corrugated concrete (6-foot wide) median with 1-foot offsets from the inside edge of the adjacent lanes.

Justification:

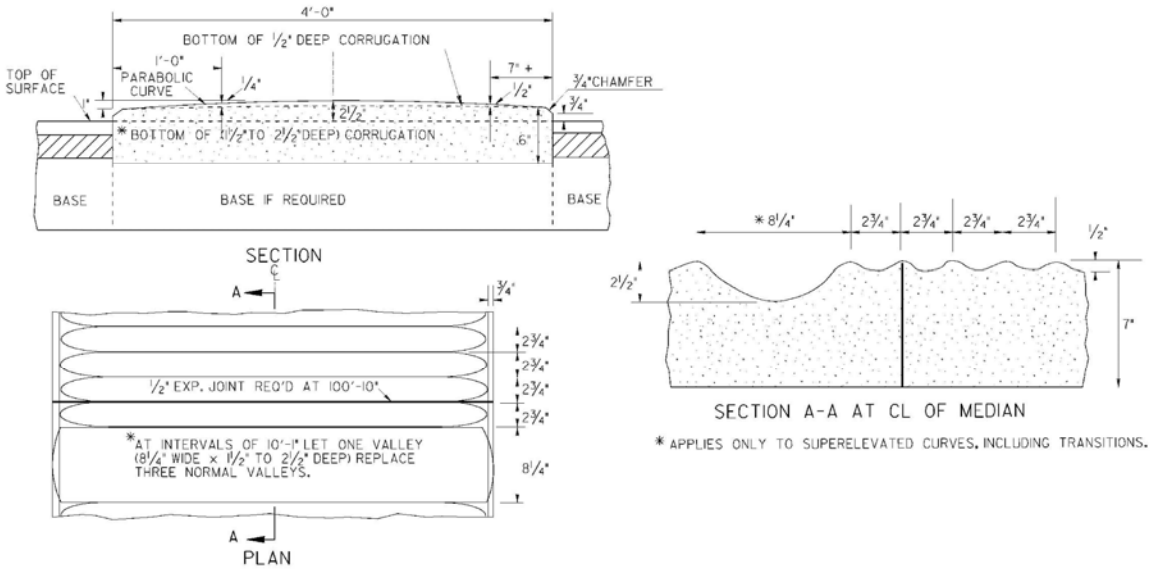
Constructing the median with a raised 6-foot wide corrugated concrete strip (with 1-foot offsets) in-lieu-of dual curb and gutters with concrete median paving would improve project constructability and reduce construction time. The raised corrugated concrete median would present a clear visual and physical barrier and would also reduce project cost.

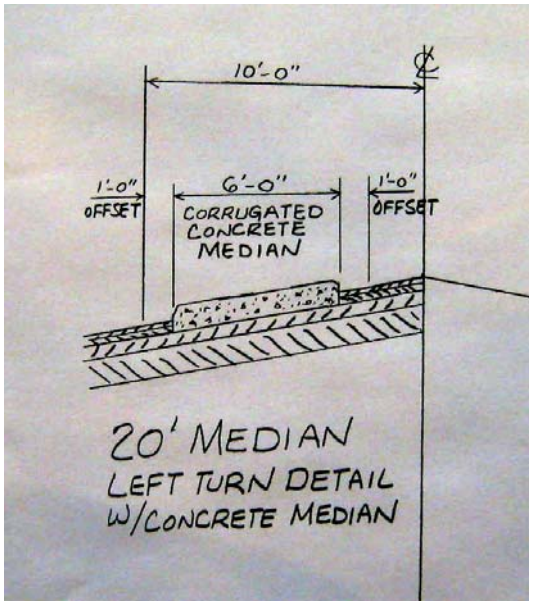
LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	$1,218,000		
- Proposed	$1,118,000		
- Savings	$100,000		$100,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$100,000**

SKETCH

Project: Bethelview Road Improvements	ITEM No.: N-2 CLIENT: GADOT Sheet 2 of 4

DETAIL OF 4' CORRUGATED CONCRETE MEDIAN





COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: N-2 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
8' Median at turn lane locations							
Curb & Gutter	LF	33,440	$15.91	$532,030			
Concrete Median	SY	5,573	$31.64	$176,330			
GAB	SF	133,760	$2.76	$369,178			
8' Median at turn lane locations							
Concrete Median	SY				11,147	$31.64	$352,691
Asp (top 2 courses	SF				33,440	$1.44	$48,154
Asp (AC 25mm)	SF				133,760	$1.64	$219,366
GAB	SF				133,760	$2.76	$369,178
SUBTOTAL				$1,077,538			$989,389
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$140,080			$128,621
TOTAL				$1,217,628			$1,118,010
TOTAL ROUNDED				**$1,218,000**			**$1,118,000**

CALCULATIONS

Project: Bethelview Road Improvements	ITEM No.: N-2 CLIENT: GADOT Sheet 4 of 4

Standard 8-Foot Median:

Station 112+20 – 121+00 = 880	Station 266+50 – 271+00 = 450
Station 122+20 - 130+80 =860	Station 272+80 – 282+00 = 920
Station 132+00 – 136+60 =460	Station 283+20 – 292+00 = 880
Station 141+00 – 145+40 = 440	Station 293+20 – 298+00 = 470
Station 146+80 - 151+20 = 440	Station 314+50 – 319+00 = 450
Station 154+50 – 159+20 = 470	Station 320+20 – 324+50 = 430
Station 160+50 – 165+00 = 450	Station 334+00 – 338+70 = 470
Station 175+50 – 180+00 = 450	Station 339+60 – 342+00 = 240
Station 181+20 – 185+80 = 400	Station 345+20 – 348+60 = 340
Station 201+80 – 204+40 = 260	Station 349+60 – 354+20 = 460
Station 205+50 – 210+00 – 450	Station 366+00 - 370+50 = 450
Station 226+40 – 227+50 = 110	Station 371+50 – 377+30 = 580
Station 228+80 – 233+40 = 460	Station 378+30 – 385+30 = 700
Station 240+50 – 245+00 = 450	Station 386+40 – 390+40 = 400
Station 245+80 – 250+50 = 470	Station 398+00 – 402+20 = 420
Station 253+50 – 258+20 = 470	Station 403+10 – 407+70 = 460
Station 259+50 – 264+50 = 500	Station 411+20 – 417+00 = 580

Total length of median at turn lanes = 16,720 feet.

<u>Current Plans</u>
Calculate cost of road in the currently proposed 8-foot median section.

Curb and gutter: (16,720)(2) = 33,440 LF x $15.91 / LF = $532,030
Concrete median: (16,720)(3)(1/9) = 5,573 SY x $31.64 / SY = $176,330
GAB: (16,720)(8) = 133,760 SF x $2.76 / SF = $369,178
TOTAL = $1,077,538

<u>Plans with VE recommendation</u>
Calculate cost of road in the proposed VE revision 8-foot median section.

Concrete median: (16,720)(6)(1/9) = 11,147 x $31.64 / SY = $352,691
Asphaltic concrete pavement (top 2 courses): (16,720)(2) = 33,440 SF x $1.44 / SF = $48,154
Asphaltic concrete pavement (AC 25mm): (16,720)(8) 133,760 SF x $1.64 / SF = $219,366
GAB: (16,720)(8) = 133,760 SF x $2.76 / SF = $369,178
TOTAL = $989,389

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: N-4	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To reduce the median width by 4 feet and use a 2-foot raised corrugated concrete median with 1-foot offsets in-lieu-of curb and gutter median.

