



Wrightsboro Road From Jimmie Dyess Parkway to I-520 Ramp

Project No: STP00-7001-00(009), P.I. No. 250510
Richmond County, GA

Value Engineering Study Report

July 2009

Designer



Value Engineering Consultant





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Ms. Helen Keller
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5665 New Northside Drive, Suite 400
Atlanta, Georgia 30328

Re: Project No. STP00-7001-00(009) P.I. No. 250510
Wrightsboro Road from Jimmie Dyess Parkway to I-520 Ramp
Value Engineering Study Report

Dear Ms. Keller:

Lewis & Zimmerman Associates, Inc. is pleased to submit three hard copies and two electronic copies of the referenced value engineering study report documenting the study that took place June 15 - 18, 2009. The objective of the VE effort was to identify opportunities to reduce costs and enhance the value of the project.

The VE workshop team developed 13 ideas that will yield significant project cost savings. Of particular interest are alternatives to use multi-use trails, reduce lane widths, reduce curb and gutter width, and use HDPE piping for longitudinal storm drain piping. The team also suggested the use of a one-way pair of roads between Maddox Drive and Belair Road to improve access and reduce impacts to wetlands.

We would like to thank you for your assistance during the course of the VE team's work. Please do not hesitate to call us if you or any of the reviewers have any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company

A handwritten signature in black ink that reads 'Stephen G. Havens'.

Stephen G. Havens, PE, CVS
Senior Project Manager

Attachment

Date:
July 8, 2009

Contact:
Stephen Havens

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Our ref:
MY096801.0000

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EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates (LZA) for Post, Buckley, Schuh & Jernigan, Inc. (PBS&J). The subject of the study is Project No. STP00-7001-00(009), P.I. No. 250510, Wrightsboro Road from Jimmie Dyess Parkway to I-520 Ramp, Richmond County, Georgia. The project is being planned by a team headed by PBS&J for the Georgia Department of Transportation (GDOT) District 2.

The VE workshop was conducted June 15 - 18, 2009 at GDOT's Atlanta Headquarters, One Georgia Center and followed the six-phase VE Job Plan.

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

PROJECT DESCRIPTION

The Wrightsboro Road project in the city of Augusta begins at mile marker 0.49, approximately 2,400 feet east of the intersection with Jimmie Dyess Parkway where the existing five-lane section ends. It extends approximately 2.4 miles to mile marker 2.89 at the intersection of the I-520 southbound ramps.

The approved concept includes the widening and reconstruction of Wrightsboro Road from a two-lane section to a four-lane roadway with a 20-ft wide raised median. The proposed alignment follows the existing Wrightsboro Road from the project beginning to Maddox drive. Wrightsboro Road is realigned between Maddox Drive and Barton Chapel Road to avoid impacts to historical sites.

Improvements to Barton Chapel Road and Augusta West Parkway are also included. They consist of the realignment of both roadways to form a single signalized intersection and the construction of required left and right turn lanes at this intersection.

Five additional intersections including Maddox Road, Lukes Road, Flowing Wells Road, Maddox Drive, and Belair Road will receive capacity improvements to improve the level of service (LOS).

As part of the work, the following box culverts will be constructed:

- Three 8 ft by 6-ft box culverts at Rae's Creek Stream #1, Sta. 92+00.
- One 10 ft by 6-ft box culvert at Flowing Wells Spring.
- Three 10 ft by 8-ft box culverts at Rae's Creek Stream #3, Sta. 132+00

The design speed is 45 mph, but the proposed posted speed will remain 35 mph.

The estimated total cost of construction for P.I. No. 250510 is \$17,813,771. The estimated right-of-way cost is \$6,300,000 and the estimated reimbursable utilities cost is \$250,000 as of the start of the VE workshop.

CONCERNS AND OBJECTIVES

Concerns

- A total of six historic landmarks have been identified and must be avoided. Key historic landmarks include Flowing Wells Spring and two historic homes near Sta. 132+00. The two historic homes near Sta. 132+00 created the need for realignment of a portion of the existing roadway to avoid disturbance.
- Wetlands located near Sta. 132+00 will require careful coordination to minimize disturbance.

Objectives

The VE team was tasked with the following key objectives:

- Recommend cost reduction ideas
- Recommend ideas to add value by improving roadway design

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to roadway design, including typical sections, roadway alignment, bicycle paths, sidewalk requirements, culvert requirements, and drainage material requirements.

RESULTS

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 11 VE alternatives and 2 design suggestions for consideration by the project team. If the following list of recommended VE alternatives are accepted, a total present worth cost savings of approximately \$1.7 million could be realized:

- Construct a one-way pair between Maddox Drive and Belair Road to save 267,303 (Alt. No. P-1).
- Eliminate the eastbound U-turn and eyebrow at Sta. 82+00 to save \$19,635 (Alt. No. P-3).
- Use 24-in- wide curb and gutter in lieu of 30-in- wide curb and gutter to save \$197,809 (Alt. No. P-4).
- Use 11-ft-wide through lanes in lieu of 12-ft-wide through lanes from Sta. 33+46 to Sta 142+26 (Belair Road) to save \$190,400 (Alt. No. P-5).
- Provide two 8-ft-wide multi-use trails in lieu of two 5-ft-wide sidewalks and two 4-ft-wide bike lanes to save \$865,381 (Alt. No. P-9).
- Relocate the proposed intersection between Existing Wrightsboro Road and New Wrightsboro Road to Sta. 125+50 away from the wetlands to reduce environmental impact and save \$100,428 (Alt. No. P-11).
- Use a single-span bridge in lieu of providing three (3) 10-ft by 8-ft box culverts at Sta. 132+00 to reduce environmental impact and realize \$31,530 total present worth life-cycle savings (Alt. No. C-4).

- Use HDPE pipe in lieu of concrete pipe for longitudinal storm drain piping to save \$110,038 (Alt. No. D-1).

IMPLEMENTATION

This VE report is a formalization of the draft materials provided to the project team during the out-briefing discussion which occurred on June 18, 2009. The Summary of Potential Cost Savings worksheet following this narrative outlines all of the alternatives and the design suggestion developed by the VE team. Some of the alternatives are mutually exclusive or interrelated, so that addition of all project cost savings does not equal total savings for the project. Details of the alternatives are presented in the Study Results section of the report. A full listing of all of the ideas considered by the VE team can be found on the Creative Idea Listing in the Value Analysis and Conclusions section of the report.



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520						
<i>Richmond County, Georgia</i>						
PRESENT WORTH OF COST SAVINGS						
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
PAVEMENT (P)						
P-1	Construct a one-way pair between Maddox Drive and Belair Road.	\$365,412	\$98,109	\$267,303		\$267,303
P-2	Provide a right-in/right-out in lieu of a cul-de-sac on Existing Wrightsboro Road.					
DESIGN SUGGESTION						
P-3	Eliminate the eastbound U-turn and eyebrow at Sta 82+00.	\$19,635	\$0	\$19,635		\$19,635
P-4	Use 24-in-wide curb and gutter in lieu of 30-in-wide curb and gutter.	\$988,896	\$791,087	\$197,809		\$197,809
P-5	Use 11-ft-wide through lanes in lieu of 12-ft-wide through lanes from Sta 33+46 to Sta 142+26 (Belair Road).	\$190,400	\$0	\$190,400		\$190,400
P-6	Use 11-ft-wide outside through lanes in lieu of 12-ft-wide outside through lanes from Sta 33+46 to Sta 142+26 (Belair Road).	\$95,200	\$0	\$95,200		\$95,200
P-8	Eliminate sidewalks from the north side of Wrightsboro Road between Sta 76+00 and Sta 142+00.	\$121,880	\$0	\$121,880		\$121,880
P-9	Provide two 8-ft-wide multi-use trails in lieu of two 5-ft-wide sidewalks and two 4-ft-wide bicycle lanes.	\$1,175,067	\$309,686	\$865,381		\$865,381
P-11	Relocate the proposed intersection between Existing Wrightsboro Road and New Wrightsboro Road to Sta 125+50 away from the wetlands.	\$100,428	\$0	\$100,428		\$100,428
P-13	Cul-de-sac the Rae's Creek end of Existing Wrightsboro Road and create an intersection at Sta 123+00.	\$100,428	\$0	\$100,428		\$100,428
CULVERTS (C)						
C-4	Use a single-span bridge in lieu of providing three, 10 ft by 8 ft box culverts at Sta 132+00.	\$360,360	\$351,920	\$8,440	\$23,090	\$31,530
DRAINAGE (D)						
D-1	Use HDPE pipe in lieu of concrete pipe for longitudinal storm drain piping.	\$632,495	\$522,457	\$110,038		\$110,038

STUDY RESULTS

INTRODUCTION

The results of this value engineering study since portray the benefits that can be realized by GDOT and the users. The results will directly affect the project's design and require coordination among the GDOT project team to determine the disposition of each alternative.

During the course of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical feasibility, applicability to the project, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (without cost estimates). For each alternative developed, the following information has been provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design, if appropriate;
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

The capital cost comparisons for each alternative use unit quantities from the Estimate Report for file "STP-7001(9)_2009-05-28", prepared by District 2, State of Georgia Department of Transportation, dated 6/1/2009. If unit quantities were not available, GDOT databases were consulted.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons may include: they improve circulation, reduce maintenance, improve constructability, improve safety, and reduce project risk. In addition, some ideas cannot be quantified in terms of cost with the design information provided, these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value analysis process and facilitate referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings table. The Alt. No. includes a prefix that refers to one of the major project elements:

PROJECT ELEMENT	PREFIX
Pavement	P
Culverts	C
Drainage	D
Earthwork	E
General	G

Summaries of the alternatives are provided on the Summary of Potential Cost Savings table. The table is divided into project elements for the reviewer’s convenience and is used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows the Summary of Potential Cost Savings tables.

KEY ISSUES

The project team summarized the following key design issues to the VE team during the design overview:

- A total of six historic landmarks have been identified and must be avoided. The historic landmarks include Flowing Wells Spring and two historic homes near Sta. 132+00. The two historic homes near Sta. 132+00 created the need for realignment of a portion of the existing roadway to avoid disturbance.
- Wetlands located near Sta. 132+00 will require careful coordination to minimize disturbance.
- Approximately 75 percent of right-of-way parcels have already been closed through acquisition. Any recommendations involving changes in right-of-way should be avoided.
- Street lighting over the entire 2.4 miles of Wrightsboro Road has been reviewed and approved by GDOT.

STUDY OBJECTIVES

The VE team was tasked with the following objectives:

- Recommend cost reduction ideas
- Recommend ideas to add value by improving roadway design

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to roadway design including typical sections, roadway alignment, bicycle paths, sidewalk requirements, culvert requirements, and drainage material requirements.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 11 VE alternatives and 2 design suggestions for consideration by the project team. Several of the design suggestions have cost savings potential which should be easy to quantify as the project develops. The greatest opportunity for cost reduction and added value centers on roadway alignment, lane widths, curb and gutter width, culvert requirements, and storm drain piping material.

Each of the alternatives should be given careful consideration for the potential cost savings and/or value improvement that it offers compared to the tradeoffs.

COMMENT ON THE COST ESTIMATE

A review of the cost estimate indicates a \$3.5 million cost for all of the grading. The VE team calculated the quantity of cut and fill required and associated clearing and grubbing and then determined the costs to accomplish this work as \$1.023 million, as shown on the following pages. This is significantly less than the cost used in the cost estimate. Thus a careful review is recommended so that a more accurate cost of the project is carried forward.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the project team should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are “mutually exclusive,” so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated, thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

PBS&J and GDOT District 2 should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520

Richmond County, Georgia

Preliminary Earthwork Quantities Net Quantities:

Station 168+50.00(3)

EMBANK	13.12	52.82	82087.02
EXCAV	118.43	178.80	39270.22
CUT	118.43	178.80	39270.22
USABLE	118.43	178.80	39270.22
FILL	13.12	52.82	82087.02
			-42816.80

Assume shrinkage Factor: 30% ←
from GDOT website →

$$\text{BORROW} = \frac{\text{Net Embankment}}{(1 - \text{shrinkage Factor})} - \text{UNCLASS. EXCAV.} =$$

$$\rightarrow \text{BORROW} = \frac{82,087 \text{ c.y.}}{(1 - .30)} - 39,270 \text{ c.y.} = 78,000 \text{ c.y.}$$

(\$5.43/cy from
Latest GDOT Item Mean
Summary)

$$\rightarrow \text{UNCLASS EXCAV.} = 39,270 \text{ c.y.} \left(\$2.90/\text{c.y. from } \begin{matrix} \text{Latest GDOT} \\ \text{Item Mean Summary} \end{matrix} \right)$$

$$\rightarrow \text{Clearing \& Grubbing} = 32 \text{ AC. } (\$10,000/\text{AC})$$

→ Demolition & Removal is included in the GDOT R/W estimate under Property Management, dated 2/24/2009.



SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520 <i>Richmond County, Georgia</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
PAVEMENT (P)						
P-1	Construct a one-way pair between Maddox Drive and Belair Road.	\$365,412	\$98,109	\$267,303		\$267,303
P-2	Provide a right-in/right-out in lieu of a cul-de-sac on Existing Wrightsboro Road.					
P-3	Eliminate the eastbound U-turn and eyebrow at Sta 82+00.	\$19,635	\$0	\$19,635		\$19,635
P-4	Use 24-in-wide curb and gutter in lieu of 30-in-wide curb and gutter.	\$988,896	\$791,087	\$197,809		\$197,809
P-5	Use 11-ft-wide through lanes in lieu of 12-ft-wide through lanes from Sta 33+46 to Sta 142+26 (Belair Road).	\$190,400	\$0	\$190,400		\$190,400
P-6	Use 11-ft-wide outside through lanes in lieu of 12-ft-wide outside through lanes from Sta 33+46 to Sta 142+26 (Belair Road).	\$95,200	\$0	\$95,200		\$95,200
P-8	Eliminate sidewalks from the north side of Wrightsboro Road between Sta 76+00 and Sta 142+00.	\$121,880	\$0	\$121,880		\$121,880
P-9	Provide two 8-ft-wide multi-use trails in lieu of two 5-ft-wide sidewalks and two 4-ft-wide bicycle lanes.	\$1,175,067	\$309,686	\$865,381		\$865,381
P-11	Relocate the proposed intersection between Existing Wrightsboro Road and New Wrightsboro Road to Sta 125+50 away from the wetlands.	\$100,428	\$0	\$100,428		\$100,428
P-13	Cul-de-sac the Rae's Creek end of Existing Wrightsboro Road and create an intersection at Sta 123+00.	\$100,428	\$0	\$100,428		\$100,428
CULVERTS (C)						
C-4	Use a single-span bridge in lieu of providing three, 10 ft by 8 ft box culverts at Sta 132+00.	\$360,360	\$351,920	\$8,440	\$23,090	\$31,530
DRAINAGE (D)						
D-1	Use HDPE pipe in lieu of concrete pipe for longitudinal storm drain piping.	\$632,495	\$522,457	\$110,038		\$110,038

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-1

DESCRIPTION: **CONSTRUCT A ONE-WAY PAIR BETWEEN MADDOX DRIVE AND BELAIR ROAD**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN:

The original design relocates the alignment for the widening of Wrightsboro Road from Maddox Drive to Belair Road to avoid impacts to historical sites.

ALTERNATIVE:

Provide a one-way pair between Maddox Drive and Belair Road by retaining the existing two-lane roadway for westbound through traffic and using the new alignment for two-lanes of eastbound through traffic.

ADVANTAGES:

- Reduces construction cost
- Reduces environmental impact
- Reduces wetland impact
- Less right-of-way required

DISADVANTAGES:

- No median opening for residents to travel westbound
- Requires an additional 20 lf of triple 10 ft by 8 ft culvert for Stream #3 at Sta 132+50

DISCUSSION:

The alternate design saves cost by repaving the existing Wrightsboro Road for westbound traffic. This would result in less impact to Rae's Creek and to local wetlands because only two new lanes would need to be constructed. A paved shoulder, curb and gutter, sidewalks, and a bicycle trail would be included with the repaved westbound roadway.

The triple 10 ft by 8 ft culvert in Stream #3 at Sta 132+50 would be shorter on the inlet side; however, it would have to be extended on the outlet side to accommodate the existing Wrightsboro Road for westbound traffic. The total net increase would be approximately 20 linear feet of culvert.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 365,412	—	\$ 365,412
ALTERNATIVE	\$ 98,109	—	\$ 98,109
SAVINGS	\$ 267,303	—	\$ 267,303

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-1**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 7**



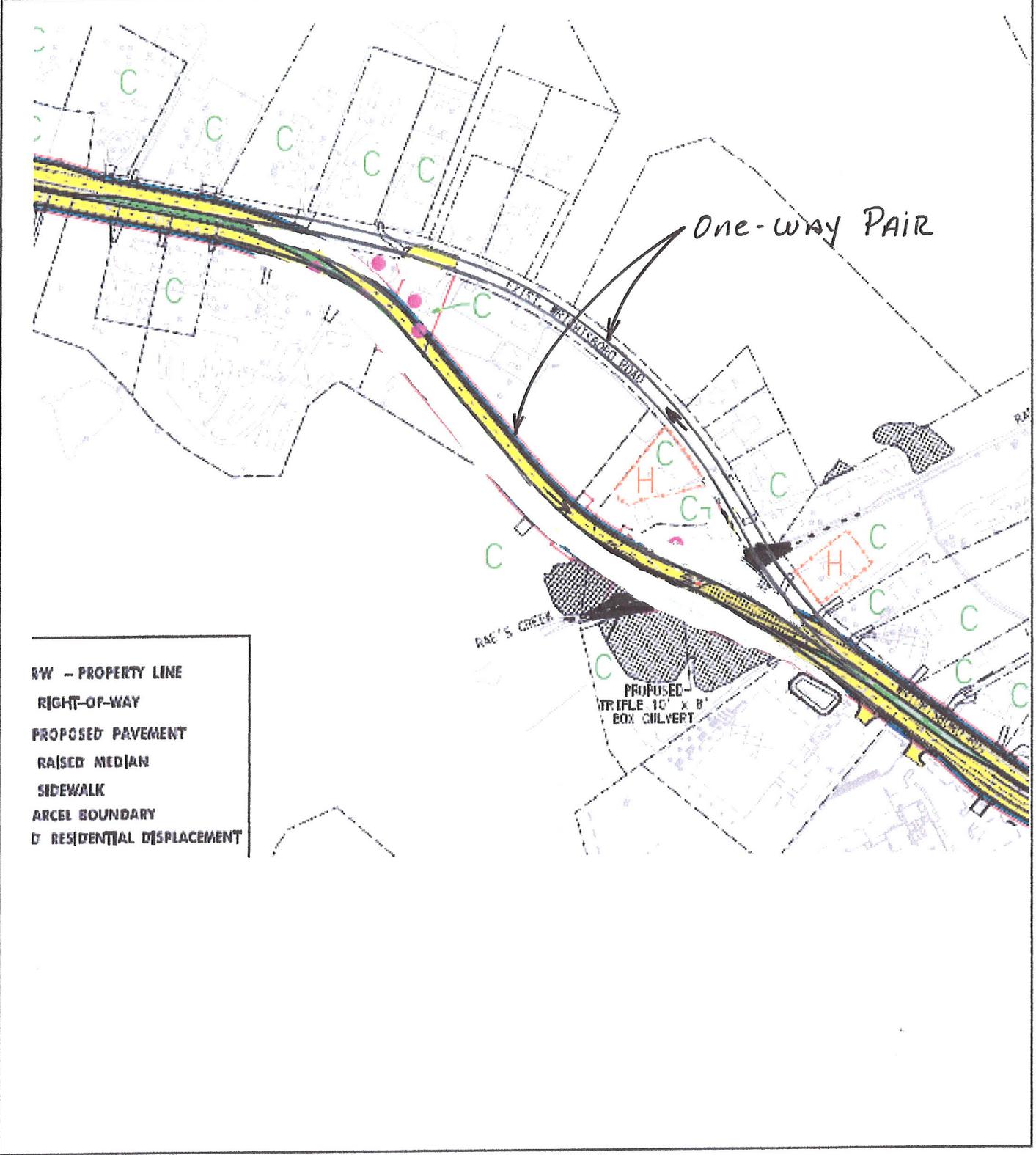
- RW - PROPERTY LINE
- RIGHT-OF-WAY
- PROPOSED PAVEMENT
- RAISED MEDIAN
- SIDEWALK
- PARCEL BOUNDARY
- C RESIDENTIAL DISPLACEMENT

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: P-1

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **3 of 7**



RW - PROPERTY LINE
 RIGHT-OF-WAY
 PROPOSED PAVEMENT
 RAISED MEDIAN
 SIDEWALK
 ARCEL BOUNDARY
 C RESIDENTIAL DISPLACEMENT

CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

P-1

SHEET NO.: 4 of 7

Full Depth Pavement Unit Cost (\$/s.y.)

$$(12.5\text{mm Mix}) \frac{165\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$6.19/\text{s.y.}$$

$$(19\text{mm Mix}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$8.25/\text{s.y.}$$

$$(25\text{mm Mix}) \frac{440\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$16.50/\text{s.y.}$$

$$(10" GAB) \frac{147\text{lbs}}{\text{c.f.}} \times \frac{9\text{sf}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times .833' \times \frac{\$21.59}{T} = \$11.90/\text{s.y.}$$

Pavement Total = \$42.84/s.y.
Section

Earthwork Saved:

$$\frac{24' \times 6' \text{ AOS.} \times 1200'}{27\text{cf/cy}} = 6,400\text{c.y.} \pm$$

clearing & grubbing saved .7 AC

unacquired R/W saved: $((20' + 24') \times 400') = 17,600\text{sf}$
Parcel 9B. \$2/sf from GDOT Est.

CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520

ALTERNATIVE NO.:

Richmond County, Georgia

P-1

Construct A one-way Pair
between Maddox DR and Belair DR.

SHEET NO.: 5 of 7

Original Cost = Saved for only Two new
Lanes:

$$\text{Pavement: } \frac{28' \times 1200'}{9 \text{ SF} / \text{SY}} = 3,733 \text{ SY}$$

(mainline)

$$\text{SAVE two L.TURNS; R.TURN; "eyebrow" U-TURN} \\ 3 \text{ EA} \times 12' \times \left(200' + \frac{100'}{2}\right) + (10' \times 150') = 1,167 \text{ SY}$$

9 SF/SY

$$\text{TOTAL PAVEMENT SAVED} = 4,900 \text{ S.Y.} \leftarrow$$

"ORIGINAL" vs. ALTERNATE P-1

curb & gutter costs basically the
same since the existing route would have c&g.

ALTERNATE P-1 ADD'L COSTS

Longer Culvert 20 L.F.

$$\text{Quantities: Concrete: } \frac{3.836 \text{ C.Y.}}{\text{L.F.}} \times 20 \text{ L.F.} = 77 \text{ C.Y.} \leftarrow$$

CLASS "A"

$$\text{steel: } \frac{426.4 \text{ LBS}}{\text{L.F.}} \times 20 \text{ L.F.} = 8,528 \text{ LBS} \leftarrow$$

DRAINAGE cost basically the same since
c&g, and catch basins would be used to
upgrade the existing route.

CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

P-1

SHEET NO.:

6 of 7

Alt. Add'l Pavement for existing Route
Full depth Bike Lane

$$\frac{4' \times 1200'}{9 \text{ sf} / \text{sy}} = 534 \text{ s.y.} \leftarrow$$

Overlay area: (Alt. P-1)

$$\frac{24' \times 1200'}{9 \text{ sf} / \text{sy}} = 3,200 \text{ s.y.} \leftarrow$$

Assume 2.5" overlay:

$$275 \frac{\#}{\text{sy}} \times \frac{1}{2000 \#} \times \frac{\$75}{\text{sy}} = \$10.31 / \text{sy}$$

Original per mile costs saved. $\frac{1200'}{5280'} = .23 \text{ mi}$

Signing & marking. $.23 \text{ mi} \times \$20,000 / \text{mi} = \$4,600$
Say \$5,000

Erosion control (2 lanes saved)

$$.23 \text{ mi} \times \$50,000 / \text{mi} = \$11,500 \text{ (say } \$12,000)$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-2

DESCRIPTION: **PROVIDE A RIGHT-IN/RIGHT-OUT IN LIEU OF A CUL-
 DE-SAC ON EXISTING WRIGHTSBORO ROAD**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (See attached sketch)

The original design has a cul-de-sac on the west end of Existing Wrightsboro Road near Sta 123+00.

ALTERNATIVE: (See attached sketch)

Join Existing Wrightsboro Road to the realigned Wrightsboro Road with a right-in/right-out near Sta 123+00 in lieu of providing a cul-de-sac.

ADVANTAGES:

- Easier access to the realigned Wrightsboro Road for local residents

DISADVANTAGES:

- None identified

DISCUSSION:

With new development occurring just to the north of Existing Wrightsboro Road, the traffic will be increasing in this area. Adding an additional access to the realigned Wrightsboro Road near Sta 123+00 will improve traffic flow at the intersection near Sta 132+00 and is cost neutral compared with the proposed cul-de-sac.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-2**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 2**



VALUE ENGINEERING ALTERNATIVE



PROJECT:	WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520 <i>Richmond County, Georgia</i>	ALTERNATIVE NO.:	P-3
DESCRIPTION:	ELIMINATE THE EASTBOUND U-TURN AND EYEBROW AT STA 82+00	SHEET NO.:	1 of 4

ORIGINAL DESIGN: (See attached sketch)

The original design has an eastbound U-turn and eyebrow at Sta 82+00.

ALTERNATIVE: (See attached sketch)

Eliminate the eastbound U-turn and eyebrow at Sta 82+00.

