VALUE ENGINEERING REPORT

US 441/SR 31 Improvements in Laurens County
Project No. EDS 441(20), P.I. Number 262027
Laurens County

August 24, 2007

OWNER:

Georgia Department of Transportation
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TABLE OF CONTENTS

VALUE ENGINEERING REPORT

US 441/SR 31 Improvements in Laurens County
Project No. EDS 441(20), P.I. Number 262027
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August 2007

EXECUTIVE SUMMARY

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Introduction

This report summarizes the results of a value engineering (VE) study conducted on the improvements to SR 31 in Laurens County, GA located south of I-16 approximately 50 miles southeast of Macon. The project consists of widening/upgrading an existing 2/4 lane road to a four lane divided rural arterial over the entire 7.6 mile length at an estimated construction cost of $40.4 million. The study occurred August 6-9, 2007 at the GDOT offices in Atlanta using a four-person VE team.

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

Considerations

This project will affect a significant number of historic structures throughout the corridor. The team was asked not to impact any additional structures.

The VE was requested to stay within the proposed right of way as indicated on the plans to prevent the need to repeat the Environmental documentation which would require at least a nine month delay to the project.

Results Obtained

The VE Team generated fourteen (14) Recommendations for consideration by GDOT and the design engineer. The recommendations involve changes to the scope of the side road modifications, typical sections, material alternate bid item, design speed changes, and bridge

modifications. These have the potential to reduce project costs by as much as $3.7 Million while continuing to provide the required functionality.

A brief presentation of these recommendations was conducted on August 9th, with the following in attendance: GDOT: Lisa Myers; Design Consultant: Raju Shah; and the VE Team: Dave Wohlscheid, James Chambers, Thomas Gandolfi and Dipi Chandra.

Recommendation Highlights

A-2

The series of recommendations titled A-2 looked at the work included in the side roads. The VE team felt that for a +/- 71/2 mile mainline project, the amount of work included on the side roads (almost 2 miles of pavement) may be in excess of the norm for a project of this type and should be evaluated. For a large part the side road improvements included a left turn lane which may not be needed in all cases based on the traffic counts and projections included. In other cases no improvement was recommended if the proposed design appeared to contain minimal changes. Seven of the cross road intersection modifications were evaluated and are included below.

A-2.1 Re-evaluate width of side roads at CR 249 / CR 165

The proposed realignment includes an additional 12 foot left turn lane (36 foot new pavement width) onto SR 31 over the majority of the realignment. The VE recommendation is to delete the 12 foot left turn lane and include a 24 foot new pavement width. Based on minimal traffic projections, adequate time should be available for safe left turns from this location. In addition, the 44 foot median does provide a safe haven to store a turning vehicle if needed.

Proposed savings is $134,000

A-2.2 Re-evaluate the reconstruction of side road at CR 248

The proposed reconstruction is on the original alignment and approximately the original grade. The proposed change is to use the existing roadway alignment and typical section with minor adjustments being accomplished with overlay if needed.

Proposed savings is $122,100

A-2.3 Re-evaluate width of side roads at SR 117 / CR 195

The proposed realignment includes an additional 12 foot left turn lane (36 foot new pavement width) onto SR 31 over the majority of the realignment. The SR 117 re-alignment is significant and the CR 195 is minimal. The proposed change is to shift the intersection to the south which would minimize the impact on SR 117 (reducing the length) and eliminate the left turn lanes on CR 195 and SR 117. An alternate may be to retain the turn lane on the revised location of SR 117.

Proposed savings is $335,700.

A-2.4 Re-evaluate reconstruction of side road at CR 302

The proposed reconstruction is on the original alignment and approximately the original grade. The proposed change is to use the existing roadway alignment and typical section with minor adjustments being accomplished with overlay if needed.

Proposed savings $88,500

A-2.5 Re-evaluate reconstruction and widening of side roads at CR 292 and CR 521

The proposed realignment includes an additional 12 foot left turn lane (36 foot new pavement width) onto SR 31 over the majority of the realignment. The new alignment improves the skew angle of intersection with SR 31. The proposed change is to use the existing roadway alignment and typical section with minor adjustments being accomplished with overlay if needed. Minimize or delete the additional lane for left turn on CR 521. The existing design angle appears to be greater than 70 degrees which is acceptable. Minimal traffic counts appear not to warrant left turn lanes to the extent shown.