Comp By: J.R.C. Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. In areas (53.4% of the project length) where there is a left turn lane, the median width is reduced to 8 feet. The baseline design for this 8-foot median consists of dual 2'-6" curb and gutters with the 3'-6" area between the curbs filled with concrete median paving. During the development and design of this project, ROW cost have escalated significantly and are expected to continue to rise at a very high rate.

Proposed Change:

It is recommended that the proposed 20-foot median width be reduced by 4 feet. This 4-foot reduction would result in a 4-foot median along the left turn lanes. It is further recommended that the 4-foot median be constructed using a corrugated concrete (2-foot wide) median with 1-foot offsets from the inside edge of the adjacent lanes.

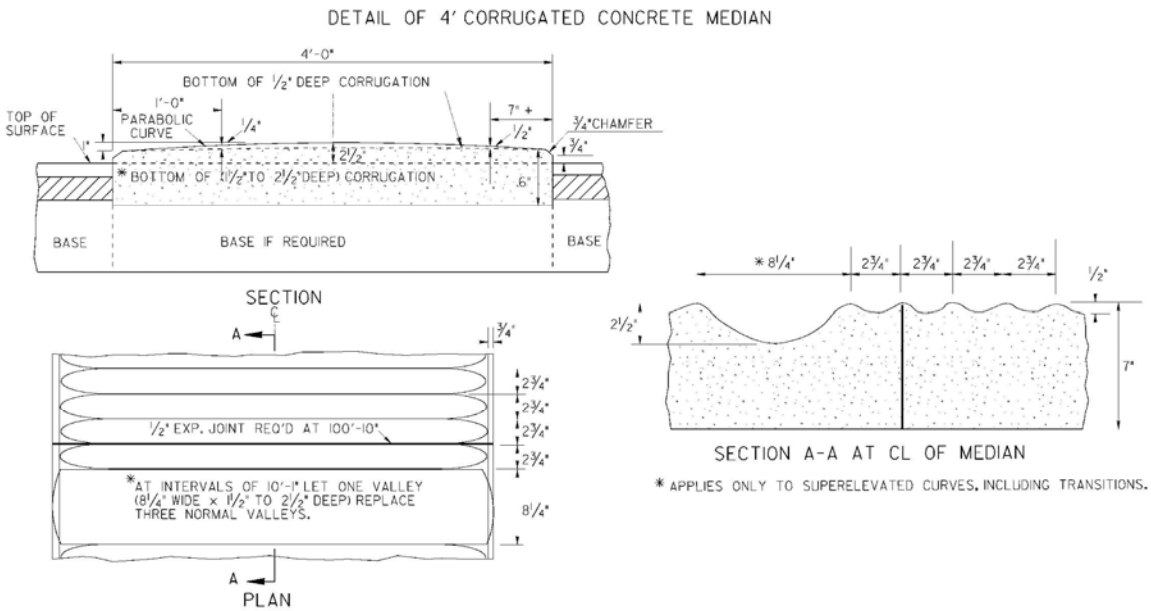
Justification:

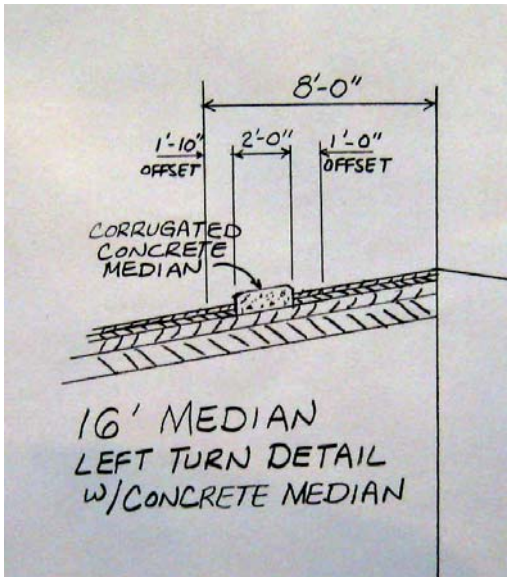
Reducing the median width 4-feet would reduce the amount of ROW required for the project, reduce the lengths of storm drain cross pipes, reduce the amount of earthwork, and reduce /eliminate the size of some retaining walls. Constructing the median with a raised 2-foot wide corrugated concrete strip (with 1-foot offsets) in-lieu-of dual curb and gutters with concrete median paving would reduce cost, improve project constructability, and reduce construction time. The raised corrugated concrete median would present a clear visual and physical barrier. This concept may require additional adjustments to the outside lane at intersections for U-turns.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$2,587,000		
- Proposed	$520,000		
- Savings	$2,067,000		$2,067,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$2,067,000**

SKETCH

Project: Bethelview Road Improvements	ITEM No.: N-4 CLIENT: GADOT Sheet 2 of 4





COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: N-4 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
8' Median at turn lane locations							
Curb & Gutter	LF	33,440	$15.91	$532,030			
Concrete Median	SY	5,573	$31.64	$176,330			
GAB	SF	133,760	$2.76	$369,178			
4' Median at turn lane locations							
Concrete Median	SY				3,716	$31.64	$117,574
Asp (top 2 courses	SF				33,440	$1.44	$48,154
Asp (AC 25mm)	SF				66,880	$1.64	$109,683
GAB	SF				66,880	$2.76	$184,589
Embankment: (4' Reduction)							
For 4' Reduction	CY	10,215	$4.90	$50,054			$0
Reduction to ROW:							
4 x 31,303 = 125,212	SF	125,212	$9.28	$1,161,967			$0
SUBTOTAL				$2,289,559			$460,000
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$297,644			$59,800
TOTAL				$2,587,203			$519,800
TOTAL ROUNDED				**$2,587,000**			**$520,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: N-4 CLIENT: GADOT Sheet 4 of 4

Total length of median at turn lanes = 16,720 feet.

<u>Current Plans</u>
Calculate cost of road in the currently proposed 8-foot median section.

Curb and gutter: (16,720)(2) = 33,440 ft x $15.91 / ft = $532,030
Concrete median: (16,720)(3)(1/9) = 5,573 SY x $31.64 / SY = $176,330
GAB: (16,720)(8) = 33,440 SF x $2.76 / SF = $369,178
TOTAL = $1,077,538

<u>Plans with VE recommendation</u>
Calculate cost of road in the proposed VE revision to a 4-foot median section.

Concrete median: (16,720)(2)(1/9) = 3,716 SY x $31.64 / SY = $117,574
Asphaltic concrete pavement (top 2 courses): (16,720)(2) = 33,720 SF x $1.44 / SF = $48,154
Asphaltic concrete pavement (AC 25mm): (16,720)(4) = 66,880 SF x $1.64 / SF = $109,683
GAB: (16,720)(4) = 66,880 SF x $2.76 / SF = $184,589
TOTAL = $460,000

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
L-1	1 of 3	Eliminate Sidewalks Along the Bethelview Road Corridor.

Comp By: D.P.C. Date: 11-28-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes, a 20-foot raised median, and 16-foot outside shoulders with 5-foot wide concrete sidewalks throughout the entire length of the project.