ADVANTAGES:

- Reduces cost
- Improves traffic flow

DISADVANTAGES:

- Drivers who fail to make the U-turn at Sta 75+00 will need to travel an additional 1,100 ft. to Sta 93+00 to make a U-turn

DISCUSSION:

Since there are no businesses or residences south of Wrightsboro Road between Sta 75+00 and Sta 82+00, eliminating the eastbound U-turn and eyebrow at Sta 82+00 will reduce cost and improve traffic flow with minimal inconvenience to local residents.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 19,635	—	\$ 19,635
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 19,635	—	\$ 19,635

SKETCH



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-3**

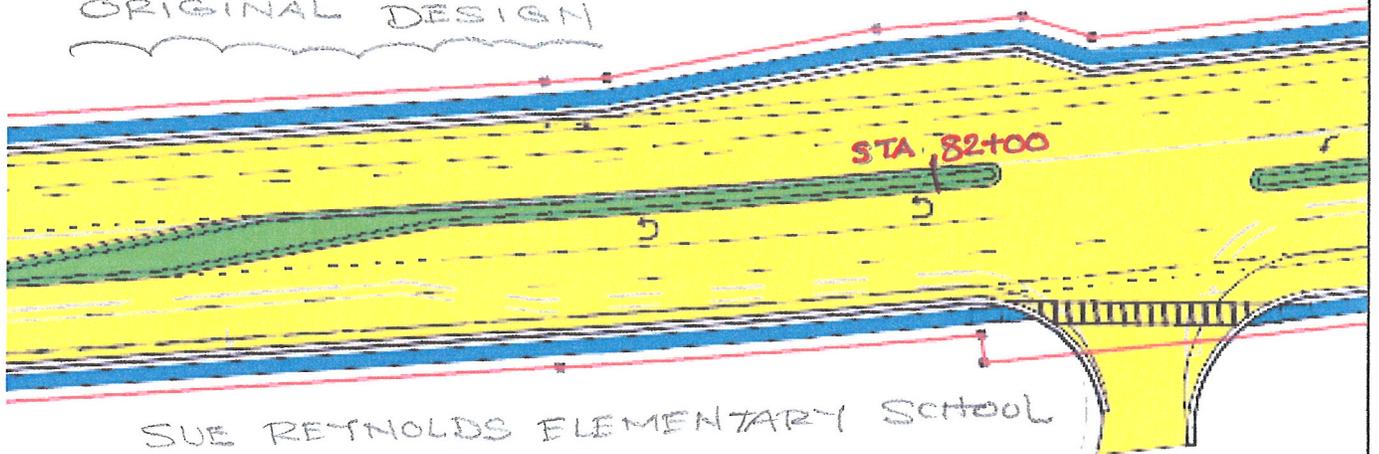
ORIGINAL DESIGN

ALTERNATIVE DESIGN

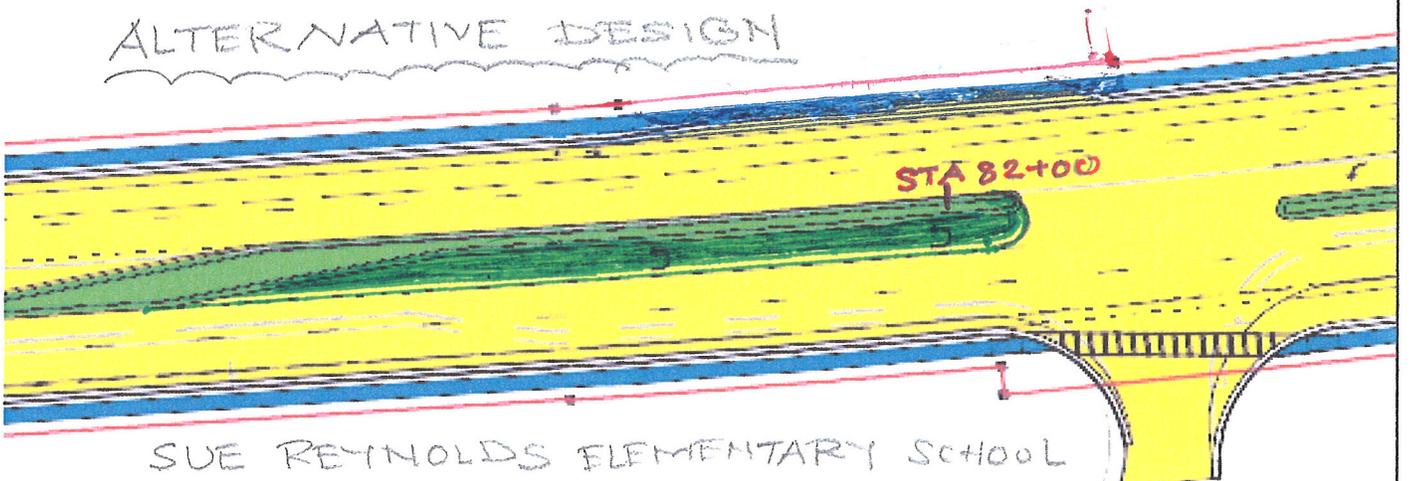
BOTH

SHEET NO.: **2** of **4**

ORIGINAL DESIGN



ALTERNATIVE DESIGN



CALCULATIONS



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
 Richmond County, Georgia

ALTERNATIVE NO.:

P-3

SHEET NO.:

3 of 4

Full Depth Pavement Unit Cost (\$/s.y.)

$$(12.5\text{mm Mix}) \frac{165\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$6.19/\text{s.y.}$$

$$(19\text{mm Mix}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$8.25/\text{s.y.}$$

$$(25\text{mm mix}) \frac{440\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$16.50/\text{s.y.}$$

$$(10''\text{GAB}) \frac{147\text{lbs}}{\text{c.f.}} \times \frac{9\text{sf}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times .833' \times \frac{\$21.59}{T} = \$11.90/\text{s.y.}$$

$$\text{Pavement Total} = \underline{\underline{\$42.84/\text{s.y.}}}$$

Section

Asphalt Leveling:

$$(\text{Aug.}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$8.25/\text{s.y.}$$

U-turn Lane:

$$\left(\frac{1}{2} \times 100 \times 12 + 200 \times 12\right) / 9 = 333.3 \text{ s.y. of pavement}$$

Eye-brow:

$$\left(\frac{1}{2} \times 100 \times 10 + 50 \times 10 + \frac{1}{2} \times 25 \times 10\right) / 9 = 125 \text{ s.y. of pavement}$$

$$\text{Total Savings: } (333.3 + 125) \times 42.84 = \$19,635$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-4**

DESCRIPTION: **USE 24-IN-WIDE CURB AND GUTTER IN LIEU OF 30-IN-WIDE CURB AND GUTTER**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (See attached sketch)

The original design has 30-in-wide curb and gutter throughout the project.

ALTERNATIVE: (See attached sketch)

Use 24-in-wide curb and gutter throughout the project.

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- Slightly less (6 inches) gutter spread

DISCUSSION:

Since the project has 4-ft-wide bicycle lanes on both sides of the road, a 12 ft gutter spread is allowable as compared with an 8 ft gutter spread limit with no bicycle lanes. As a result, 24-in-wide curb and gutter is advisable to reduce cost with no loss of functionality.

The median width would remain 20 feet.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 988,896	—	\$ 988,896
ALTERNATIVE	\$ 791,087	—	\$ 791,087
SAVINGS	\$ 197,809	—	\$ 197,809

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-5

DESCRIPTION: **USE 11-FT-WIDE THROUGH LANES IN LIEU OF 12-FT-WIDE THROUGH LANES FROM STA 42+00 TO STA 142+26 (BELAIR ROAD)**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The current design includes 12-ft-wide through lanes throughout the project.

ALTERNATIVE: (See attached sketch)

Use 11-ft-wide through lanes from Sta 42+00 to Sta 142+26 (Belair Road).

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- None identified

DISCUSSION:

Since traffic from the beginning of the project to Belair Road is mainly residential, through lanes can be constructed 11-ft-wide in lieu of 12-ft-wide, particularly since they are adjacent to 4-ft-wide bicycle lanes.

Traffic from Bel-Air Road to I-520 is mainly commercial and therefore the through lanes should remain 12-ft-wide to accommodate truck traffic.

The calculated cost savings does not include right-of-way since most of the right-of-way for this project has already been acquired.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 190,400	—	\$ 190,400
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 190,400	—	\$ 190,400



PROJECT: **WRIGHTSBORO RD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

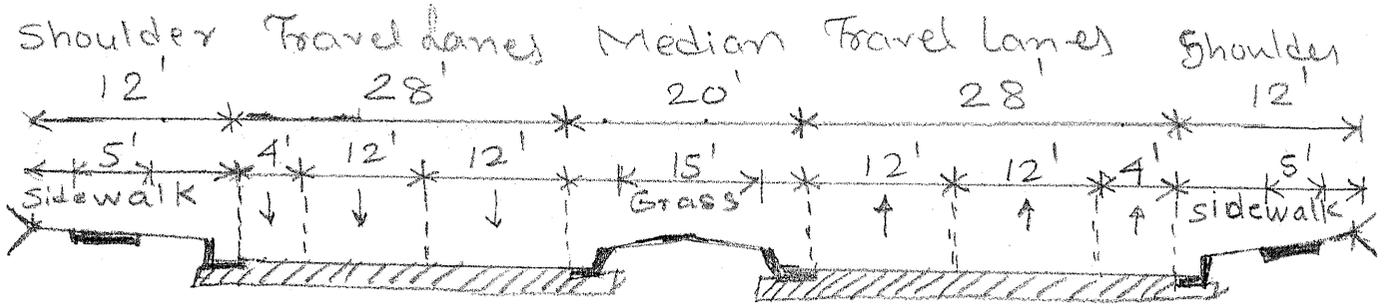
ALTERNATIVE NO.:

P-5

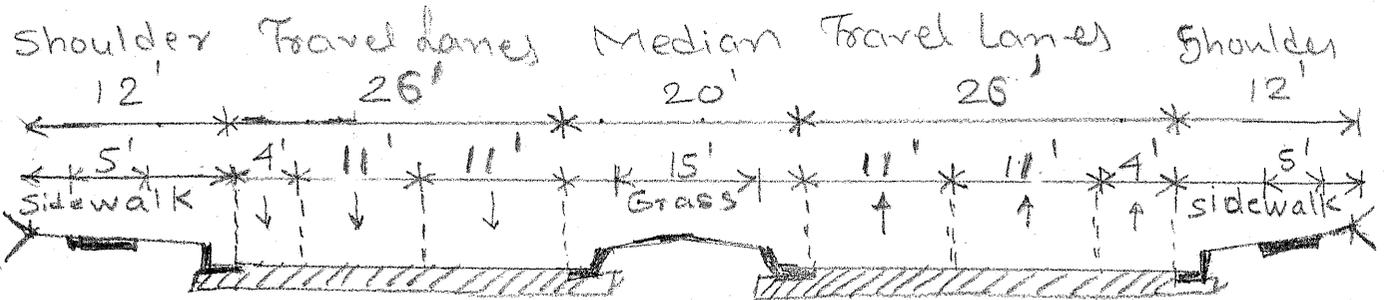
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATIVE DESIGN



CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

P-5

SHEET NO.:

3 of 4

Full Depth Pavement Unit Cost (\$/s.y.)

$$(12.5\text{mm Mix}) \frac{165\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$6.19/\text{s.y.}$$

$$(19\text{mm Mix}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$8.25/\text{s.y.}$$

$$(25\text{mm Mix}) \frac{440\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$16.50/\text{s.y.}$$

$$(10'' \text{ GAB}) \frac{147\text{lbs}}{\text{c.f.}} \times \frac{9\text{sf}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times .833' \times \frac{\$21.59}{T} = \$11.90/\text{s.y.}$$

$$\text{Pavement Total} = \underline{\$42.84/\text{s.y.}}$$

Section

Asphalt Leveling:

$$(\text{Aug}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \$ \frac{75}{T} = \$8.25/\text{s.y.}$$

(STA. 142+00) - (STA. 42+00) = 10,000 feet in length

4 lanes; width of A.C. pavement sand: 4 feet.

Area of pavement sand: $\frac{10,000 \times 4}{4} = 4,444.4 \text{ s.y.}$

Money saved: $4,444.4 \times 42.84 = \$190,400$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-6

DESCRIPTION: **USE 11-FT-WIDE OUTSIDE THROUGH LANES IN LIEU OF
 12-FT-WIDE OUTSIDE THROUGH LANES FROM STA
 42+00 TO STA 142+26 (BELAIR ROAD)**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The current design includes 12-ft-wide through lanes throughout the project.

ALTERNATIVE: (See attached sketch)

Use 11-ft-wide outside through lanes from Sta 42+00 to Sta 142+26 (Belair Road).

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- None identified

DISCUSSION:

Since traffic from the beginning of the project to Belair Road is mainly residential, the outside through lanes can be constructed 11-ft-wide in lieu of 12-ft-wide, particularly since they are next to 4-ft-wide bicycle lanes.

Traffic from Belair Road to I-520 is mainly commercial and therefore the through lanes should remain 12-ft-wide to accommodate truck traffic.

The calculated cost savings does not include right-of-way since most of the right-of-way for this project has already been acquired.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 95,200	—	\$ 95,200
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 95,200	—	\$ 95,200

PROJECT: **WRIGHTSBORO RD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

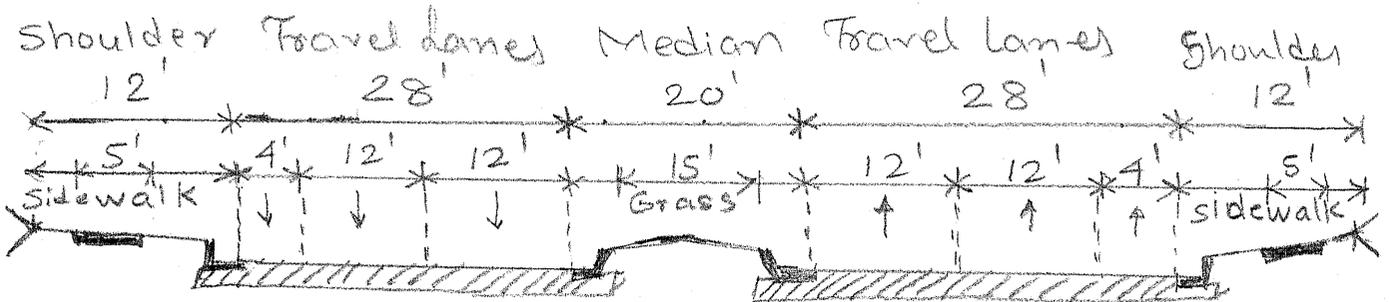
ALTERNATIVE NO.:

P-6

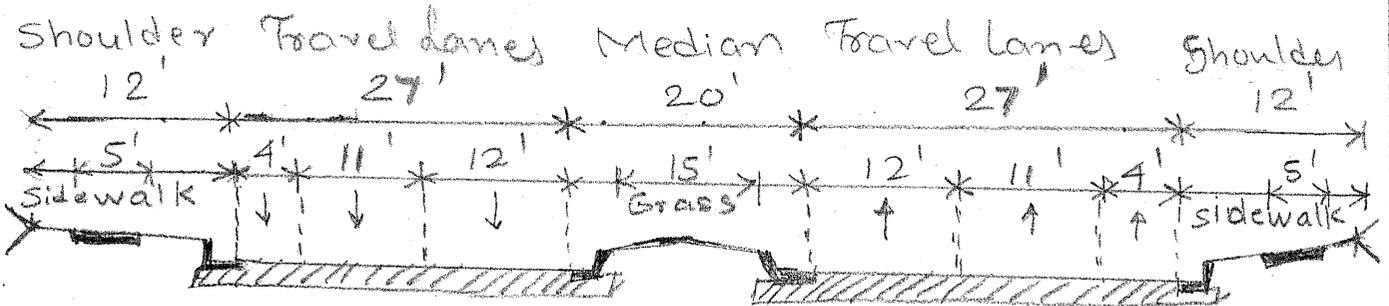
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATIVE DESIGN



CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

P-6

SHEET NO.:

3 of 4

Full Depth Pavement Unit Cost (\$/s.y.)

$$(12.5\text{mm Mix}) \frac{165\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \frac{\$75}{T} = \$6.19/\text{s.y.}$$

$$(19\text{mm Mix}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \frac{\$75}{T} = \$8.25/\text{s.y.}$$

$$(25\text{mm mix}) \frac{440\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \frac{\$75}{T} = \$16.50/\text{s.y.}$$

$$(10''\text{GAB}) \frac{147\text{lbs}}{\text{c.f.}} \times \frac{9\text{sf}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times .833' \times \frac{\$21.59}{T} = \$11.90/\text{s.y.}$$

$$\text{Pavement Total} = \frac{\$42.84/\text{s.y.}}{\text{Section}}$$

Asphalt Leveling:

$$(\text{Aug}) \frac{220\text{lbs}}{\text{s.y.}} \times \frac{T}{2000\text{lbs}} \times \frac{\$75}{T} = \$8.25/\text{s.y.}$$

(STA. 142+00) - (STA. 42+00) = 10,000 feet in length.