Proposed savings amounts to $318,600

A-2.6 Re-evaluate alignment of side road at CR 157

The proposed reconstruction of the side road includes a median opening on SR 31. The proposed change is to move the realignment of CR 157 to the north to minimize the length of realignment and retain the median opening at the new location. This would allow the closing of the median at Dominy Camphouse Road (see A-2.7).

Proposed saving is $152,600

A-2.7 Re-evaluate median opening for side road at Dominy Camphouse Road

The proposed reconstruction includes a median opening on SR 31 opposite the intersection of Dominy Camphouse Road. The proposed change is to delete this opening as there are two openings in proximity. One is located 2,400 feet north and one is located 1,000 feet south at the proposed new location of CR 157 (See A-2.6).

Proposed savings is $89,000

A-4 Delete asphaltic concrete leveling used to remove adverse crown on existing pavement

The current design uses a substantial amount of asphaltic concrete for leveling. This is used to adjust the cross slope of existing pavement. The VE recommendation is to reduce the covering in these locations where leveling is used to provide a constant 2.08% cross slope across the pavement.

Potential savings is $219,000

A-5 Reduce thickness of cross road paving.

The current design indicates that cross street relocations will be paved using the same pavement structure as the mainline. The VE recommendation is to reduce the pavement thickness to reflect the actual loadings they will experience. There are about 2 miles of crossroads on this project.

Potential savings amounts to $1,060,000

B-1 Reduce median width

The proposed median on the southern half of the project is a 44 foot depressed median. The proposal is to use the same 20 foot raised median designed for the northern half on the entire project. This concept increases curb and gutter but reduces shoulders, earthwork, right of way and drainage.

The total net potential savings if accepted is $367,000

C-1 Use soil cement base course material as a bid alternate

The current baseline concept specifies graded aggregate base course for the pavement structure. This concept recommends considering allowing an alternate bid for a base course of soil cement. The two courses will be structurally equivalent, and the State may reap the benefit of substantial savings.

Total potential savings is $1,023,000 based on bid information currently available

D-1 Design clear zones on a 55 mph design speed in lieu of 65

The current design for the southern half of the project is based on a 65 mph design speed. The proposal is to reduce it to the proposed posted limit of 55. This in turn results in a reduction of clear zone from 32 feet to 24 feet using the same 6:1 slope resulting in savings in earthwork, ROW, drainage etc.

Proposed savings for this concept is $109,000

I-1 Retain the existing width for Turkey Creek Bridge

The current design proposes to widen the bridge by 6 feet on the eastern side. The proposed change is to not widen the bridge. The shoulder would be reduced from 10 to 7 feet over the bridge length, or the median width could be reduced.

Proposed life cycle savings is $459,000

I-2 Replace Turkey Creek bridge now with a new bridge

The current design is to widen the existing bridge by 6 feet. The proposed design is to replace the bridge now with a new bridge. This results in a life cycle cost increase but eliminates a lot of unknown factors that may occur for a structure of this age that are difficult to quantify.

Proposed life cycle cost <u>increase</u> is $505,500

SR 31 Improvements in Laurens County
SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
A	**Pavement**						
A-2.1	Re-evaluate width of side roads @ CR 249/CR 165	401,700	267,700	134,000	-0-	134,000	134,000
A-2.2	Re-evaluate reconstruction of side road @ CR 248	122,100	-0-	122,100	-0-	122,100	122,100
A-2.3	Re-evaluate width of side roads @ SR 117/CR 195	778,200	442,500	335,700	-0-	335,700	335,700
A-2.4	Re-evaluate reconstruction of side road @ CR 302	88,500	-0-	88,500	-0-	88,500	88,500
A-2.5	Re-evaluate reconstruction and widening of side roads @ CR 292/CR 521	532,200	213,600	318,600	-0-	318,600	318,600
A-2.6	Re-evaluate alignment for Side Road @ CR 157	320,400	167,800	152,600	-0-	152,600	152,600
A-2.7	Re-evaluate median opening for Side Road @ Dominy Camphouse Road (CR 355 South?)	89,000	-0-	89,000	-0-	89,000	89,000
A-4	Delete leveling for removal of adverse crowns on existing pavement	3,520,000	3,301,000	219,000	-0-	219,000	219,000