Proposed Change:

It is recommended that the designer be requested to only place sidewalks in areas where there are existing commercial and residential buildings.

Justification:

This project was originally being developed as an urban / rural roadway. Much of the area is still undeveloped and there is no need to place sidewalks through undeveloped areas. This concept would reduce the amount of sidewalk and reduce the project cost.

As the area continues to develop and more commercial /residential properties are built, the County should require developers to install sidewalks along the roadway.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$670,000		
- Proposed	$0		
- Savings	$670,000		$670,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$670,000**

COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: L-1 CLIENT: GADOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
5-Foot Concrete Sidewalk							
Assumed Reductions NB Side							
Station 148+00 to 193+00	SY	2,500	$33.76	$84,175	0	0	$0
Station 194+50 to 238+00	SY	2,417	$33.67	$81,370	0	0	$0
Station 293+00 to 339	00SY	2,556	$33.67	$86,061	0	0	$0
				$251,606.00			
Assumed Reductions SB Side							
Station 172+00 to 193+00	SY	1,167	$33.67	$39,293	0	0	$0
Station 194+50 to 258+00	SY	3,528	$33.67	$118,788	0	0	$0
Station 273+00 to 371+00	SY	5,444	$33.67	$183,299	0	0	$0
				$341,380.00			
SUBTOTAL				$592,986			$0
Includes E&C, Inflation, & Utilities							
MARK-UP (13 %)				$77,088			$0
TOTAL				$670,074			$0
TOTAL ROUNDED				**$670,000**			**$0**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: L-1 CLIENT: GADOT Sheet 3 of 3

Sidewalk:

NB side:

Station 148+00 to 193+00 = 4,500 x 5 / 9 = 2,500 SY
Station 194+50 to 238+00 = 4,350 x5 / 9 = 2,417 SY
Station 293+00 to 339+00 = 4,600 x 5 / 9 = 2,556 SY

SB Side

Station 172+00 to 193+00 = 2,100 x 5 / 9 = 1,167 SY
Station 194+50 to 258+00 = 6,350 x 5 / 9 = 3,528 SY
Station 273+00 to 371+00 = 9,800 x 5 / 9 = 5,444 SY

DEVELOPMENT AND RECOMMENDATION PHASE		
Project: Bethelview Road Improvements		
IDEA No.: J-1	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To reduce the width of the bridge by 4 feet to match the reduction in the roadway width if 11-foot lanes are constructed.
Comp By: Aruna Sastry Date: 11-28-07 Checked By: K.B. Date: 12-03-07		

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design consists of a dual span (83' & 67') bridge using AASHTO Type III PSC Beams for its superstructure. The proposed two span 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

Proposed Change:

It is recommended that the width of the Big Creek Bridge be reduced by 4 feet to match the revised roadway section if 11-foot lanes are constructed on Bethelview Road.

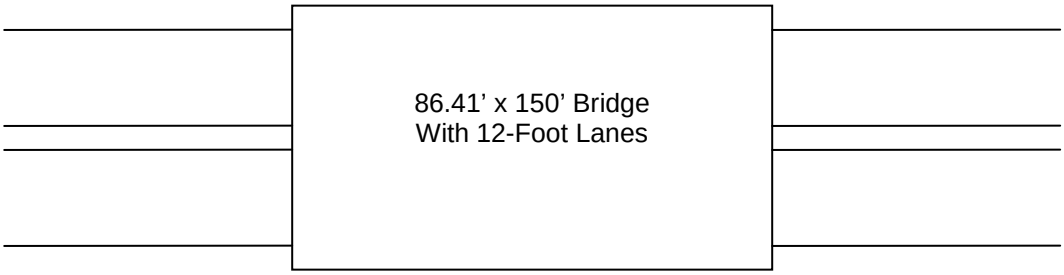
Justification:

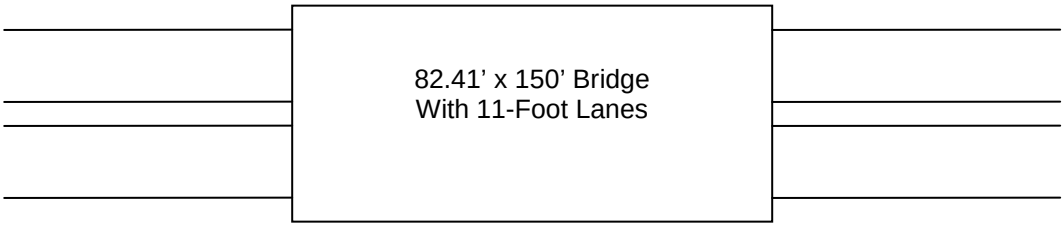
Carrying 11-foot lanes across the bridge would result in a 4-foot reduction in the overall width of the structure. The total width of the recommended bridge would be 82.41 feet. This concept would not change any other features (type of superstructure or center pier) of the bridge. Reducing the bridge width would result in cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$1,172,000		
- Proposed	$1,118,000		
- Savings	$54,000		$54,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$54,000**

SKETCH	
Project: Bethelview Road Improvements	ITEM No.: J-1 CLIENT: GADOT Sheet 2 of 4

Original Bridge 86.41' x 150'
Recommended Bridge 82.41' x 150'





COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: J-1 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Current Design:							
Two span 86.41 x 150 ft. bridge	SF	12,962	$80.00	$1,036,960			
Recommended Design:							
Two span 82.41 x 150 ft. bridge	SF				12,362	$80.00	$988,960
SUBTOTAL				$1,036,960			$988,960
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$134,805			$128,565
TOTAL				$1,171,765			$1,117,525
TOTAL ROUNDED				**$1,172,000**			**$1,118,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: J-1 CLIENT: GADOT Sheet 4 of 4

Current two-span bridge (86.41 ft x 150 ft) design.

86.41 ft x 150 ft = 12,962 SF x $80.00 = $1,036,960

Two span bridge (82.41 ft x 150 ft) after reduction of 4 ft.

82.41 ft x 150 ft = 12,362 SF x $80.00 = $988,960

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: J-2	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To Reduce the bridge width by 8 feet to match the reduction of roadway width if 11-foot lanes are constructed and the median width is also reduced by 4 feet.

Comp By: Aruna Sastry Date: 11-28-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design consists of a dual span (83' & 67') bridge using AASHTO Type III PSC Beams for its superstructure. The proposed two span 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

Proposed Change:

It is recommended that the width of the Big Creek Bridge be reduced by 8 feet to match the revised roadway section if 11-foot lanes are constructed and the median width is also reduced 4 feet.