2 lanes; width of A.C. Pavement saved: 2 feet.

Area of pavement saved: $\frac{10,000 \times 2}{9} = 2,222.2 \text{ s.y.}$

Money saved: $2,222.2 \times 42.84 = \$95,200$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-8

DESCRIPTION: **ELIMINATE SIDEWALKS FROM THE NORTH SIDE OF
 WRIGHTSBORO ROAD BETWEEN STA 76+00 AND STA
 142+00**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (See attached sketch)

The current design includes 4-in-thick, 5-ft-wide concrete sidewalks on both sides of Wrightsboro Road for the entire length of the project.

ALTERNATIVE: (See attached sketch)

Construct sidewalks as specified everywhere as shown on the plans except on the north side of Wrightsboro Road between Sue Reynolds Elementary School (Sta 76+00) and Belair Road (Sta 142+00). Keep the grading as designed for future sidewalks in this area.

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- Pedestrians will have to use crosswalks to cross the roadway periodically in order to use the sidewalks

DISCUSSION:

There are fewer residents and a minimal number of commercial establishments on the north side of Wrightsboro Road between Sue Reynolds Elementary School and Belair Road. Pedestrians will be able to access the entire length of the project by using crosswalks as required.

If development warrants sidewalks in the future, the developer can install the sidewalks at that time.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 121,880	—	\$ 121,880
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 121,880	—	\$ 121,880

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-9

DESCRIPTION: **PROVIDE TWO, 8-FT-WIDE MULTI-USE TRAILS IN LIEU OF TWO, 5-FT-WIDE SIDEWALKS AND TWO, 4-FT-WIDE BICYCLE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (See attached sketch)

The current design includes 5-ft-wide concrete sidewalks and 4-ft-wide, full depth, bicycle lane pavements on both sides of Wrightsboro Road for the entire length of the project.

ALTERNATIVE: (See attached sketch)

Provide 8-ft-wide multi-use trails in lieu of 5-ft-wide concrete sidewalks and 4-ft-wide full depth bicycle lane pavements on both sides of Wrightsboro Road for the entire length of the project.

ADVANTAGES:

- Reduces pavement cost
- Enhances safety for bikers since they do not have to ride directly adjacent to vehicle traffic

DISADVANTAGES:

- Bikers and pedestrians will have to share the pathway
- The ride can be unpleasant over the many driveways

DISCUSSION:

Multi-use trails have been successfully installed along many high traffic areas resulting in significant cost savings. The cyclists' inconvenience of traversing the driveways can be mitigated somewhat by constructing the driveways such that they are flush with the adjoining multi-use trail.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,175,067	—	\$ 1,175,067
ALTERNATIVE	\$ 309,686	—	\$ 309,686
SAVINGS	\$ 865,381	—	\$ 865,381



PROJECT: **WRIGHTSBORO RD FROM JIMMIE DYESS TO I-520**
 Richmond County, Georgia

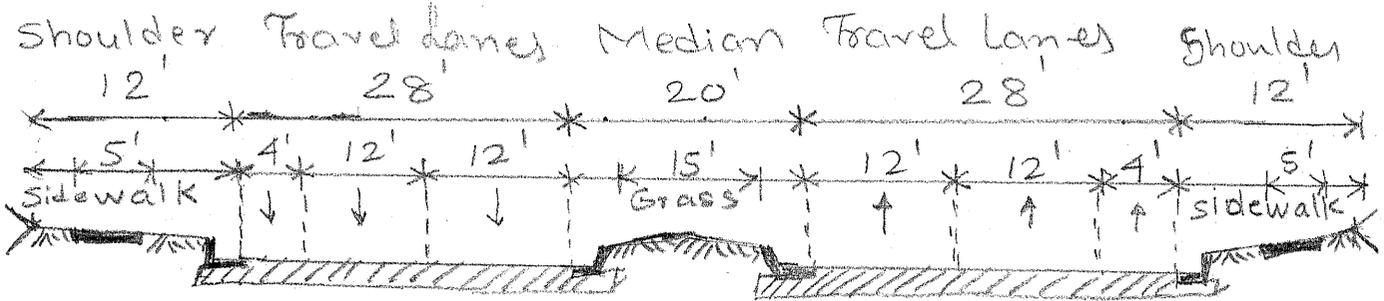
ALTERNATIVE NO.:

P-9

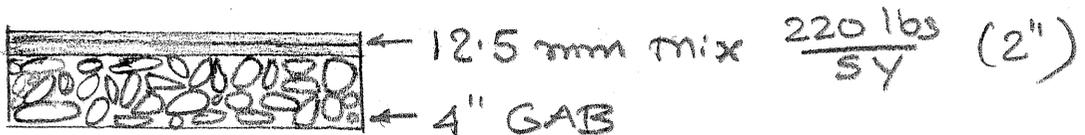
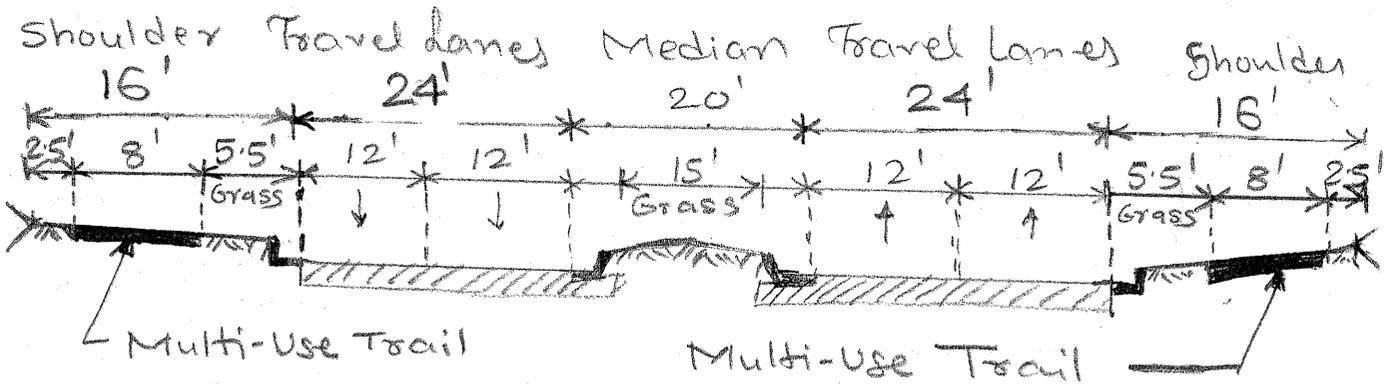
SHEET NO.: 2 of 4

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

ORIGINAL DESIGN



ALTERNATIVE DESIGN



Multi-Use Trail X-Section

CALCULATIONS



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
 Richmond County, Georgia

ALTERNATIVE NO.:

P-9

SHEET NO.:

3 of 4

Full Depth Pavement Unit Cost (\$/s.y.)

$$(12.5\text{mm Mix}) \frac{165\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$ \frac{75}{T} = \$6.19/\text{sy}$$

$$(19\text{mm Mix}) \frac{220\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$ \frac{75}{T} = \$8.25/\text{sy}$$

$$(25\text{mm mix}) \frac{440\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$ \frac{75}{T} = \$16.50/\text{sy}$$

$$(10''\text{GAB}) \frac{147\text{Lbs}}{\text{c.f.}} \times \frac{9\text{sf}}{\text{s.y.}} \times \frac{T}{2000\text{Lbs}} \times .833' \times \frac{\$2159}{T} = \$11.90/\text{sy}$$

$$\text{Pavement Total Section} = \underline{\$42.84/\text{sy}}$$

Multi-Use Trail:

Total Width: 8' + 8' = 16'

$$12.5\text{ mm mix} \frac{220\text{ lbs}}{\text{sy}} : \$8.25/\text{sy}$$

$$4''\text{ GAB} : \frac{\$11.90}{10''} \times 4'' = \$4.75/\text{sy}$$

$$\underline{\$13/\text{sy}}$$

Total length: STA. 168+00 - STA. 34+00 = 13,400'

Multi-Use Trail Area: (13,400 x 16') / 9 = 23,822 sy

A.C. Pavement Reduction: 13,400 (4' + 4') / 9 = 11,911 sy
 due to bike lane elimination

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
P-11

DESCRIPTION: **RELOCATE THE INTERSECTION BETWEEN EXISTING
 WRIGHTSBORO ROAD AND NEW WRIGHTSBORO ROAD
 TO STA 125+50, AWAY FROM THE WETLANDS**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (See attached sketch)

The current design connects Existing Wrightsboro Road with Relocated Wrightsboro Road at Sta 132+50 in the area of wetlands and the triple 10 ft by 8 ft box culvert.

ALTERNATIVE: (See attached sketch)

Relocate the connection between Existing Wrightsboro Road and New Wrightsboro Road to Sta 125+50, away from the wetlands. Terminate the south end of Existing Wrightsboro Road with a cul-de-sac.

ADVANTAGES:

- Reduces wetland impact
- Reduces construction cost
- Shortens the length of the triple 10 ft by 8 ft culvert

DISADVANTAGES:

- May require additional right-of-way

DISCUSSION:

The current connection for Existing Wrightsboro Road and New Wrightsboro Road is in an environmentally sensitive area due to wetlands and requires a longer triple 10 ft by 8 ft box culvert. The alternative design moves the connection to Sta 125+50 to provide a “straight” alignment with Existing Wrightsboro Road. The intersection site distance meets requirements for turning movements.

It is important to provide a convenient intersection for this connection since this roadway provides access to several apartments and condominiums to the north. There appears to be access to Wheeler Road on the other end of the development; however, this exit is much further away and would require traffic to travel through another large development. In the near future, this connection will have a heavy traffic demand, and the current connection will not accommodate this demand.

The alternative design impacts parcel 98 more than the current design. However, this parcel has not yet been acquired. It is the judgment of the VE Team that parcel 98 is being severely damaged by the current design and could possibly even result in a displacement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 100,428	—	\$ 100,428
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 100,428	—	\$ 100,428

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-11**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **6**