SR 31 Improvements in Laurens County
SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
A-5	Revise pavement design for side roads	1,060,000	-0-	1,060,000	-0-	1,060,000	530,000
B	**Right of Way**						
B-1	Reduce median width	367,000	-0-	367,000	-0-	367,000	367,000
C	**Base Material**						
C-1	Evaluate alternate sub base design	4,169,000	3,146,000	1,023,000	-0-	1,023,000	850,000
D	**Earthwork**						
D-1	Reduce design speed to 55 on project south end to reduce clear zone	109,000	-0-	109,000	-0-	109,000	109,000

SR 31 Improvements in Laurens County
SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
I	**Bridge Widening**						
I-1	Retain the existing width for Turkey Creek bridge	412,500	-0-	412,500	46,900	459,400	459,400
I-2	Replace Turkey Creek bridge now with a new one	412,500	2,808,700	(2,396,200)	1,890,700	(505,500)	-0-
	TOTAL POTENTIAL SAVINGS						**3,774,900**

STUDY IDENTIFICATION

Project: SR 31 Improvements in Laurens County	**Dates: August 6-9, 2007**
Location: GDOT HQ - Atlanta	

VE Team Members

Name:	Discipline:	Organization:	Telephone:
David Wohlscheid	VE Team Leader	MACTEC	703-471-8383
James Chambers	Highway Design	Street Smarts	770-813-0882
Thomas Gandolfi	Highway Construction	Parsons	770-446-4900
Dipi Chandra	Structural Design	MACTEC	770-421-3526

Project Description

This GRIP project is to widen 7.6 miles of the rural arterial SR 31 from CR 272 to just South of CR 354 in Laurens County. The proposed concept is to improve SR 31 from the existing two and three lanes to four lanes with a 44 foot depressed grassed median from CR 272 to CR 302 (Payne Road). Also, additional improvements will include from the existing two and four lanes to a rural divided with a 20 foot raised median from Turkey Creek to CR 302 The proposed design speed is 65/55 mph with an estimated 2020 AADT of 22,000. The required ROW varies from 129 feet m to 250 feet with the existing varying from 100 feet to 200 feet. The bridge at Turkey Creek was reconstructed in 1991 with a width of 82 feet. It is proposed to widen this facility to the east by 8.5 feet.

Beginning at CR 272 (Barron Road), the concept is to widen to the east side of SR 31 to the end of the project just south of CR 354 (Pinehill Road). The 44 foot median is proposed from CR 272 to CR 302, and the 20 foot median from CR 302 to CR 354.

The current project estimate is $40.4 million. Please refer to the Cost Distribution Model included in the appendix for more details.

Kick off Meeting/Design Presentation

The following personnel attended this meeting which was held at the outset of the VE study:

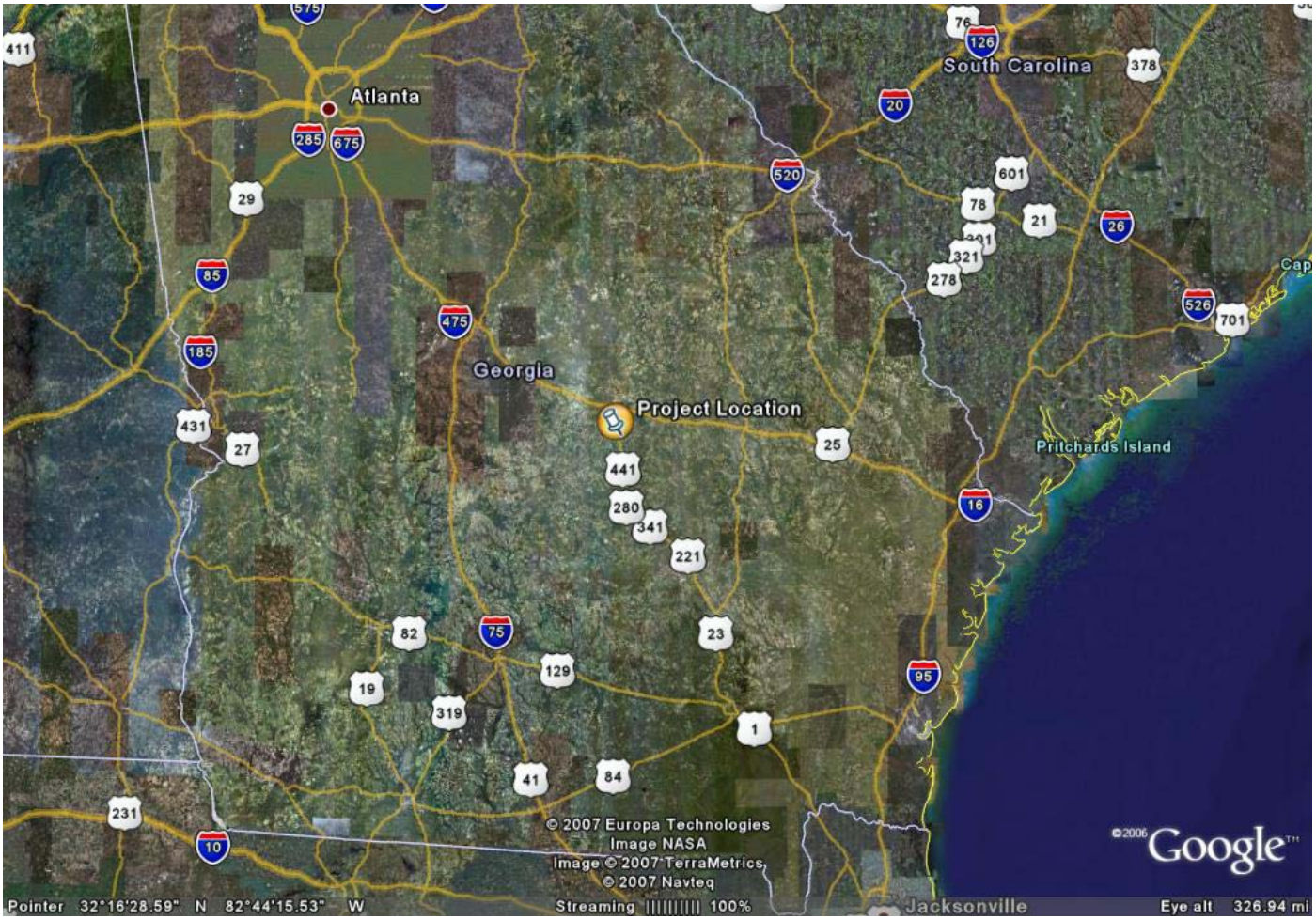
Lisa Myers	GDOT Engineering Services
Jerry Milligan	GDOT Right of Way
Ron Wishon	GDOT Engineering Services
Daniel Smith	GDOT Dublin area

Paul Condit	GDOT Environmental
Joe King	GDOT Bridges
Nabil Raad	GDOT Traffic and Safety Services
Michael Haithcock	GDOT Project Manager
Raju Shah	R. K. Shah and Associates
James Philpot	R. K. Shah and Associates
Aruna Sastry	Sastry and Associates
Dave Wohlscheid	MACTEC
James Chambers	Street Smarts
Thomas Gandolfi	Parsons
Dipi Chandra	MACTEC