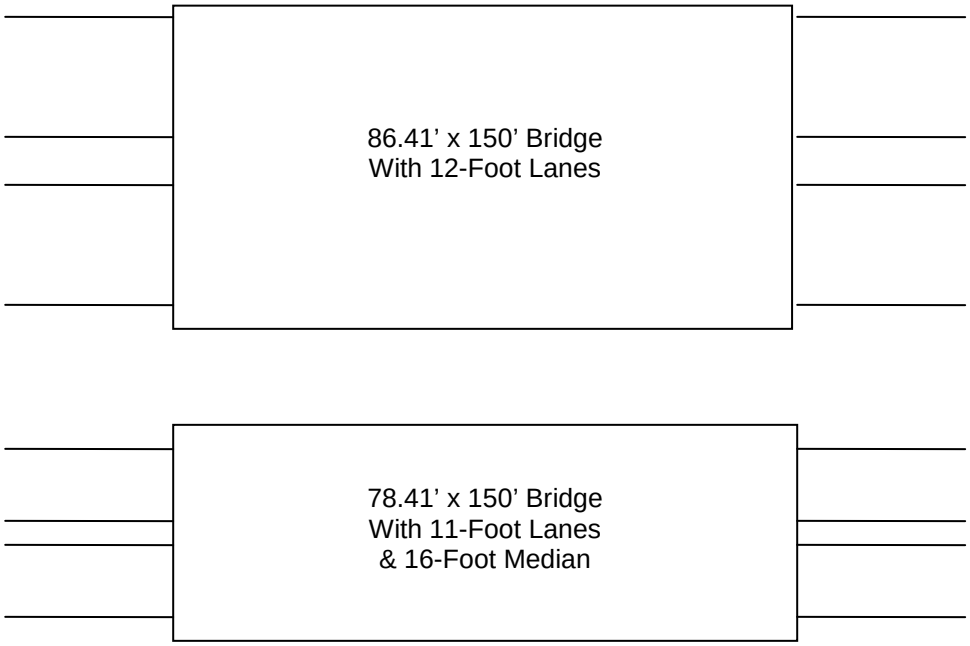
Justification:

Carrying 11-foot lanes and a 16-foot median across the bridge would result in an 8-foot reduction in the overall width of the structure. The total width of the recommended bridge would be 78.41 feet. This concept would not change any other features (type of superstructure or center pier) of the bridge. Reducing the bridge width would result in cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$1,172,000		
- Proposed	$1,063,000		
- Savings	$109,000		$109,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$109,000**

SKETCH	
Project: Bethelview Road Improvements	ITEM No.: J-2 CLIENT: GADOT Sheet 2 of 4

Original Bridge 86.41' x 150'
Recommended Bridge 78.41' x 150'



COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: J-2 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Current Design:							
Two span 86.41 x 150 ft. bridge	SF	12,962	$80.00	$1,036,960			
Proposed Design:							
Two span 78.41 x 150 ft. bridge	SF				11,762	$80.00	$940,960
SUBTOTAL				$1,036,960			$940,960
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$134,805			$122,325
TOTAL				$1,171,765			$1,063,285
TOTAL ROUNDED				**$1,172,000**			**$1,063,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: J-2 CLIENT: GADOT Sheet 4 of 4

Current two-span bridge (86.41 ft x 150 ft) design.

86.41 ft x 150 ft = 12,962 SF x $80.00 = $1,036,960

Two span bridge (78.41 ft x 150 ft) after reduction of 8 ft.

78.41 ft x 150 ft = 11,762 SF x $80.00 = $940,960

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: J-3	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To construct dual bridges and reduce the overall bridge width 16 feet by eliminating the median and constructing 12-foot lanes.

Comp By: Aruna Sastry Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design consists of a dual span (83' & 67') bridge using AASHTO Type III PSC Beams for its superstructure. The proposed two span 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

Proposed Change:

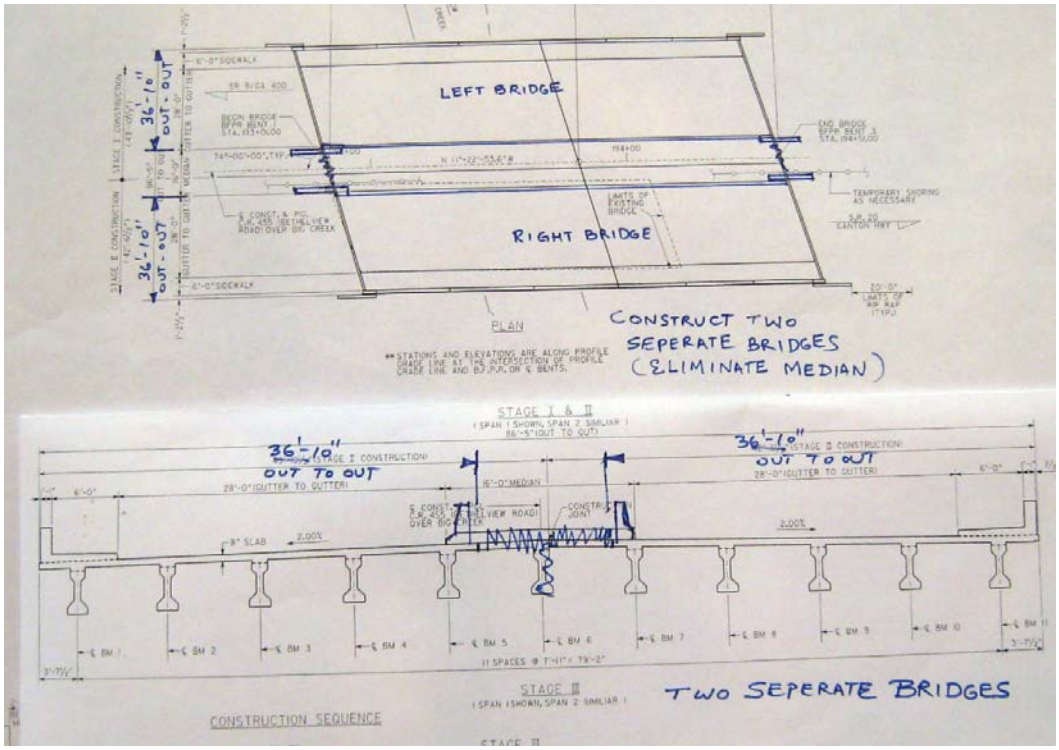
It is recommended that dual bridges be constructed over Big Creek in-lieu-of a single width bridge. Concept J-3 would be used for a roadway section with 12-foot lane widths and provides for dual 36.83-foot wide bridges.

Justification:

The construction of dual bridges over Big Creek would allow for a 16-foot reduction in the overall bridge width. This concept would result in two 36.83 ft x 150 ft bridges. The 16-foot width reduction results from eliminating the raised concrete median on the structure. With no left turn lanes on the proposed bridge there is no need to carry the full width raised concrete median across the structure. Constructing two separate bridges with a gap between them would result in a significant cost savings.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	$1,172,000		
- Proposed	$1,010,000		
- Savings	$162,000		$162,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$162,000**

SKETCH	
Project: Bethelview Road Improvements	ITEM No.: J-3 CLIENT: GADOT Sheet 2 of 4



COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: J-3 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Current Design:							
Two span 86.41 x 150 ft. bridge	SF	12,962	$80.00	$1,036,960			
Recommended Design:							
Dual two-span 36.83 ft x 150 ft bridges	SF				11,050	$80.00	$883,920
Miscellaneous Guard Rail and	LS				1	$10,000	$10,000
Protection							
SUBTOTAL				$1,036,960			$893,920
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$134,805			$116,210
TOTAL				$1,171,765			$1,010,130
TOTAL ROUNDED				**$1,172,000**			**$1,010,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: J-3 CLIENT: GADOT Sheet 4 of 4

Current two-span bridge (86.41 ft x 150 ft) design.