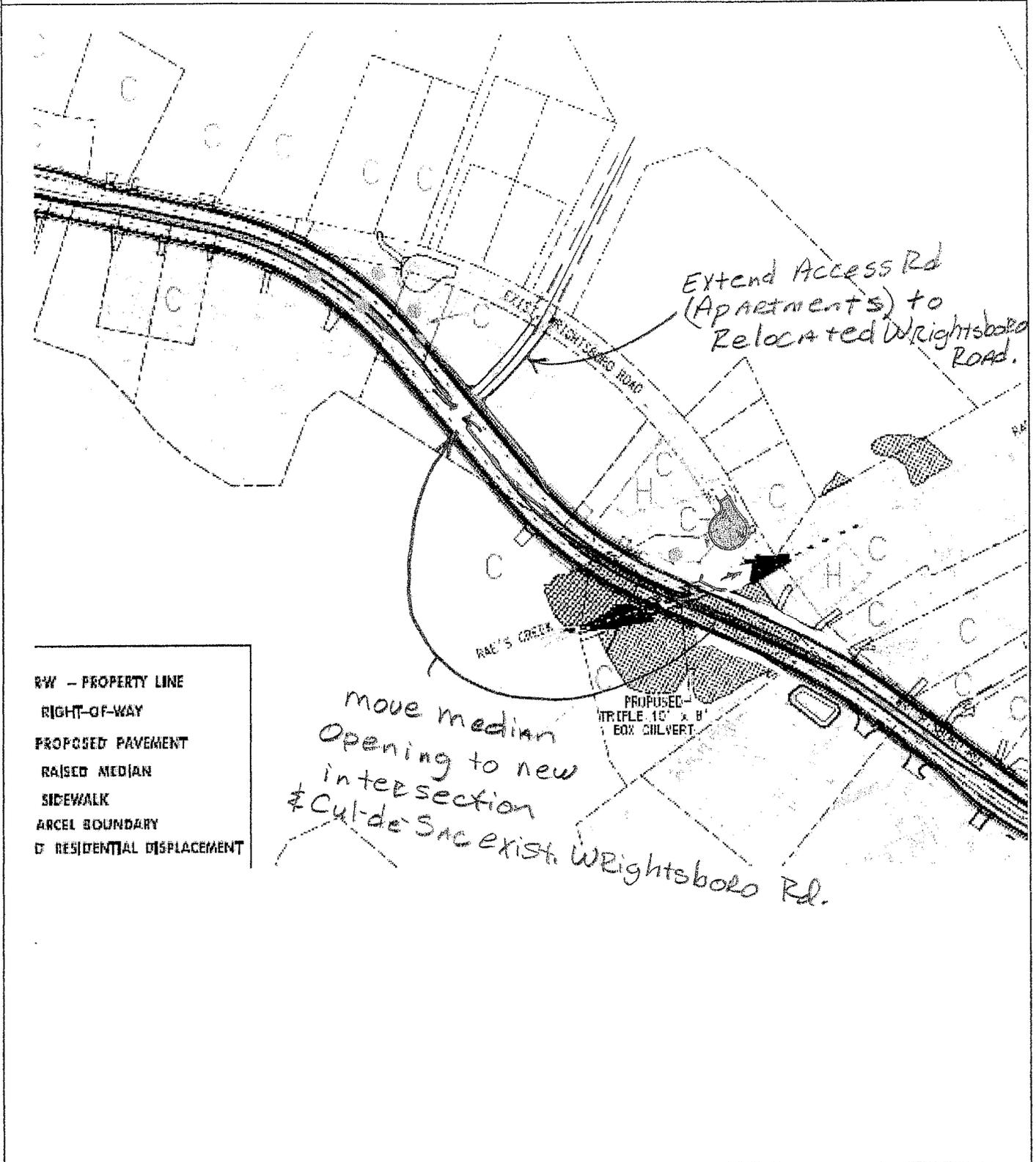
RW - PROPERTY LINE
RIGHT-OF-WAY
PROPOSED PAVEMENT
RAISED MEDIAN
SIDEWALK
PARCEL BOUNDARY
D RESIDENTIAL DISPLACEMENT

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: P-11

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 3 of 6



CALCULATIONS



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
 Richmond County, Georgia

ALTERNATIVE NO.:

P-11

SHEET NO.:

5 of 6

The existing tie-in under "Original" Design is 225' Long. (Wrightsboro Rd (132+50) at Old Wrightsboro Rd)

The new tie-in is approximately the same length as the current proposed tie-in. (225')

Therefore the construction cost for both roadway tie-ins are the same.

However the Alternate Design (P-11) shortens the Culvert (Triple 10'x8') by 46 L.F. (Saved)

$$\text{Class "A" Concrete: } 46 \text{ L.F.} \times \frac{3.836 \text{ cy}}{\text{L.F.}} = 177.5 \text{ cy.}$$

$$\text{Bar Reinf. Steel: } 46 \text{ L.F.} \times \frac{426.4 \text{ lbs}}{\text{L.F.}} = 19,615 \text{ lbs}$$

Foundation Backfill Mat' / Tp 2:

$$\frac{1' \times 36' \times 46'}{27 \text{ cf/cy}} = 61.4 \text{ c.y.}$$

The cost of 2nd cut-de-sac to the south end of existing (Wrightsboro Road) will be negligible

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Clayton/Henry Counties, Georgia

ALTERNATIVE NO.:
P-13

DESCRIPTION: **CUL-DE-SAC THE RAE'S CREEK END OF EXISTING
 WRIGHTSBORO ROAD AND CREATE AN INTERSECTION
 AT STA 123+00**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (See attached sketch)

The current design connects Existing Wrightsboro Road and Realigned Wrightsboro Road at Sta 132+50 in the area of wetlands and the triple 10 ft by 8 ft box culvert.

ALTERNATIVE: (See attached sketch)

Relocate the proposed connection between Existing Wrightsboro Road and Realigned Wrightsboro Road to the west end (Sta 123+00), away from wetland areas and historic properties.

ADVANTAGES:

- Reduces wetland impact
- Reduces construction cost
- Shortens the length of the triple 10 ft by 8 ft box culvert
- Less environmental impact to Rae's Creek

DISADVANTAGES:

- May require additional right-of-way

DISCUSSION:

The current design is in an environmentally sensitive area due to wetlands and requires a longer, triple 10-ft by 8 ft box culvert. The alternative moves the connection to Sta 123+00 to reduce costs, improve access for local residents, and reduce the environmental impact by moving the connection further away from wetland areas.

The intersection sight distance was checked and it meets the requirements for turning movements.

This alternative would require a small area of right-of-way from Parcel 98; however, this parcel has not yet been acquired. It is the judgment of the VE Team that Parcel 98 could possibly require a displacement under the current design. Additionally, a drainage easement may possibly be saved on Parcel 102.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 100,428	—	\$ 100,428
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 100,428	—	\$ 100,428

PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **P-13**

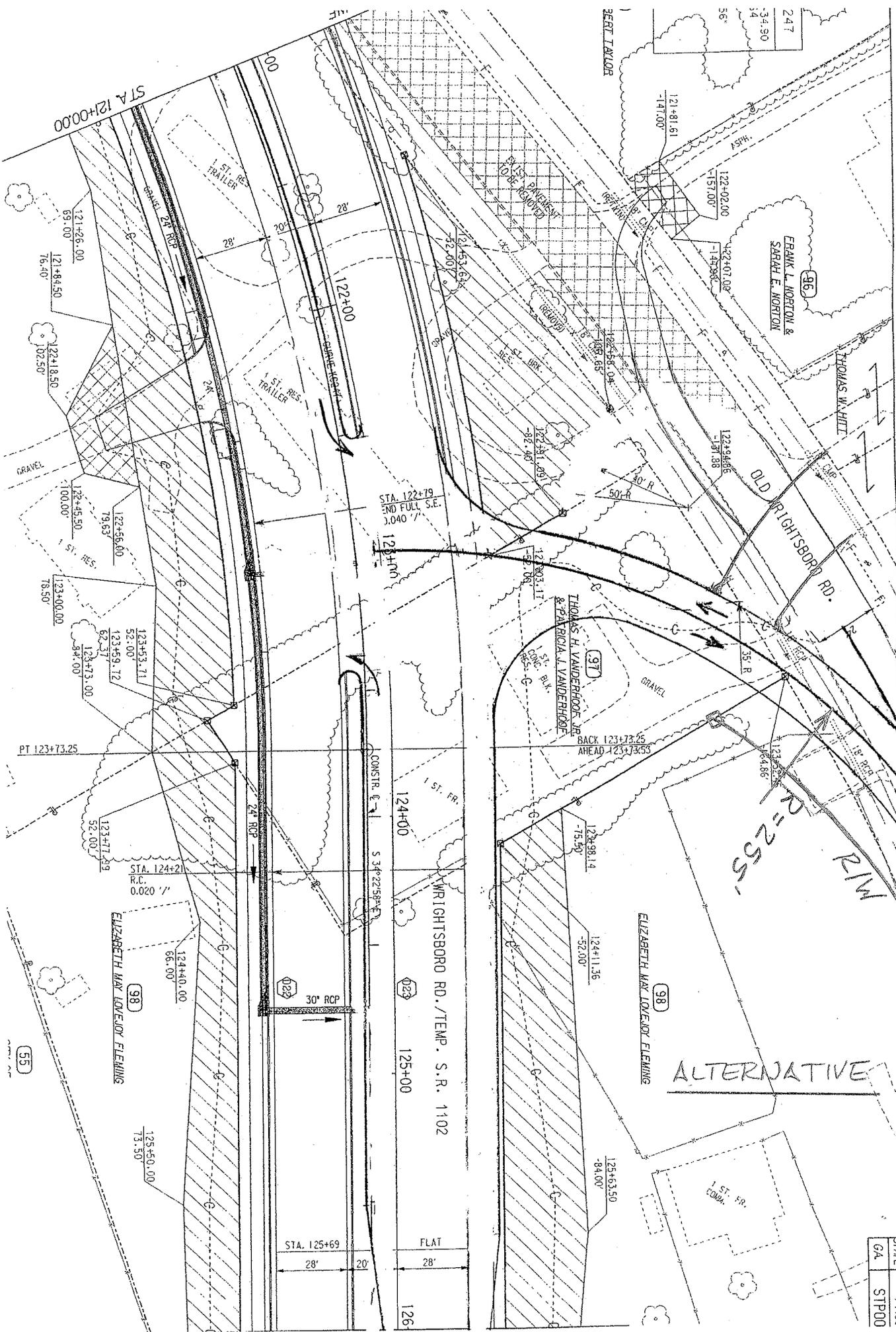
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **6**



- RW - PROPERTY LINE
- RIGHT-OF-WAY
- PROPOSED PAVEMENT
- RAISED MEDIAN
- SIDEWALK
- ARCEL BOUNDARY
- RESIDENTIAL DISPLACEMENT

ALT. NO.
P-13
Sht. 3 of 6



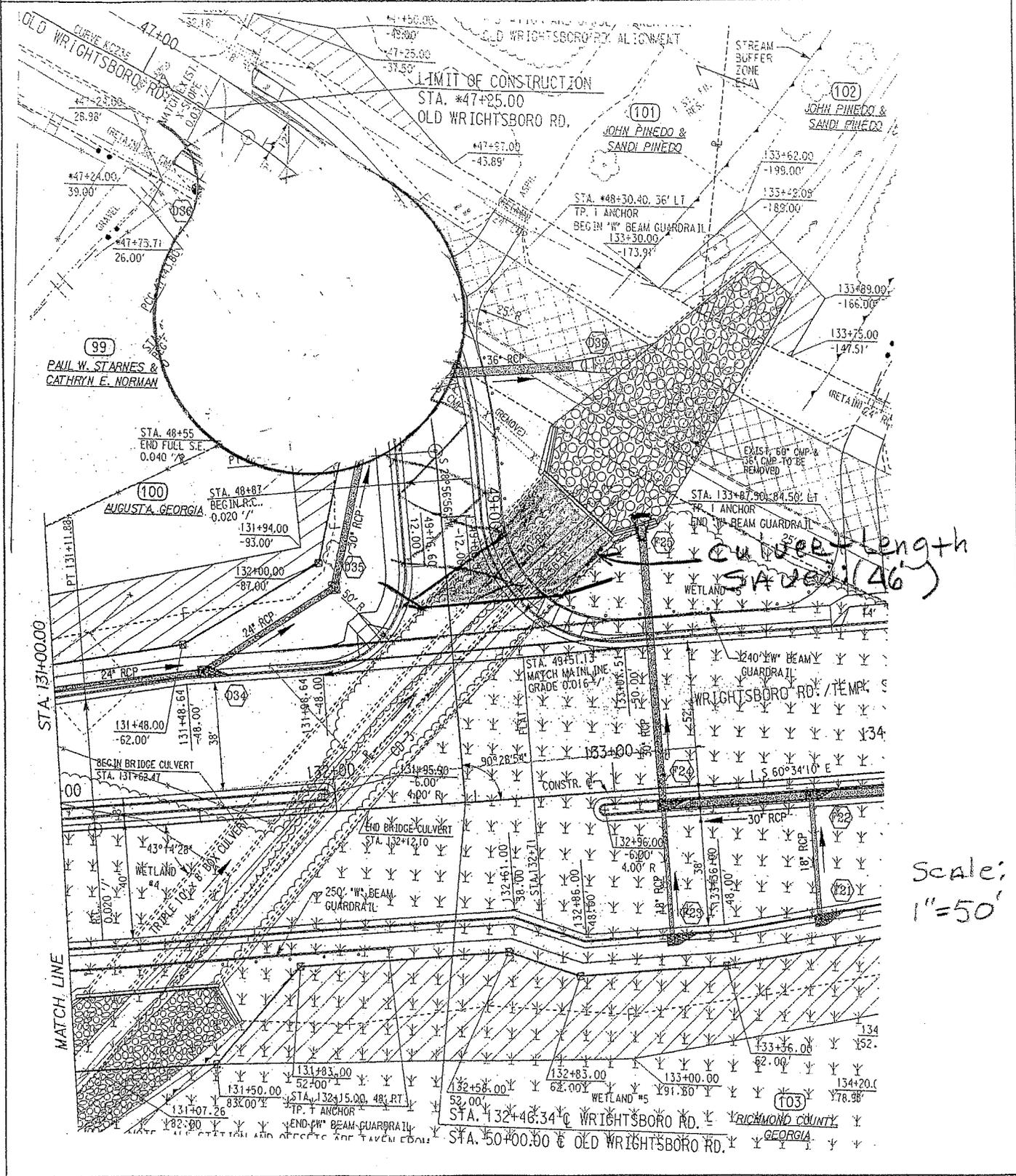
STATE	PROJ
GA	STP00

PROJECT: **WRIGHTSBORO RD FROM JIMMIE DYESS TO I-520**
 Richmond County, Georgia

ALTERNATIVE NO.: **P-13**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **4** of **6**



CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

P-13

SHEET NO.:

5 of 6

The existing tie-in under "Original" Design is 225' Long. (Wrightsboro Rd (132+50) AT Old Wrightsboro Rd)

The new tie-in is approximately the same length as the current proposed tie-in. (225')

Therefore the construction cost for both roadway tie-ins are the same.