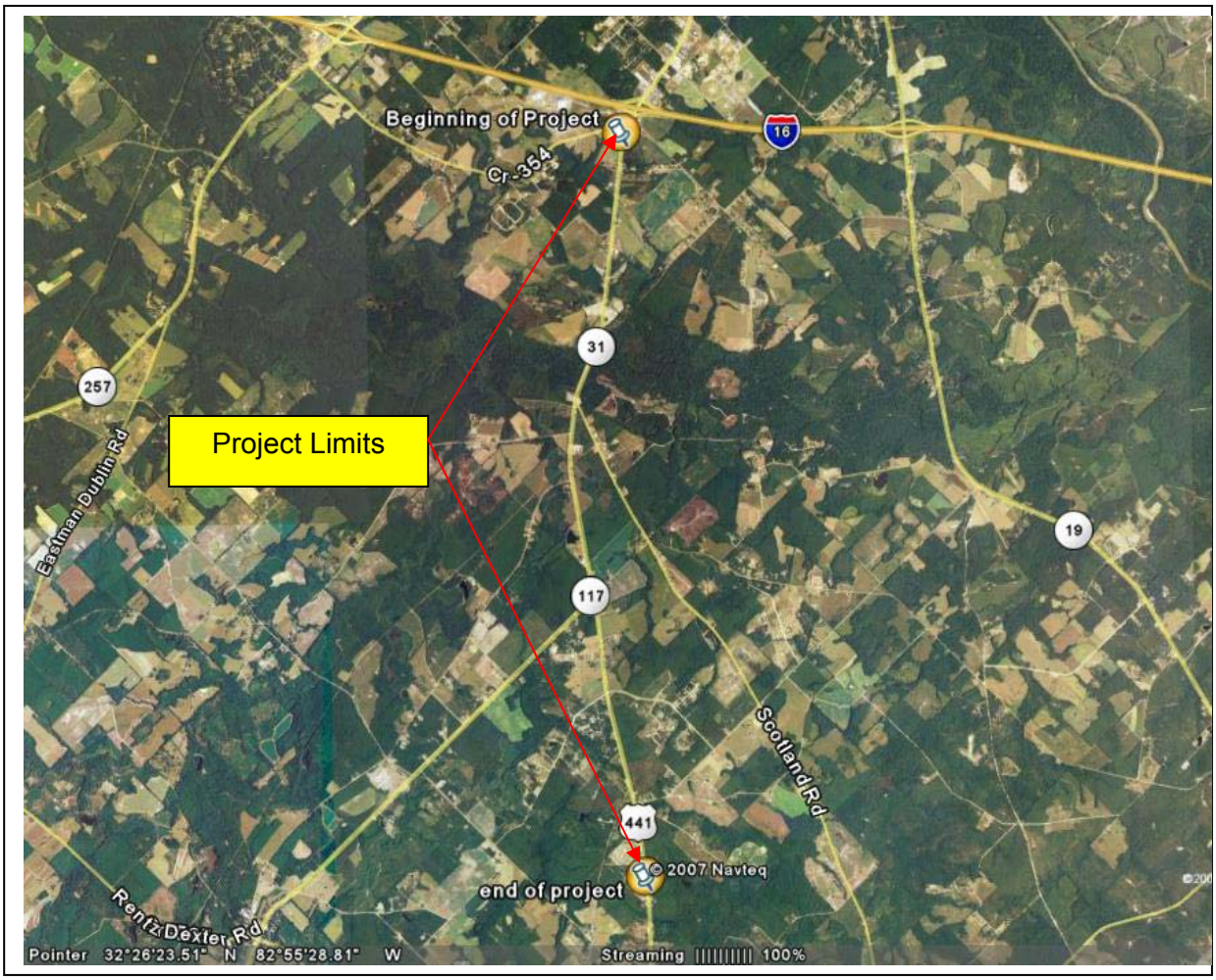
The VE Team appreciated the fine project overview given by Raju Shah of R. K. Shah Associates. Highlights included:

- The GEPA document has been completed and approved and caution was urged for changing (increasing) right of way limits as shown in that document.
- Much of the project has historic properties within its area, making property acquisition more complex.
- Approximately 120 acres of additional land will be required for this project as well as relocating 22 parties (21 residential and 1 commercial).

Project Location



Project Limits



DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A-2.1	1 of 5	Re-evaluate Width of Side Roads @ CR 249/CR 165
Comp By: TG	Date: 8/8/07	Checked By: DCW Date: 8/8/07

Original Concept:

Proposed re-alignment of Side Roads includes additional 12 ft for left turn lanes on to SR 31 over the majority of the re-alignment.
Note Functional Classifications:
CR 249 = Rural Collector
CR 165 = Rural Local

Proposed Change:

Minimize or delete additional lane for left turns.

Justification:

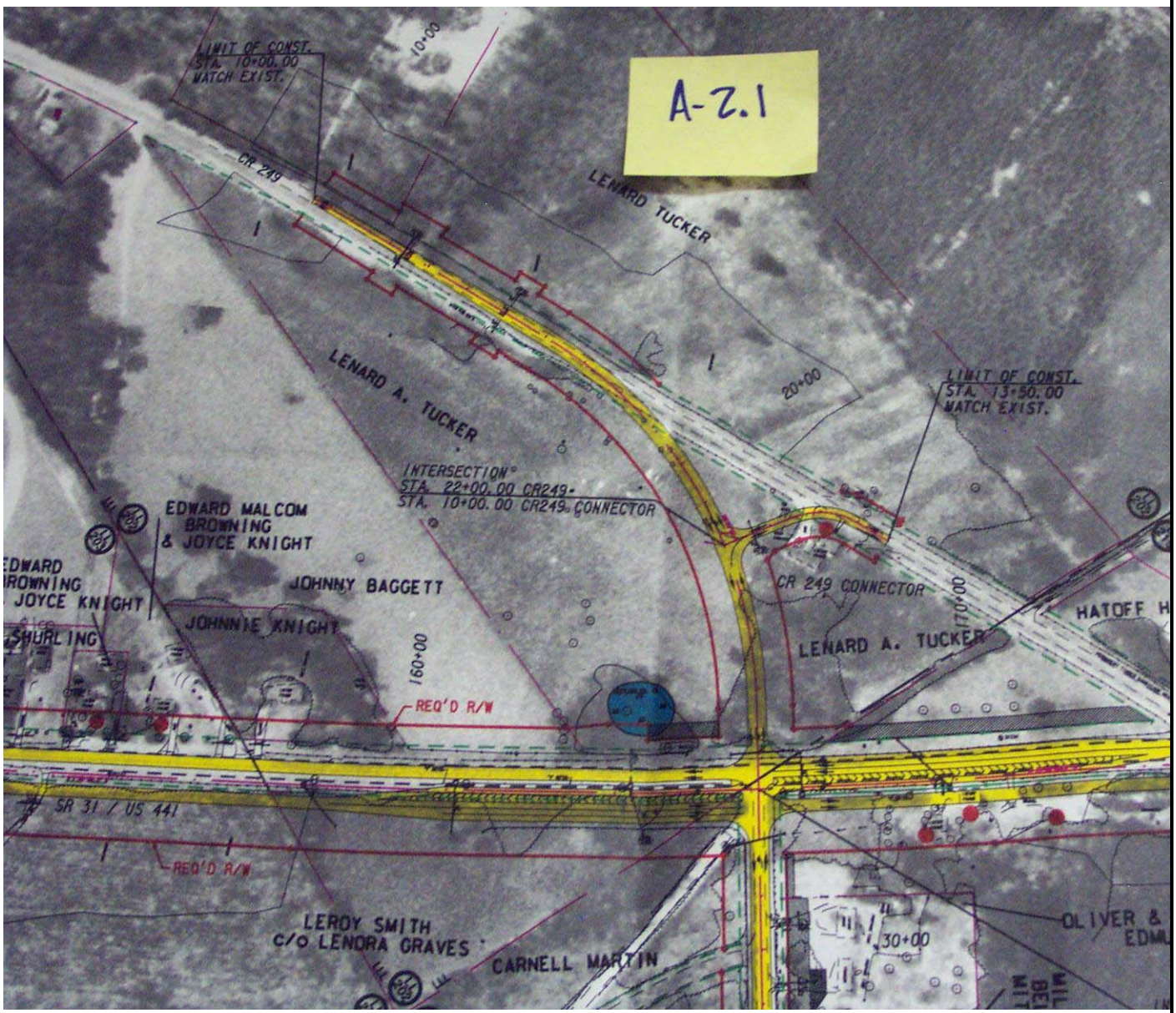
Design year traffic projections indicate minimum traffic on CR 249, no data is provided for CR 165, and therefore it is assumed left turn lanes are not required or could be minimized to a large extent.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	401,700		
- Proposed	267,700		
- Savings	134,000		134,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**134,000**