86.41 ft x 150 ft = 12,962 SF x $80.00 = $1,036,960

Dual two-span bridges (36.83 ft x 150 ft)

(36.83 ft x 150 ft) x 2 = 11,049 SF x $80.00 = $883,920

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: J-4	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To construct dual bridges and reduce the overall bridge width by 20 feet by eliminating the median and constructing 11-foot lanes.

Comp By: Aruna Sastry Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current urban roadway typical section for the proposed project includes four 12-foot lanes and a 20-foot wide raised median. This roadway typical section results in a proposed bridge width of 86.41 feet for the two-span Big Creek Bridge. The current bridge design consists of a dual span (83' & 67') bridge using AASHTO Type III PSC Beams for its superstructure. The proposed two span 86.41 ft by 150 ft bridge is scheduled to be built in three stages.

Proposed Change:

It is recommended that dual bridges be constructed over Big Creek in-lieu-of a single width bridge. Concept J-4 would be used for a roadway section with 11-foot lane widths and provides for dual 34.83-foot wide bridges.

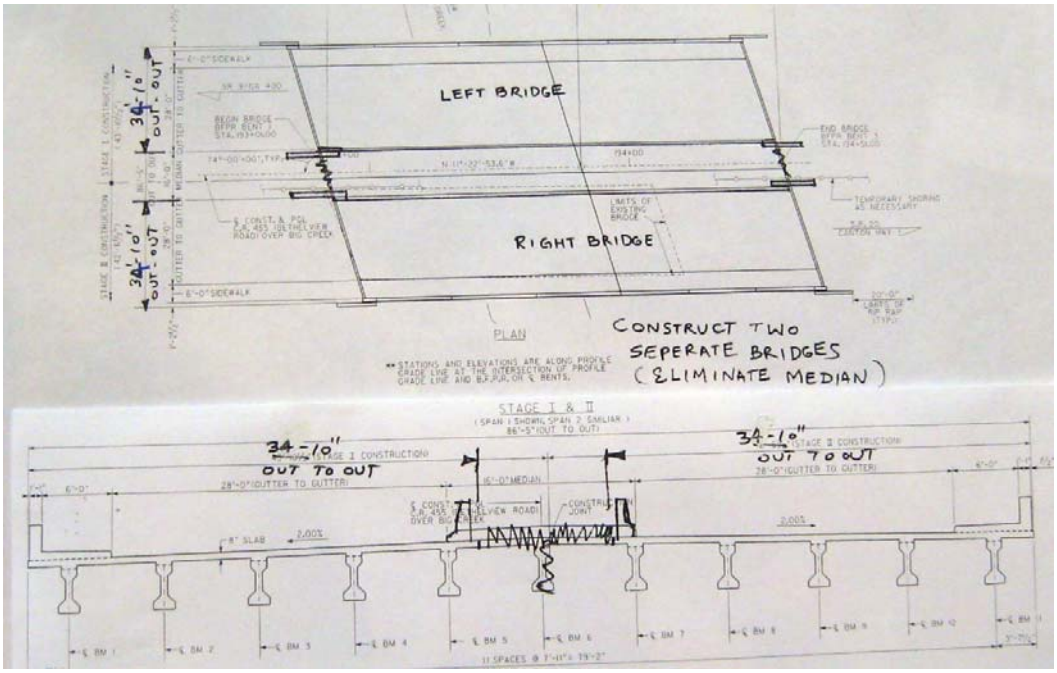
Justification:

The construction of dual bridges with 11-foot lanes over Big Creek would allow for a 20-foot reduction in the overall bridge width. This concept would result in two 34.83 ft x 150 ft bridges. The 20-foot width reduction results from eliminating the raised concrete median on the structure and constructing 11-foot lanes. With no left turn lanes on the proposed bridge there is no need to carry the full width raised concrete median across the structure. Constructing two separate bridges with a gap between them would result in a significant cost savings.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	$1,172,000		
- Proposed	$956,000		
- Savings	$216,000		$216,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$216,000**

SKETCH

Project: Bethelview Road Improvements	ITEM No.: J-4 CLIENT: GADOT Sheet 2 of 4



COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: J-4 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Current Design:							
Two span 86.41 x 150 ft. bridge	SF	12,962	$80.00	$1,036,960			
Recommended Design:							
Dual two-span 34.83 ft x 150 ft bridges	SF				10,450	$80.00	$835,920
Miscellaneous Guard Rail and	LS				1	$10,000	$10,000
Protection							
SUBTOTAL				$1,036,960			$845,920
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$134,805			$109,970
TOTAL				$1,171,765			$955,890
TOTAL ROUNDED				**$1,172,000**			**$956,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: J-4 CLIENT: GADOT Sheet 4 of 4

Current two-span bridge (86.41 ft x 150 ft) design.

86.41 ft x 150 ft = 12,962 SF x $80.00 = $1,036,960

Dual two-span bridges (34.83 ft x 150 ft)

(34.83 ft x 150 ft) x 2 = 10,449 SF x $80.00 = $835,920

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.: R-1	**Sheet No.:** 1 of 4	**CREATIVE IDEA:** To replace the existing double 10' x 9' Box Culvert with a three span concrete "T" beam or PSC 17" box beam bridge.

Comp By: Aruna Sastry Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The current design extends the existing double 10 ft x 9 ft box culvert by 112 ft. and adds an extra 189-foot long, 10 ft x 9 ft barrel to accommodate the new roadway section at station 308+52.77.

Proposed Change:

It is recommended that a three-span, 90-foot long concrete "T" Beam or PSC 17" Box Beam bridge with pile bents be constructed in-lieu-of constructing a new triple 10 ft x 9 ft box culvert.

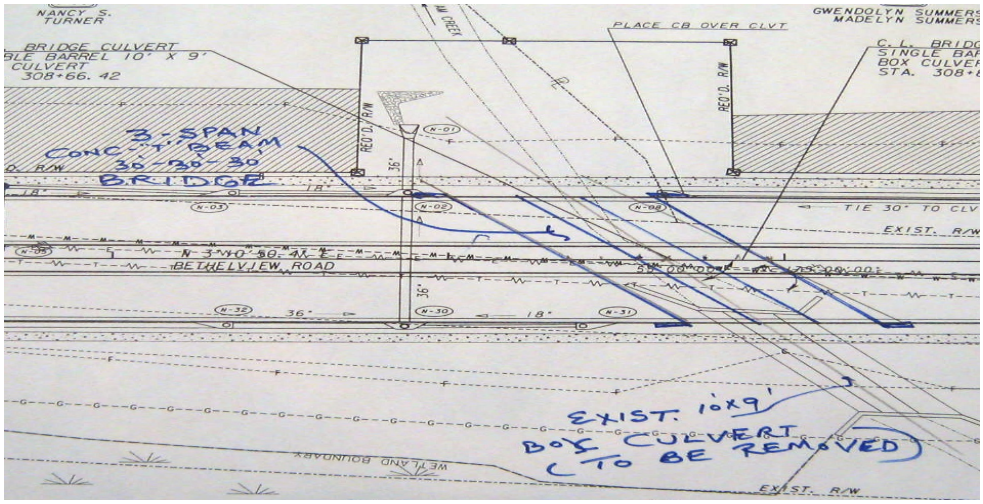
Justification:

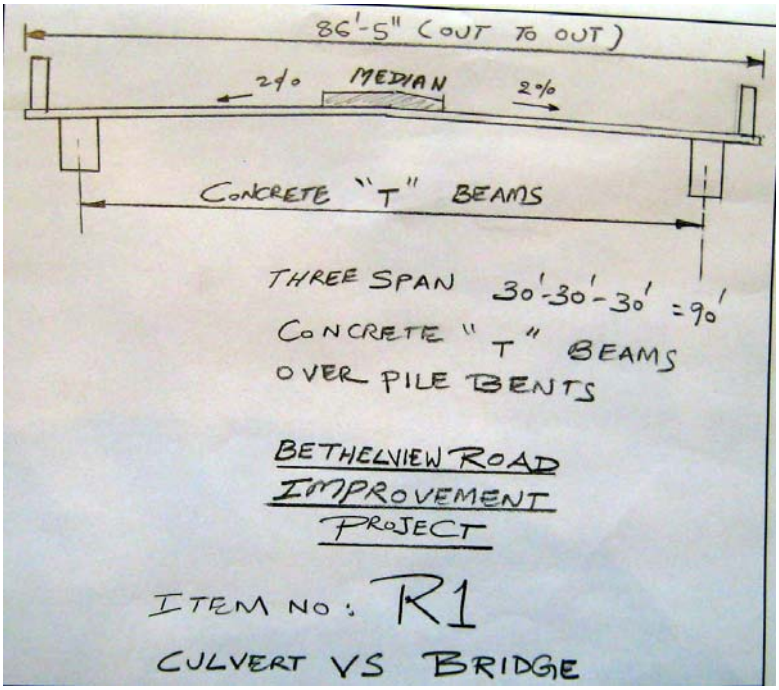
The construction of a short 90-foot three-span bridge would reduce the cost of the project. This concept also removes the obstruction from the waterway by removing the existing old culvert.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$530,000		
- Proposed	$439,000		
- Savings	$91,000		$91,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$91,000**

SKETCH

Project: Bethelview Road Improvements	ITEM No.: R-1 CLIENT: GADOT Sheet 2 of 4





COST WORKSHEET							
Project: Bethelview Road Improvements					IDEA No.: R-1 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Current Design:							
Triple 10 ft. 9 ft. Box culvert-Concrete	CY	542	$700.00	$379,344			
Triple 10 ft. 9 ft. Box culvert-reinforcing steel	Lb	57,264	$1.56/Lb	$89,332			
Recommended Design:							
Construct Concrete "T" Beam bridge 90 ft. long x 86.41 ft. wide (Assume 12' lanes & 20' median)	SF				7,777	$50.00	$388,845
SUBTOTAL				$468,676			$388,845
Includes E&C, Inflation, & Utilities **MARK-UP (13%)**				$60,928			$50,550
TOTAL				$529,604			$439,395
TOTAL ROUNDED				**$530,000**			**$439,000**

CALCULATIONS	
Project: Bethelview Road Improvements	ITEM No.: R-1 CLIENT: GADOT Sheet 4 of 4

Triple 10 ft. 9 ft. Box culvert-Concrete …….. 542 CY x $700/CY = $ 379,344
Triple 10 ft. 9 ft. Box culvert-Reinforcing steel…..57,264 Lb x $ 1.56/Lb = $89,332
TOTAL = $468,676

Assume 12-Foot Lanes and 20-Foot Median:
Construct Concrete "T" Beam bridge three spans, 90 ft long x 86.41 ft wide

Bridge 86.41 ft x 90 ft = 7,777 SF x $50.00 = $388,850

DEVELOPMENT AND RECOMMENDATION PHASE

Project: Bethelview Road Improvements

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
P-1	1 of 2	As a result of other VE design changes, retaining walls may be reduced in size or eliminated.

Comp By: J.R.C. Date: 11-29-07 Checked By: K.B. Date: 12/03/07

Original Concept:

The baseline concept provides for six retaining walls. The walls are all in situations where the roadway shoulder is higher than a paved parking area adjacent to the roadway. Most wall sections are less than five feet in height between the back of the roadway shoulder and the proposed ground elevations at the back of the wall.

Proposed Change:

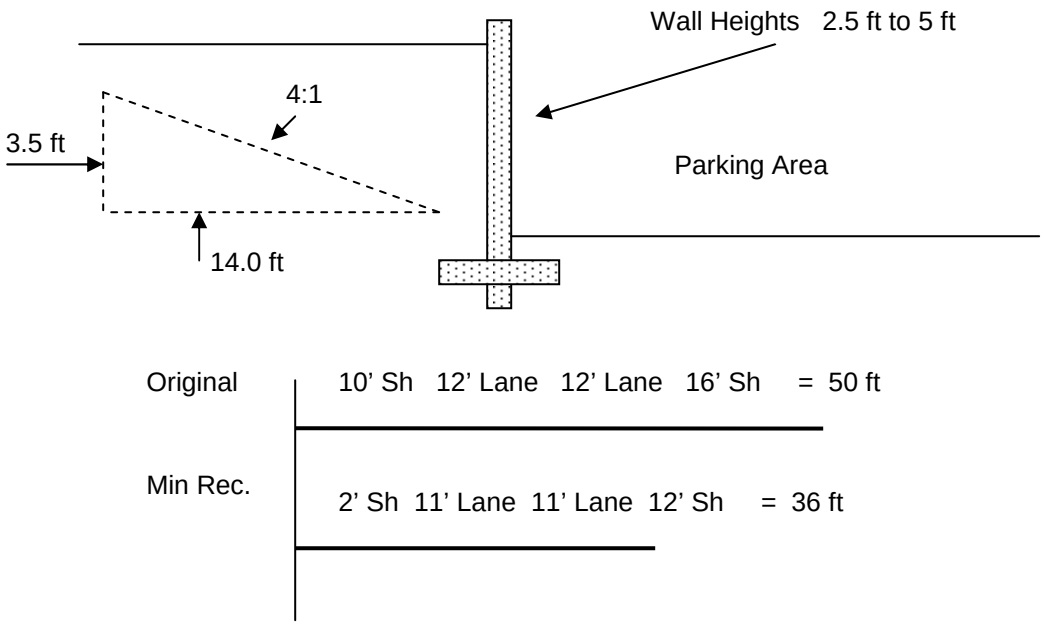
It is recommended that the roadway width be reduced by four to eight feet to reduce the height of the proposed retaining walls.