However the Alternate Design (P-13) shortens the Culvert (Triple 10'x8') by 46 L.F. (Saved)

$$\text{Class "A" Concrete: } 46 \text{ L.F.} \times \frac{3.836 \text{ cy}}{\text{L.F.}} = 177.5 \text{ c.y.}$$

$$\text{Bar Reinf. Steel: } 46 \text{ L.F.} \times \frac{426.4 \text{ lbs}}{\text{L.F.}} = 19,615 \text{ lbs}$$

Foundation Backfill Mat' / Tp 2:

$$\frac{1' \times 36' \times 46'}{27 \text{ cf/cy}} = 61.4 \text{ c.y.}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
C-4

DESCRIPTION: **USE A SINGLE-SPAN BRIDGE IN LIEU OF PROVIDING
 THREE, 10 FT BY 8 FT BOX CULVERTS AT STA 132+00**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (See attached sketch)

The current design proposes three, 10 ft by 8 ft box culverts at Stream #3, Sta 132+00.

ALTERNATIVE: (See attached sketch)

Use a 30-ft-long single-span T-beam bridge on pile bents.

ADVANTAGES:

- Does not interfere with the stream bed
- Reduces maintenance and cost of debris removal from the stream bed
- Provides a clear span without interruptions

DISADVANTAGES:

- Increases construction duration
- Requires relocation of the connection to existing Wrightsboro Road (see Alt. No. P-11 or Alt. No. P-13)

DISCUSSION:

Less interruption to the waterway and reduced disturbance from periodic removal of debris from the stream bed is more environmentally friendly than the proposed three box culvert design. Selection of this alternative will also eliminate the need for stream mitigation at this site.

The 30-ft-long, single-span, T-beam bridge on pile bents will require relocation of the connection to existing Wrightsboro Road as illustrated in Alt. No. P-11 or Alt. No. P-13.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 360,360	\$ 23,090	\$ 383,450
ALTERNATIVE	\$ 351,920	\$ 0	\$ 351,920
SAVINGS	\$ 8,440	\$ 23,090	\$ 31,530

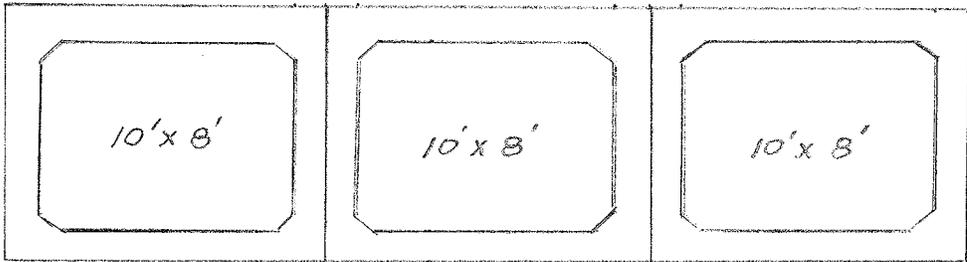
PROJECT: **WRIGHTSBORO RD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: C4

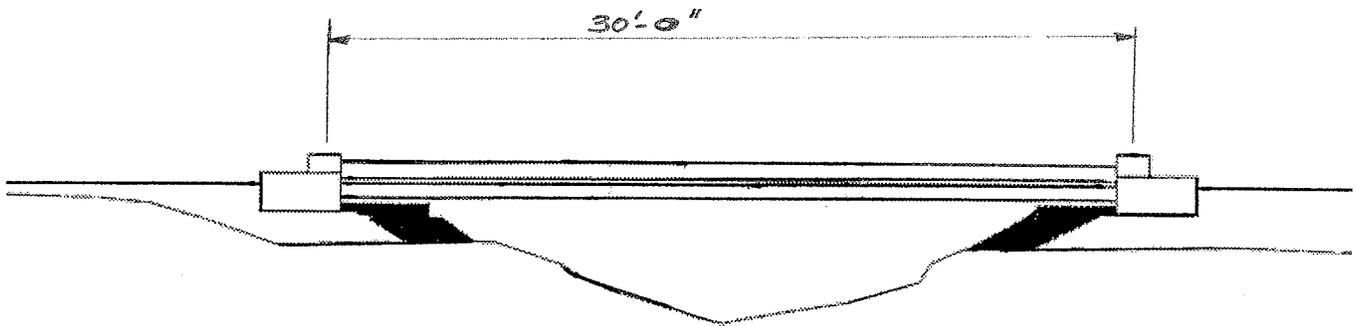
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 5

ORIGINAL DESIGN



ALTERNATIVE DESIGN



BRIDGE ELEVATION

CALCULATIONS



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.: **C4**

SHEET NO.: **3** of **5**

ORIGINAL DESIGN

$$\begin{aligned} 3 - 10' \times 8' \text{ box culvert} &= 3 \text{ eq.} \times \$520/\text{lin. ft.} \times 231' \\ &= \$360,360 \end{aligned}$$

ALTERNATIVE DESIGN

$$\begin{aligned} \text{Bridge width} &= 146.63' \\ \text{Bridge length} &= 30' \\ \text{Bridge area} &= 4,399 \text{ sf} \\ \text{Bridge unit cost} &= \$80/\text{sf.} \\ \\ \text{Bridge cost} &= 4,399 \text{ sf} \times \$80/\text{sf} \\ &= \$351,920 \end{aligned}$$

LIFE CYCLE COST WORKSHEET



PROJECT: WRIGHTSBORO ROAD/JIMMIE DYESS TO I-520 <i>Richmond County, Georgia</i>		ALTERNATIVE NO. C-4					
		SHEET NO.:	5 of 5				
LIFE CYCLE PERIOD: <u>50</u> years							
INTEREST RATE: <u>3.00%</u> ESCALATION RATE:		ORIGINAL	PROPOSED				
A. INITIAL COST		360,360	351,920				
Useful Life (Years)							
INITIAL COST SAVINGS			8,440				
B. RECURRENT COSTS (Annual Expenditures)							
1. Maintenance							
2. Operating							
3. Energy							
4.							
5. test							
6.							
Total Annual Costs		-	-				
Present Worth Factor		25.7298	25.7298				
Present Worth of RECURRENT COSTS		-	-				
C. SINGLE EXPENDITURES		Year	Amount				
		PW factor	Present Worth				
ORIG	PROP	< Put "x" in appropriate box (original design or proposed design)					
x		1.	5	5,000	0.8626	4,313	-
x		2.	10	5,000	0.7441	3,720	-
x		3.	15	5,000	0.6419	3,209	-
x		4.	20	5,000	0.5537	2,768	-
x		5.	25	5,000	0.4776	2,388	-
x		6.	30	5,000	0.4120	2,060	-
x		7.	35	5,000	0.3554	1,777	-
x		8.	40	5,000	0.3066	1,533	-
x		9.	45	5,000	0.2644	1,322	-
D. SALVAGE VALUE		Year	Amount	PW factor	Present Worth	Present Worth	
		1.		(1.0000)	-	-	
		2.		(1.0000)	-	-	
Present Worth of SINGLE EXPENDITURES					23,090	-	
E. Total Recurrent Costs & Single Expenditures (B + C + D)					23,090	-	
RECURRENT COSTS & SINGLE EXPENDITURES SAVINGS						23,090	
TOTAL PRESENT WORTH COST (A + E)					383,450	351,920	
TOTAL LIFE CYCLE SAVINGS						31,530	

VALUE ENGINEERING ALTERNATIVE



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520**
Richmond County, Georgia

ALTERNATIVE NO.:
D-1

DESCRIPTION: **USE HDPE PIPE IN LIEU OF CONCRETE PIPE FOR
 LONGITUDINAL STORM DRAIN PIPING**

SHEET NO.: 1 of 3

ORIGINAL DESIGN: (See attached sketch)

The current design uses reinforced concrete storm drain pipe (RCP) for all storm drain piping.

ALTERNATIVE: (See attached sketch)

Use High Density Polyethylene (HDPE) pipe for the longitudinal storm drainage piping only.

ADVANTAGES:

- Reduces material cost
- Reduces installation cost
- Reduces construction time due to easier installation requirements

DISADVANTAGES:

- None identified

DISCUSSION:

HDPE pipe comes in 20 ft sections, is lightweight, and much easier and faster to install than the conventional concrete storm drain pipe with similar life span. A 6 in-Type II backfill material is required for a foundation with HDPE pipe.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 632,895	—	\$ 632,895
ALTERNATIVE	\$ 522,457	—	\$ 522,457
SAVINGS	\$ 110,438	—	\$ 110,438

CALCULATIONS



PROJECT:

WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520
Richmond County, Georgia

ALTERNATIVE NO.:

D-1

SHEET NO.:

2 of 3

The amount of Longitudinal Pipe that could be changed to HDPE pipe

18" storm DR. Pipe: 8,480 L.F.

24" storm DR. Pipe: 2,980 L.F.

30" storm DR. pipe: 1,720 L.F.

(6" TPZ Mat'l Backfill)

$$\frac{147\#}{cf} \times \frac{T}{2000\#} \times (.5' \times \overset{\text{Avg. width}}{2'} \times 13,180') = 967 \text{ Tons}$$

\$50.40/Ton

HDPE Pipe: (includes mat'l's & installation)

18" HDPE Pipe: \$30.00/L.F.

24" HDPE Pipe: \$39.00/L.F.

30" HDPE Pipe: \$50.00/L.F.

PROJECT DESCRIPTION

Project STP00-7001-00(009), P.I. No. 250510, Wrightsboro Road from Jimmie Dyess Parkway to I-520 Ramp, widens, realigns and reconstructs the existing two-lane section of Wrightsboro Road between existing Barton Chapel Road and Maddox Road to a four-lane highway in Richmond County, a total of 2.40 miles. The project is being design by Post, Buckley, Schuh & Jernigan, Inc. in concert with GDOT District 2.

Existing Conditions

The existing roadway is a two-lane section with no turn lanes at intersections. The existing shoulder on the south side of Wrightsboro Road is mostly header curb with sidewalk and insufficient drainage structures. The north side of Wrightsboro Road is primarily narrow graded shoulders with steep ditches, which violate clear zone requirements and present a safety hazard. The existing land use along Wrightsboro Road is mostly residential to the west with some commercial sites mainly to the east between Belair Road and the I-520 Ramp. The base year (2000) traffic is 29,660 vehicles per day (VPD) and the design year (2020) traffic is 39,500 VPD. The posted speed is 35 mph and the design speed is 45 mph.

Need and Purpose

The purpose of this project is to correct roadway deficiencies, improve the operational efficiency, provide a safer transportation environment for vehicles, bicycles and pedestrians, and serve the transportation demand generated by the increase in developments.

Based on the future traffic projections, the level of service (LOS) will deteriorate on Wrightsboro Road without the proposed improvements. Projected average daily traffic between Jimmie Dyess Parkway and Belair Road is in the range of 25,500. According to general guidelines for arterial LOS analysis, Wrightsboro Road will operate at a LOS E for this segment if improvements are not made. The deterioration will be more significant on the eastern end of Wrightsboro Road where unacceptable levels of service will be experienced between Belair Road and I-520 southbound ramp termini during the peak hours. In addition, due to the conflicts with the left turns on Crescent Drive and the increased congestion in the AM peak, traffic will experience substantial delay traveling westbound in the future without the proposed improvements. The proposed widening with the four-lane, divided highway design will improve the flow of traffic for future conditions. The future LOS with proposed improvements will result in no worse than a LOS C at the intersections along Wrightsboro Road.

The accident and injury rates by segment exceed GDOT's statewide average for the eastern portion of Wrightsboro Road between Belair Road and I-520 southbound ramp termini. The analysis of accidents by intersections shows that there is a higher number of accidents on the eastern end of the project. Five of the intersections exceed the average number of accidents for Augusta per year based on data provided by GDOT. The addition of right turn and left turn bays and a signal at the intersection with Belair Road will provide a more controlled environment for turning movements and will separate left turning vehicles from the through traffic.

Project Location

The proposed Wrightsboro Road project in the city of Augusta begins at mile marker 0.49, approximately 2,400 feet east of the intersection with Jimmie Dyess Parkway where the existing five-lane section ends. It extends approximately 2.4 miles to mile marker 2.89 at the intersection of the I-520 southbound ramps.

Description of the Approved Concept

The approved concept includes the widening and reconstruction of Wrightsboro Road from a two-lane section to a four-lane roadway with a 20-ft-wide raised median. The proposed alignment follows the existing Wrightsboro Road from the project beginning to Maddox Drive. Wrightsboro Road is realigned between Maddox Drive and Barton Chapel Road to avoid impacts to historical sites that were identified in this corridor.

Improvements to Barton Chapel Road and Augusta West Parkway consist of realigning both roadways to form a single signalized intersection and providing required left and right turn lanes at this intersection.

Five additional intersections including Maddox Road, Lukes Road, Flowing Wells Road, Maddox Drive, and Belair Road will receive capacity improvements to improve LOS.

Included in the work are the following box culverts:

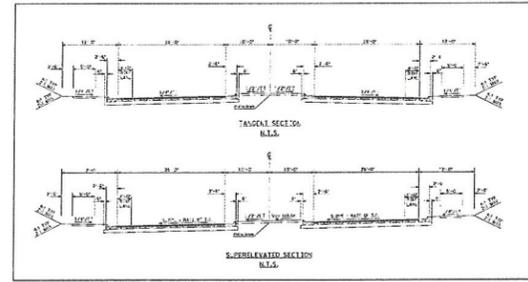
- Three 8 ft by 6 ft box culverts at Rae's Creek Stream #1, Sta. 92+00.
- One 10 ft by 6 ft box culvert at Flowing Wells Spring.
- Three 10 ft by 8 ft box culverts at Rae's Creek Stream #3, Sta. 132+00

No design exceptions or variances are anticipated.

The estimated total cost of construction for P.I. Number 250510 is \$17,813,771 based upon the Estimate Report for file "STP-7001(9)_2009-05-28" dated June 1, 2009. The estimated right-of-way cost is \$6,300,000 and the estimated reimbursable utilities cost is \$250,000 as of the start of the VE workshop.

A plan of the new road follows.

WRIGHTSBORO RD. SCALE: 1" = 100'



WRIGHTSBORO ROAD
 PROJECT NUMBER STP00-7001-00(009)
 P.I. NUMBER 250510
 SCALE: 1" = 100'
 JUNE 1, 2009

- LEGEND
- EXISTING RW - PROPERTY LINE
 - PROPOSED RIGHT-OF-WAY
 - LIMITS OF PROPOSED PAVEMENT
 - PROPOSED RAISED MEDIAN
 - PROPOSED SIDEWALK
 - HISTORIC PARCEL BOUNDARY
 - ANTICIPATED RESIDENTIAL DISPLACEMENT
 - PARCEL CLOSED THROUGH ACQUISITION
 - PROPOSED TRAFFIC SIGNAL
 - JURISDICTIONAL STREAMS
 - JURISDICTIONAL WETLANDS



VALUE ANALYSIS AND CONCLUSIONS

INTRODUCTION

This section describes the procedures used during the VE study. It is followed by separate narratives and conclusions including:

- Value Engineering Study Agenda
- Value Engineering Workshop Participants
- Economic Data
- Cost Estimate Summary and Cost Model
- Function Analysis
- Creative Idea Listing and Evaluation of Ideas

A systematic approach was used in the VE study and the key procedures involved were organized into three distinct parts: 1) preparation; 2) VE workshop; and 3) post-study. A Task Flow Diagram that outlines each of the procedures included in the VE study is attached for reference.

PREPARATION EFFORT

Pre-study preparation for the VE effort consisted of scheduling study participants and tasks, gathering necessary background information on the facility, and compiling project data into a cost model and graphic cost histogram. Information relating to the design, construction, and operation of the facility is important as it forms the basis of comparison for the study effort. Information relating to funding, project planning operating needs, systems evaluations, basis of cost, soil conditions, and construction of the facility was also a part of the analysis.

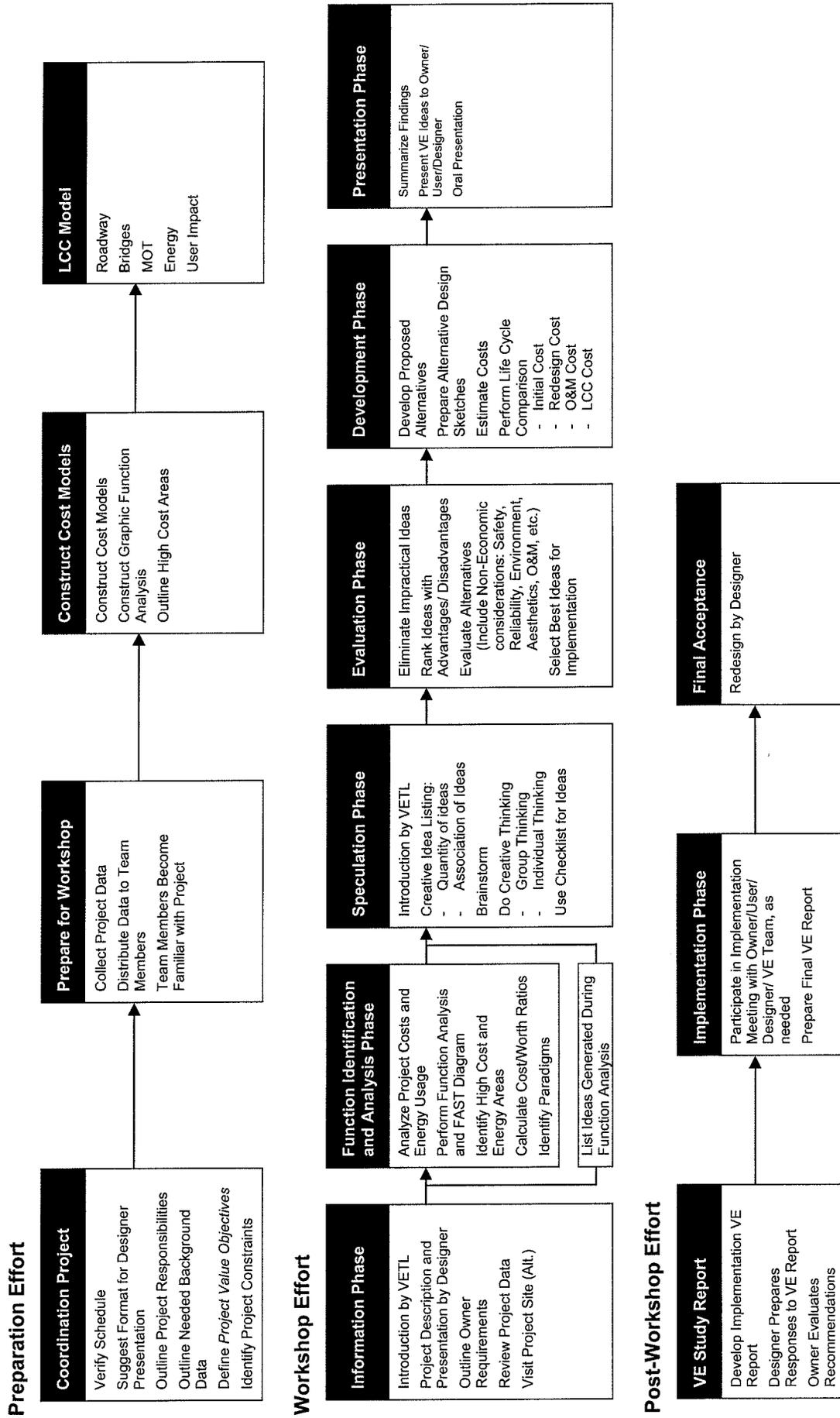
VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three and a half-day effort (see attached agenda). During the workshop, the VE job plan was followed. The job plan guides the search for high cost areas in the project and includes procedures for developing alternative solutions for consideration. It has six phases:

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



Value Engineering Study Task Flow Diagram



Information Phase

At the beginning of the study, the conditions and decisions that have influenced the development of the project must be reviewed and understood. For this reason, the design team presented information about the project to the VE team on the first day of the session. Following the presentation, the VE team discussed the project using the following documents:

- Construction Plans of Proposed Wrightsboro Road, STP00-7001-00(009), P.I. No. 250510, Richmond County, Georgia, Jimmie Dyess Parkway to I-520 Ramp, dated May 28, 2009;
- Approved Revised Concept Report, Department of Transportation, State of Georgia, P.I. No. 250510, Richmond County, STP00-7001-00(009), Wrightsboro Road from Jimmie Dyess Parkway to I-520 Ramp, dated August 21, 2002;
- Estimate Report for file “STP-7001(9)_2009-05-28”, prepared by District 2, State of Georgia Department of Transportation; dated 6/1/2009;
- Item Mean Summary for 01/2008 to 12/2008 compiled by the State of Georgia Department of Transportation; dated January 20, 2009;
- Standards and Construction Details Binder; prepared by the Department of Transportation, State of Georgia; undated;
- Pedestrian & Streetscape Guide, Georgia Department of Transportation, December 2003, prepared by Otak, Inc.;
- Wrightsboro Road Traffic Analysis – STP00-7001-00(009), P.I. No. 250510, prepared by PBS&J, dated May 14, 2009;
- Standard Specifications Construction of Transportation Systems; prepared by the Department of Transportation, State of Georgia; 2001 Edition;
- Design Policy Manual; A Georgia Department of Transportation Publication; Version 2.0; revised May 21, 2007; and
- A Policy on Geometric Design of Highway and Streets; prepared by the American Association of State Highway and Transportation Officials; dated 2004.

Function Identification and Analysis Phase

Based on historical and background data, a cost model and graphic function analysis were developed for this project by major construction elements. They were used to distribute costs by project element, serve as a basis for alternative functional categorization, and assign worth to the categories, where worth is the least cost to provide the required function, as determined by the VE team. The VE team identified the functions of the various project elements and subsystems by using random function generation techniques resulting in the attached Random Function Analysis worksheet.

Creative Phase

This VE study phase involved the creation and listing of ideas. Creative idea worksheets were organized by project element. During this phase, the VE team developed as many ideas as possible to provide the necessary functions within the project at a lower cost to the owner, or to improve the quality of the project. Judgment of the ideas was restricted at this point. The VE team was looking for a large quantity of ideas and association of ideas.

PBS&J and GDOT District 2 may wish to review the creative list since it may contain ideas that can be further evaluated for potential use in the design.

Evaluation Phase

During this phase of the workshop, the VE team judged the ideas generated during the creative phase. Advantages and disadvantages of each idea were discussed to find the best ideas for development. Ideas found to be irrelevant or not worthy of additional study were discarded. Those that represented the greatest potential for cost savings or improvement to the project were then developed further.

Each idea was compared with the present schematic design concepts, in terms of how well it met the design intent. Advantages and disadvantages were discussed, and each team member rated the ideas on a scale of zero to five, with the best ideas rated 4 or 5. Only those ideas rated 4 or 5 were developed into alternatives. In cases where there was little cost impact but an improvement to the project was anticipated, the designation DS, for design suggestion, was used. The design team should review this listing for possible incorporation of ideas into the project.

The creative listing was re-evaluated frequently during the process of developing alternatives. As the relationship between creative ideas became more clearly defined, their importance and ratings may have changed, or they may have been combined into a single alternative. For these reasons, some of the originally high-rated items may not have been developed into alternatives.

Development Phase

During the development phase, each highly rated idea was expanded into a workable solution. The development consisted of a description of the alternative, life cycle cost comparisons, where applicable, and a descriptive evaluation of the advantages and disadvantages of the proposed alternatives. Each alternative was written with a brief narrative to compare the original design to the proposed change. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in the Study Results section.

Presentation Phase

The last phase of the VE study was the presentation of the findings. The VE alternatives were screened by the VE team before draft copies of the Summary of Potential Cost Savings worksheets were provided to PBS&J and GDOT District 2 and representatives during an informal presentation on the last day of the workshop. The VE alternatives were arranged in the same order as the idea listing sheets to facilitate cross-referencing.

POST-WORKSHOP EFFORT

The post-study portion of the VE study includes the preparation of this report. It is recommended that personnel from PBS&J and GDOT District 2 analyze each alternative and prepare a short response, recommending either incorporating the alternative into the project, offering modifications before implementation, or presenting reasons for rejection.



VALUE ENGINEERING WORKSHOP AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will conduct a 3-1/2 day Value Engineering (VE) workshop on Project Number STP00-7001-00(009), P.I. No. 250510, Wrightsboro Road from Jimmie Dyess Parkway to I-520 Ramps. The project is located in Richmond County, Georgia. The workshop will be held June 15 - 18, 2009 at the following location:

Georgia Department of Transportation
One Georgia Center
5th Floor Conference Room
600 West Peachtree Street
Atlanta, Georgia 30308

The point of contact is Ms. Lisa L. Myers, Design Review Engineer Manager, and Value Engineering Coordinator, who can be reached at 404-631-1770.

The design consultants from Post, Buckley, Schuh & Jernigan, (PBS&J) Inc. will provide an overview of the project at the beginning of the workshop and be available to answer questions during the VE study effort.

AGENDA

Monday, June 15, 2009

8:30 am - 9:00 am **VE Team Gathers for Introductions**

9:00 am - 9:15 am **Introduction to the Workshop**

- Welcome and opening remarks by GDOT and District 2
- Team member introductions
- VE process, workshop organization and agenda
- Objectives of the workshop

9:15 am - 11:00 am **Designer's Overview**

Representatives from the design team from PBS&J will provide an overview of the project. After the overview, the design team will answer VE team questions.

11:00 am - 12:00 pm **Function Analysis Phase**

The VE team will perform function analysis by defining the function of each project element or system in the cost model, selecting the primary or basic functions, and determining the worth, or least cost, to provide the function. The goal is to identify those functions or project elements which offer the greatest opportunity for cost reduction or value improvement.



- 12:00 pm - 1:00 pm **Lunch**
- 1:00 pm - 2:00 pm **Conclude Function Analysis Phase**
- 2:00 pm – 5:00 pm **Creative Phase**

The team will conduct a brainstorming session and list as many ideas as possible for consideration. The aim is to obtain a large quantity of ideas through free association, by eliminating roadblocks to creativity and deferring judgment. The VE Team Leader will be responsible for developing an idea listing for the team.

Tuesday, June 16, 2009

- 8:00 am – 10:00 am **Conclude Creative Phase**
- 10:00 am - 11:00 am **Evaluation Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas based on project criteria obtained during the design overview and a discussion of the ideas advantages and disadvantages. This will be accomplished by assigning each idea a *Gut Feel Index* rating between 1 and 5, with 5 being the best, based on the team’s consensus of how well the idea meets the noted criteria.

The team selects the highly rated ideas for research and development.

- 11:00 am - 12:00 pm **Development Phase**

The VE team will develop creative ideas into alternate designs. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives will be developed and supported with sketches, calculations and substantiation for change. Suppliers of materials and equipment will be contacted and specialists consulted.

- 12:00 noon - 1:00 pm **Lunch**
- 1:00 pm - 5:00 pm **Continue Development Phase**

Wednesday, June 17, 2009

- 8:00 am - 8:30 am **Review Status and Progress of the Team**

The VE team will assess its status and plan for completion of the alternatives development.

- 8:30 am - 12:00 noon **Continue Development Phase**
- 12:00 noon - 1:00 pm **Lunch**
- 1:00 pm - 3:00 pm **Continue Development Phase**



3:00 pm - 5:00 pm

Completion of Development Phase

The VE team will wrap up and complete the development effort. The VE Team Leader will be responsible for reviewing each developed idea for completion and preparing a summary of the VE alternatives in preparation for the out-briefing presentation.

Thursday, June 18, 2009

8:00 am - 9:00 am

Preparation for Presentation Phase

The VE team will finalize a summary of the VE alternatives with descriptions and initial and life cycle costs for a verbal presentation to interested parties. Summary of Potential Cost Saving worksheets will be copied for distribution to VE presentation attendees.