Justification:

A four-eight foot reduction can be obtained by using 11-foot lanes (Idea B-1) and reducing the width of the outside shoulders (B-2). Narrowing the roadway will result in reduced retaining wall requirements and costs. The amount of savings for retaining walls depends on how much the proposed roadway is narrowed. The recorded savings assumes an eight-foot reduction in the typical section however a reduction of up to 16 feet can be achieved if all the recommendations regarding the typical section are implemented.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	$690,000		
- Proposed	$340,000		
- Savings	$350,000		$350,000
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**$350,000**

SKETCH	
Project: Bethelview Road Improvements	ITEM N^{o} : P-1 CLIENT: GADOT Sheet 2 of 2



Using the proposed 100-foot roadway width (from shoulder break to shoulder break) and the retaining wall cost of $690,000, the following reductions in retaining wall cost could be anticipated:

Narrowing up to 2 feet - no reduction in cost ($0)
Narrowing 2-4 feet - 10% reduction in cost. ($69,000)
Narrowing 4-6 feet - 25% reduction in cost. ($173,000)
Narrowing 6-10 feet - 50% reduction in cost. ($350,000)
Narrowing 10-12 feet - 70% reduction in cost. ($483,000)

APPENDIX

Sources

Approving/Authorizing Persons

Name:	Position:	Telephone:
Brian Summers	GDOT – Engineering Services, Project, Review Engineer	404-656-6846
Ron Wishon	GDOT – Engineering Services, Assistant Project Review Engineer	404-651-7470

Personal Contacts

Name:	Telephone:	Notes:

Documents/Abstracts

Reference:	Reference:
Project Concept Report	
ROW Cost Estimate	
Construction Cost Estimate	
Preliminary Project Plans	
Project Cross Sections	
Pre Final FONSI Report	

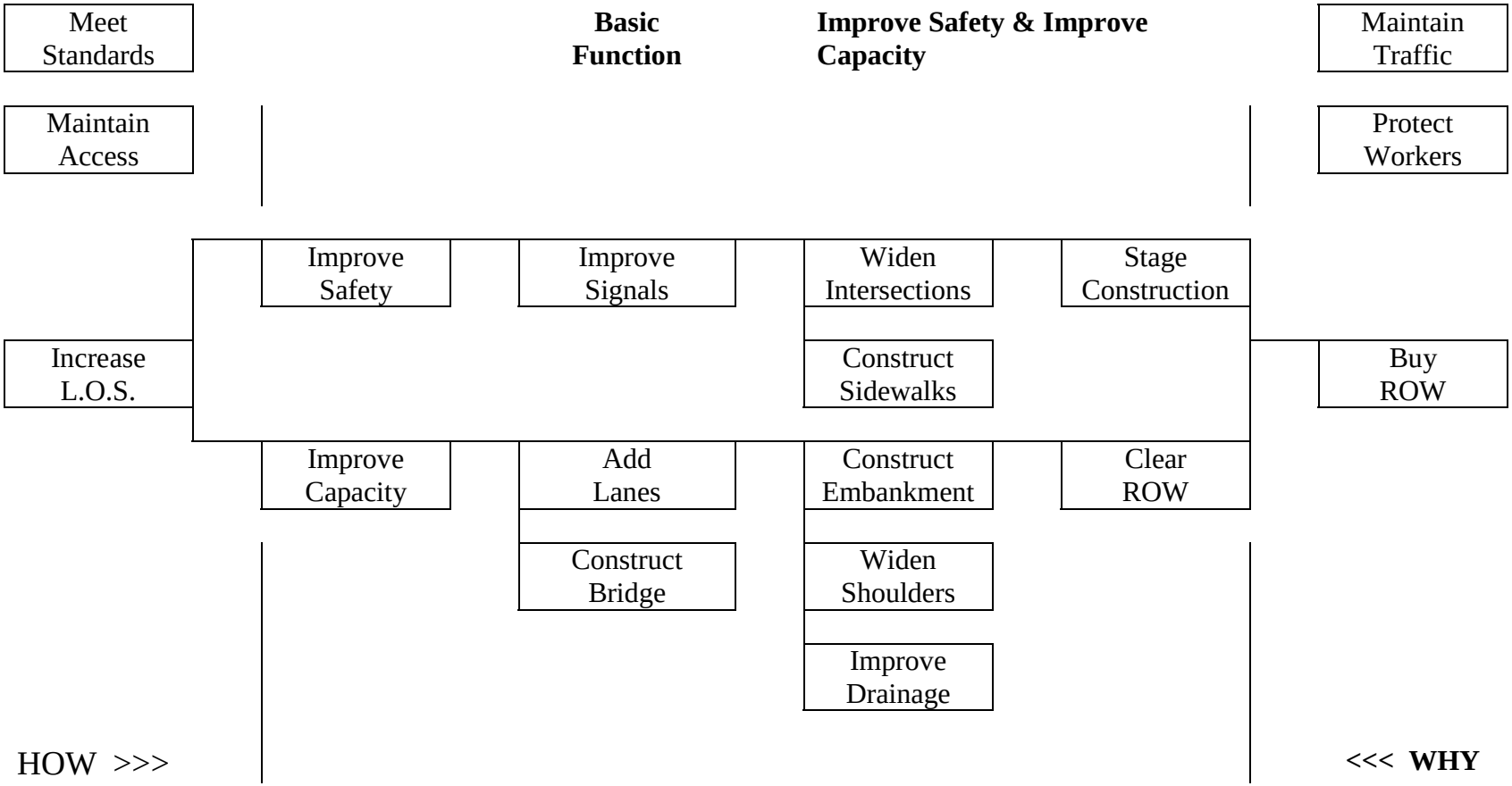
Project: Bethelview Road Improvements

Cost Model / Distribution

Item	Description	$ Amount	% of Total Project
A	ROW	$23,664,000	42.4%
B	Recycled Asphalt Superpave	$8,257,000	14.8%
C	Aggregate Base Course	$4,230,000	7.6%
D	Concrete Curb & Gutter	$2,321,000	4.2%
E	Storm Drain Pipe & End Sections	$2,215,000	4.0%
F	Traffic Control	$1,700,000	3.0%
G	Embankment	$1,668,000	3.0%
H	Clearing & Grubbing	$1,500,000	2.7%
I	Miscellaneous	$1,441,000	2.6%
J	Bridge	$1,352,000	2.4%
K	Erosion Control	$1,308,000	2.3%
L	Concrete Sidewalk	$1,173,000	2.1%
M	Catch Basins	$975,000	1.7%
N	Concrete Median 4”	$806,000	1.5%
O	Traffic Signals	$755,000	1.4%
P	Concrete Side Barrier	$690,000	1.2%
Q	Section Walls	$508,000	0.9%
R	Box Culvert	$402,000	0.7%
S	Signing & Marking	$310,000	0.6%
T	Mill Asphalt Pavement	$251,000	0.5%
U	Concrete Valley Gutter	$248,000	0.4%
	Subtotal	**$55,774,000**	**100.0**
	E&C @ 10%	$3,211,000	
	Inflation Rate 5%	$3,620,000	
	Utilities	$1,482,000	
	Project Total	**$64,087,000**	
	Note: The 10% E& C, 5% Inflation Rate, and Utilities Cost are used as Mark-up on the Recommendation Cost Sheets. (Items Represent 13% of Total Cost)		