9:00 am – 10:15 am

Presentation Phase

The VE team will present its alternatives to GDOT and PBS&J and is available to clarify any points. The process for accepting/rejecting VE alternatives is described and a target schedule for meeting to finalize implementation decisions is established.

10:15 am – 10:30 am

Workshop “Post Mortem” and Closing Remarks

10:30 am

Adjourn

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise on the unique project elements involved. Team members consisted of a multidisciplinary group with professional highway design and construction experience and a working knowledge of VE procedures. The VE team included the following professionals:

Joseph A. Leoni, PE	Roadway QA/QC Manager	ARCADIS-US, Inc.
Molapo R.M. Kjabo, PE	Structural Engineer	HNTB
Paresh J. Parikh	Construction/Civil Engineer	Delon Hampton & Associates
Stephen G. Havens, PE, CVS	VE Team Leader	Lewis & Zimmerman Associates

OWNER/DESIGNER PRESENTATION

Representatives from GDOT and PBS&J presented an overview of the project on Monday, June 15, 2009. The purpose of this meeting, in addition to being an integral part of the Information Gathering Phase of the VE study, was to bring the VE team “up-to-speed” regarding the overall project. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail, those areas of the project requiring additional or special attention.

VALUE ENGINEERING TEAM PRESENTATION

The VE team conducted an informal presentation on Thursday, June 18, 2009 to GDOT District 2 and PBS&J. Copies of the draft Summary of Potential Cost Savings worksheets were provided for interim use.

A copy of the meeting participants is attached for reference.

VE STUDY SIGN-IN SHEET

Project No.: STP00-7001-00(009) County: Richmond PI No.: 250510 Date: June 15-18, 2009

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS	In-briefing 6/15/09	Out-briefing 6/18/09
Lisa L. Myers	00244168	Engineering Services	404-631-1770	lmeyers@dot.ga.gov	x	x
Ken Werho	00258268	Traffic Operations	404-635-8144	kwerho@dot.ga.gov	x	
Matt Sanders	00284154	Engineering Services	404-631-1752	dfadool@dot.ga.gov	x	x
Ron Wishon	00208180	Engineering Services	404-631-1753	rwishon@dot.ga.gov	x	x
Joe Leoni		ARCADIS-US	770-431-8666	joe.leoni@arcadis-us.com	x	x
Steve Havens		Lewis & Zimmerman	608-438-8227	shavens@lza.com	x	x
Paresh J. Parikh		Delon Hampton & Assoc.	404-419-8434	pparikh@delonhampton.com	x	x
Molado Kgabo		HINTB	404-946-5700	itiernan@arcadis-us.com	x	x
Helen Keller		PBS&J	770-933-0280	hkeller@pbsj.com	x	x
Taylor Wright		PBS&J	770-933-0280	tpwright@pbsj.com	x	
Shakil Shaikh		ARC	706-821-1843	sshaikh@augusta.ga.gov	x	x
Jan C. Hilliard	00248650	GDOT Urban Design	404-631-1679	jhilliard@dot.ga.gov	x	x
Darrell Richardson	00255889	GDOT Urban Design	404-631-1705	drichardson@dot.ga.gov	x	x
Ben Buchan	00200360	GDOT Urban Design	404-631-1706	bbuchan@dot.ga.gov	x	
Alexis John	00862199	GDOT NEPA	404-699-4409	ajohn@dot.ga.gov	x	
David Griffith		JJ&G	720-862-4024	david.griffith@jig.com	x	x

ECONOMIC DATA

The VE team developed economic criteria used for evaluation with information gathered from the GDOT, PBS&J, and District 2 (D2). To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for planning project period interest rates are based on the following parameters:

Year of Analysis:	2009
Economic Planning Life:	30 years for Pavement
Economic Planning Life:	50 years for Bridges
Discount Rate/Interest:	0% (Per GDOT)
Inflation/Escalation Rate:	5.00% Rural/10% Urban (Per GDOT)
Engineering and Inspection:	5.00% (Per GDOT)
Construction Contingency:	6.00% (Per GDOT)

COST ESTIMATE SUMMARY AND COST MODEL

The VE team prepared the attached cost model for the project prior to the workshop. The cost model is arranged in the Pareto Chart/Cost Histogram format to aid in identifying high cost areas. As can be expected, judgments at this stage of the study are based on experience and intuition rather than facts, which are not uncovered until well along in the analysis of function. As a result of these qualified hypotheses, there appears to be a potential for initial savings in the following areas:

- Pavement
 - Lane widths
 - Bicycle Paths
- Culverts
 - Box vs. Con-Span
- Right-of-Way
 - Roadway Alignments
- Drainage
 - Curb and Gutter
 - Drainage Piping Material
- Sidewalks
 - Sidewalk Requirements

In order to facilitate the cost developments of the selected ideas, the VE team generated numerous “unit” prices for specific pavement and bridge costs that are noted below:

Asphaltic Concrete (12.5 mm Mix) Per Square Yard \$6.19*	Asphaltic Concrete (19 mm Mix) Per Square Yard \$8.25*	Asphaltic Concrete (25 mm Mix) Per Square Yard \$16.50*	Graded Aggregate Base (10") Per Square Yard \$11.90*	Total Cost of Full Depth Pavement Section Per Square Yard \$42.84*
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*Reference Value Engineering Alternative P-1 for Pavement unit pricing calculations.

COST HISTOGRAM

PROJECT: WRIGHTSBORO ROAD FROM JIMMIE DYESS PKWY TO I-520 RAMPS			
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement	6,280,650	35.26%	35.26%
Earthwork	3,695,142	20.74%	56.00%
Drainage	1,565,345	8.79%	64.79%
Lighting	1,524,704	8.56%	73.35%
Concrete Curb & Gutter	1,138,815	6.39%	79.74%
Class A & B Concrete (Incl. reinf steel)	949,712	5.33%	85.07%
Sidewalk & Driveway Concrete	753,550	4.23%	89.30%
Traffic Control	617,931	3.47%	92.77%
Erosion Control	580,336	3.26%	96.03%
Traffic Signal	320,034	1.80%	97.82%
Signing and Marking	183,775	1.03%	98.86%
Field Engineer's Office	69,628	0.39%	99.25%
Concrete Median	66,715	0.37%	99.62%
Guardrail	51,598	0.29%	99.91%
Temporary Barrier	15,876	0.09%	100.00%
Clearing & Grubbing		0.00%	100.00%
Walls (4)		0.00%	100.00%
Bridges (2)		0.00%	100.00%
Subtotal	\$ 17,813,811	100.00%	
Engineering & Inspection @	0.00%	\$ -	
Construction Contingency @	0.00%	\$ -	
TOTAL	\$ 17,813,811	Comp Mark-up: 0.00%	

Project Element	Approximate Cost (\$)
Pavement	6,280,650
Earthwork	3,695,142
Drainage	1,565,345
Lighting	1,524,704
Concrete Curb & Gutter	1,138,815
Class A & B Concrete (Incl. reinf steel)	949,712
Sidewalk & Driveway Concrete	753,550
Traffic Control	617,931
Erosion Control	580,336
Traffic Signal	320,034
Signing and Marking	183,775
Field Engineer's Office	69,628
Concrete Median	66,715
Guardrail	51,598
Temporary Barrier	15,876
Clearing & Grubbing	0
Walls (4)	0
Bridges (2)	0

Costs in graph are not marked-up.

FUNCTION ANALYSIS

A random function analysis was performed to (1) understand the project purpose and need, (2) define the requirements for each project element, (3) ensure a complete and thorough understanding by the VE team of the basic functions needed to attain the given project purpose and need, (4) identify other goals, and (5) identify secondary functions that should be addressed by the VE team. The Random Function Analysis worksheet completed by the team for the project in its entirety and the various elements follow.

The key opportunity areas for potential cost reduction and value improvement established during the function analysis session (including input from the design team during the design overview) include the following:

- Pavement
 - Increase Space
 - Utilize Existing Alignment
 - Add Lanes
 - Accommodate Bicyclists
- Earthwork
 - Balance Earthwork
- Culverts
 - Control Flow
- Drainage
 - Transfer Stormwater
- Sidewalks
 - Accommodate Pedestrians

RANDOM FUNCTION ANALYSIS



PROJECT: WRIGHTSBORO ROAD FROM JIMMIE DYESS PKWY TO I-520 SHEET NO.: 1 of 3 <i>Richmond County, Georgia</i>		FUNCTION		
DESCRIPTION		VERB	NOUN	KIND
Project Purpose and Need Functions		Increase	Capacity	B
		Improve	Access	RS
		Enhance	Safety	B
		Improve	Level of Service	HO
		Protect	Historic Resources	RS
		Accommodate	Bicyclists	HO
		Accommodate	Pedestrians	S
		Accommodate	Future Traffic	B
		Accommodate	Commercial Development	RS
		Improve	Drainage	G
		Sustain	Environment	HO
Right-of-Way Functions	\$6.3M	Increase	Space	RS
		Acquire	Land	RS
Pavement Functions	\$6.0M	Support	Loads	B
		Increase	Space	B
		Use	Existing Pavement	RS
		Add	Lanes	RS
		Accommodate	Bicyclists	HO
		Recycle	Material	S
		Access	School	RS

Function defined as: Action Verb	Kind: B = Basic	HO = Higher Order
Measurable Noun	S = Secondary	LO = Lower Order
	RS = Required Secondary	G = Goal

RANDOM FUNCTION ANALYSIS



PROJECT: **WRIGHTSBORO ROAD FROM JIMMIE DYESS PKWY TO I-520** SHEET NO.: **2 of 3**
Richmond County, Georgia

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Earthwork Functions \$3.7M	Change	Profile	RS
	Improve	Sight Distance	G
	Support	Additional Lanes	RS
	Increase	Space	RS
	Improve	Drainage	G
	Move	Earth	RS
Drainage Functions \$1.6M	Control	Runoff	B
	Control	Erosion	B
	Transfer	Stormwater	RS
	Protect	Natural Spring	HO
	Manage	Stormwater	B
	Control	Flow	RS
	Maintain	Existing Waterways	B
	Protect	Existing Flowing Wells	HO
Lighting Functions \$1.5M	Emit	Light	RS
	Light	Space	HO
	Enhance	Safety	B
Curb & Gutter Functions \$1.1M	Control	Flow	RS
	Enhance	Safety	B
	Prevent	Erosion	RS

Function defined as:	Action Verb	Kind:	B = Basic	HO = Higher Order
	Measurable Noun		S = Secondary	LO = Lower Order
			RS = Required Secondary	G = Goal

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creativity Phase, numerous ideas were generated using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped according to the following categories and numbered in the order in which they were conceived. The following letter prefixes were used to identify the categories.

PROJECT ELEMENT	PREFIX
Pavement	P
Culverts	C
Drainage	D
Earthwork	E
General	G

Creative Idea Evaluation

After discussing each idea, the team evaluated the ideas by consensus. This effort produced 11 ideas rated 4 or 5 to research and develop into formal VE alternatives and 2 ideas to develop as a design suggestion to be included in the Study Results section of the report. Ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The project team is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT:	WRIGHTSBORO ROAD FROM JIMMIE DYESS TO I-520 <i>Richmond County, Georgia</i>	SHEET NO.:	1 of 2
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NO.	IDEA DESCRIPTION	RATING
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	PAVEMENT (P)	
P-1	Construct a one-way pair between Maddox Drive and Belair Road.	4
P-2	Provide a right-in/right-out in lieu of a cul-de-sac on Existing Wrightsboro Road.	DS
P-3	Eliminate the eastbound u-turn and eyebrow at Sta 82+00.	4
P-4	Use 24-in-wide curb and gutter in lieu of 30-in-wide curb and gutter.	5
P-5	Use 11-ft-wide lanes in lieu of 12-ft-wide lanes from the west end of the project to Belair Road.	4
P-6	Use 11-ft-wide outside lanes in lieu of 12-ft-wide outside lanes from the west end of the project to Belair Road.	5
P-7	Provide a turnaround at the north end of Crescent Drive south of Wrightsboro Road.	2
P-8	Eliminate sidewalks from the north side of Wrightsboro Road from the west end of the project to Belair Road.	4
P-9	Provide two 8-ft-wide multi-use trails in lieu of two, 5-ft-wide sidewalks and two 4-ft-wide bicycle lanes.	4
P-10	Provide a larger turning radius at the intersection of relocated Barton Chapel Road as a betterment to accommodate large trucks.	2
P-11	Relocate the connection to existing Wrightsboro Road further to the northwest away from the wetlands.	4
P-12	Create a single, combined entrance to Sue Reynolds Elementary School in lieu of two separate entrances.	2
P-13	Cul-de-sac the Rae's Creek end of Existing Wrightsboro Road and create an intersection at Sta 123.	5
P-14	Eliminate the east to west U-turn from Wrightsboro Road at the Augusta Parkway intersection.	2
	CULVERTS (C)	
C-1	Use a Con-Span culvert in lieu of providing three, 8 ft by 6 ft box culverts at Stream #1.	2
C-2	Use a Con-Span culvert in lieu of providing a 10 ft by 6 ft box culvert at Stream #2.	2
C-3	Use a Con-Span culvert in lieu of providing three, 10 ft by 8 ft box culverts at Stream #3.	2
C-4	Use a single-span bridge in lieu of providing three, 10 ft by 8 ft box culverts at Stream #3.	4
	EARTHWORK (E)	
E-1	Review the quantity of cut and fill against the estimated cost of grading complete.	4

Rating: 1→2 = Not to be developed 3→4 = Varying degrees of development potential 5 = Most likely to be developed
 DS = Design suggestion ABD = Already being done