FAST DIAGRAM

Study **Project Name: Bethelview Road Improvements**



INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
A	ROW	Hold	Project	$23,664,000	42.4	Yes
		Expand	Roadway			
		Construct	Shoulders			
B	Asphalt Superpave	Provide	Surface	$8,257,000	14.8	Yes
		Accommodate	Vehicles			
		Provide	Capacity			
		Widen	Roadway			
		Improve	Safety			
		Improve	Access			
		Facilitate	Development			
		Accommodate	Turns			
C	Aggregate Base Course	Support	Roadway	$4,230,000	7.6	Yes
		Support	Capacity			
		Widen	Roadway			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
D	Concrete Curb & Gutter	Improve	Safety	$2,321,000	4.2	Yes
		Direct	Drainage			
		Prevent	Crossover			
		Control	Access			
		Control	Permits			
		Buffer	Sidewalk			
E	Storm Drain Pipes	Control	Water	$2,215,000	4.0	Yes
		Drain	Roadway			
		Store	Water			
F	Traffic Control	Allow	Construction	$1,700,000	3.0	No
		Improve	Safety			
		Control	Access			
		Direct	Traffic			
		Maintain	Traffic			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
G	Embankment	Achieve	Grade	$1,668,000	3.0	Yes
		Widen	Roadway			
		Improve	Clear Zone			
		Hold	Shoulder			
		Stage	Construction			
		Extend	Drainage			
		Require	ROW			
H	Clearing & Grubbing	Allow	Construction	$1,500,000	2.7	No
I	Miscellaneous	Allow	Construction	$1,441,000	2.6	No
J	Bridge	Cross	Stream	$1,352,000	2.4	Yes
		Accommodate	Floods			
		Minimize	Wetland Impact			
		Increase	Capacity			
		Accommodate	Pedestrians			
		Connect	Roadway			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
K	Erosion Control	Control	Erosion	$1,308,000	2.3	Yes
		Comply	With Laws			
L	Concrete Sidewalk	Provide	Safety	$1,173,000	2.1	Yes
		Widen	Footprint			
		Provide	Connectivity			
		Meet	ADA Req.			
		Provide	Access			
M	Catch Basins	Collect	Water	$975,000	1.7	Yes
		Redirect	Water			
		Accommodate	Year Flood			
N	Concrete Median 4”	Separate	Traffic	$806,000	1.5	Yes
		Improve	Safety			
		Limit	Access			
		Reduce	Maintenance			
		Control	Access			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
O	Traffic Signals	Improve	Flow	$755,000	1.4	Yes
		Control	Flow			
		Improve	Access			
		Regulate	Traffic			
P	Concrete Side Barrier	Retain	Embankment	$690,000	1.2	Yes
		Improve	Safety			
Q	Section Walls	Retain	Embankment	$508,000	0.9	Yes
		Reduce	ROW			
		Protect	Property			
R	Box Culvert	Cross	Stream	$402,000	0.7	Yes
		Expand	Roadway			
		Construct	Shoulders			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: **Bethelview Road Improvements**
Function: **Improve Safety & Improve Capacity**

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
S	Signing & Markings	Advise	Motorists	$310,000	0.6	No
		Improve	Safety			
		Guide	Pedestrians			
		Direct	Traffic			
T	Mill Pavement	Achieve	Smoothness	$251,000	0.5	No
		Stage	Construction			
U	Concrete Valley Gutter	Access	Property	$248,000	0.4	No
		Channel	Water			
V	Traffic Figures	Impact	Design	N/A		
W	Cost Data Up to Date	Impact	Design	N/A		
		Impact	Construction			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A	**ROW**		
A-1	Reduce Roadway Section	See B-2 Reduce ROW & Costs	✓
A-2	Reduce 6-Foot Grass Strip in Shoulder	See B-2 Reduce ROW & Costs	✓
A-3	Reduce / Eliminate Median Width	See B-2 Reduce ROW & Costs	✓
A-4	Construct Sidewalk on Only One Side	Reduce Cost	DS
A-5	Use Retaining Walls / Reduce Slopes	Higher Costs	X
B	**Asphalt Pavement**		
B-1	Use 11-Foot Lanes	Reduce the width will reduce ROW & Costs	✓
B-2	Reduce Roadway Section Width	Reduce the width will reduce ROW & Costs	✓
B-3	Use 12-Foot Lanes with 10/11-Foot Turn Lanes	Need extra width to make turns	X
B-4	Construct a 5-Lane Roadway	Traffic volumes are to high	X
B-5	Reduce the Median Width	See B-2 Reduce ROW & Costs	✓
B-6	Use Compound Curve @ Relocation Section	Could impact / reduce design speed	X
B-7	Evaluate Cross Road Intersections	Check geometrics	DS
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
C	**Aggregate Base Course**		
C-1	Reduce Width of Roadway Section	See B-2 Reduce ROW & Costs	✓
D	**Concrete Curb & Gutter**		
D-1	Eliminate for Median – Use Two Way Turn Lane	Traffic volumes are to high	X
D-2	Use Flush Median in Some Sections	Traffic volumes are to high	X
D-3	Use Rumble Strips on Concrete in Narrow Medians	See N-1	✓
D-4	Removal Small Islands in Intersections – Use Paint	Reduces safety	X
E	**Storm Drains**		
E-1	Reduce Roadway Width	See B-2 Reduce Cost	✓
E-2	Reduce Storm Water Frequency	Would not meet drainage standards	X
E-3	Reduce Shoulder Width (Fill)	See B-2 Reduce Cost	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
G	**Embankment**		
G-1	Reduce Roadway Width	See B-2 Reduce Cost	✓
G-2	Reduce Shoulder Width	See B-2 Reduce Cost	✓
G-3	Check 4:1 Slope Areas (Use 2:1 with Guardrail)	Reduced roadway section does the same thing	X
G-4	Roll Grades More to Better Balance Project	Reduced roadway section does the same thing	X
G-5	Review Construction Staging - Simplify	To early in the development stage	X
J	**Bridge**		
J-1	Reduce Bridge Width for 11-foot lanes	Reduce Cost	✓
J-2	Reduce median width on bridge	Reduce Cost	✓
J-3	Use 2 narrow bridges in-lieu-of 1 wide bridge	Reduce Cost	✓
J-4	Use 2 bridges with narrow lanes and median	Reduce Cost	✓
J-5	Use Single Spans in-lieu-of 2-Spans	Would raise roadway grade, higher costs	X
J-6	Use Box Culvert to Provide for Overflow	Would impact creek	X
J-7	Place Sidewalk on Only One Side	Needs dual sidewalks in the future	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
K	**Erosion Control**		
K-1	Develop a reusable Silt Fence	Higher cost due to re-use	X
L	**Concrete Sidewalk**		
L-1	Eliminate the sidewalk on One Side of the Project	Reduce cost, Need on both sides?	DS
L-2	Shift the Sidewalk Closer to the edge of the Roadway	See B-2	X
L-3	Reduce the Width of the Sidewalk	See B-2	X
L-4	Place an 8-Foot Trail on One Side	Need sidewalks in urban areas	X
L-5	Reduce the Shoulder Width to 12 Feet	See B-2	✓
L-6	Eliminate the Grass Strip Area	See B-2	✓
M	**Catch Basins**		
M-1	Check the Design Criteria (County or State)	Meets State Standards	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
N	**Concrete Median**		
N-1	Replace the 8-Foot Paved Median with a 4-Foot Rumble Concrete Median	Reduce Cost	✓
N-2	Reduce the 8-Foot Paved Median to a 4-Foot Width	Reduce Cost	✓
N-3	Reduce the 20-Foot Median Width to 16-Feet	Reduce Cost	✓
O	**Traffic Signals**		
O-1	Check the Warrants for Signals at the New Locations	Meets warrants	X
P	**Concrete Side Barrier**		
P-1	Are the Barriers still Needed if the Roadway Width is Reduced	See B-1, N-1, N-2	DS
Q	**Section Walls**		
Q-1	Are the Barriers still Needed if the Roadway Width is Reduced	See B-1, N-1, N-2	DS
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
R	**Box Culvert**		
R-1	Replace the Box Culvert with a Bridge	Reduce Cost	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			