SKETCH

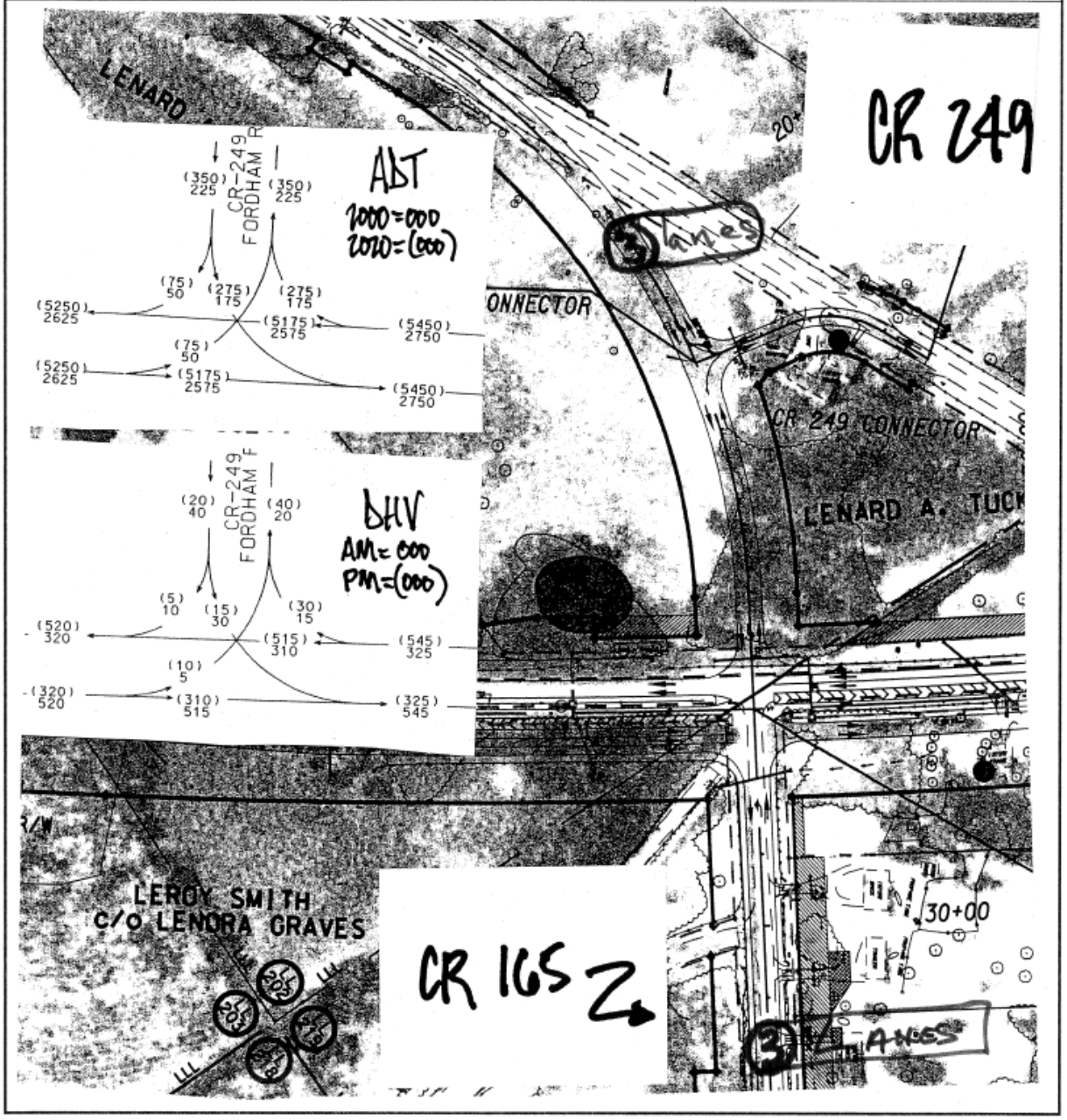
SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.1 CLIENT: GA DOT Sheet 2 of 5

Original Concept



SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.1 CLIENT: GA DOT Sheet 3 of 5



SR 31 Improvements Laurens County GA DOT
Project No. 6115070004.04 August 2007

MACTEC

						COST WORKSHEET		
PROJECT:	**SR31 Improvements in Laurens County**					ITEM No:	A-2.1	
						CLIENT:	GADOT	
						Sheet 4 of 5		
CONSTRUCTION ELEMENT			**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM		UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement		Ton	3668	75	275,100	2445	75	183,375
GAB		Ton	4680	19.24	90,043	3120	19.24	60,029
SUBTOTAL					365,143			243,404
MARK-UP	10.00%				36,514			24,340
TOTAL					401,658			267,744
TOTAL ROUNDED					401,700			267,700

SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.1 CLIENT: GA DOT Sheet 5 of 5

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 1,755 ft

Width = 36 ft

Area = 63,180 SF

Tons Pavement = 3,668

Tons GAB = 4,680

PROPOSED PLAN

Length = 1,755 ft

Width = 24 ft

Area = 42,120 SF

Tons Pavement = 2,455

Tons GAB = 3,120

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: A-2.2	**PAGE No.:** 1 of 5	**CREATIVE IDEA:** Re-evaluate reconstruction of Side Road @ CR 248
Comp By: TG	Date: 8/8/07	Checked By: DCW Date: 8/8/07

Original Concept:

Proposed reconstruction of Side Road is on original alignment and approximate original grade.
Note Functional Classification:
CR 248 = Rural Collector

Proposed Change:

Utilize existing roadway alignment and typical section, minor adjustments can be accomplished with overlay at negligible cost at this level of estimate.

Justification:

Design appears to be on same alignment with same typical section and approximate profile. No traffic data is provided for CR 248, and therefore it is assumed no reconstruction is required.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	122,100		
- Proposed	0		
- Savings	122,100		122,100
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**122,100**

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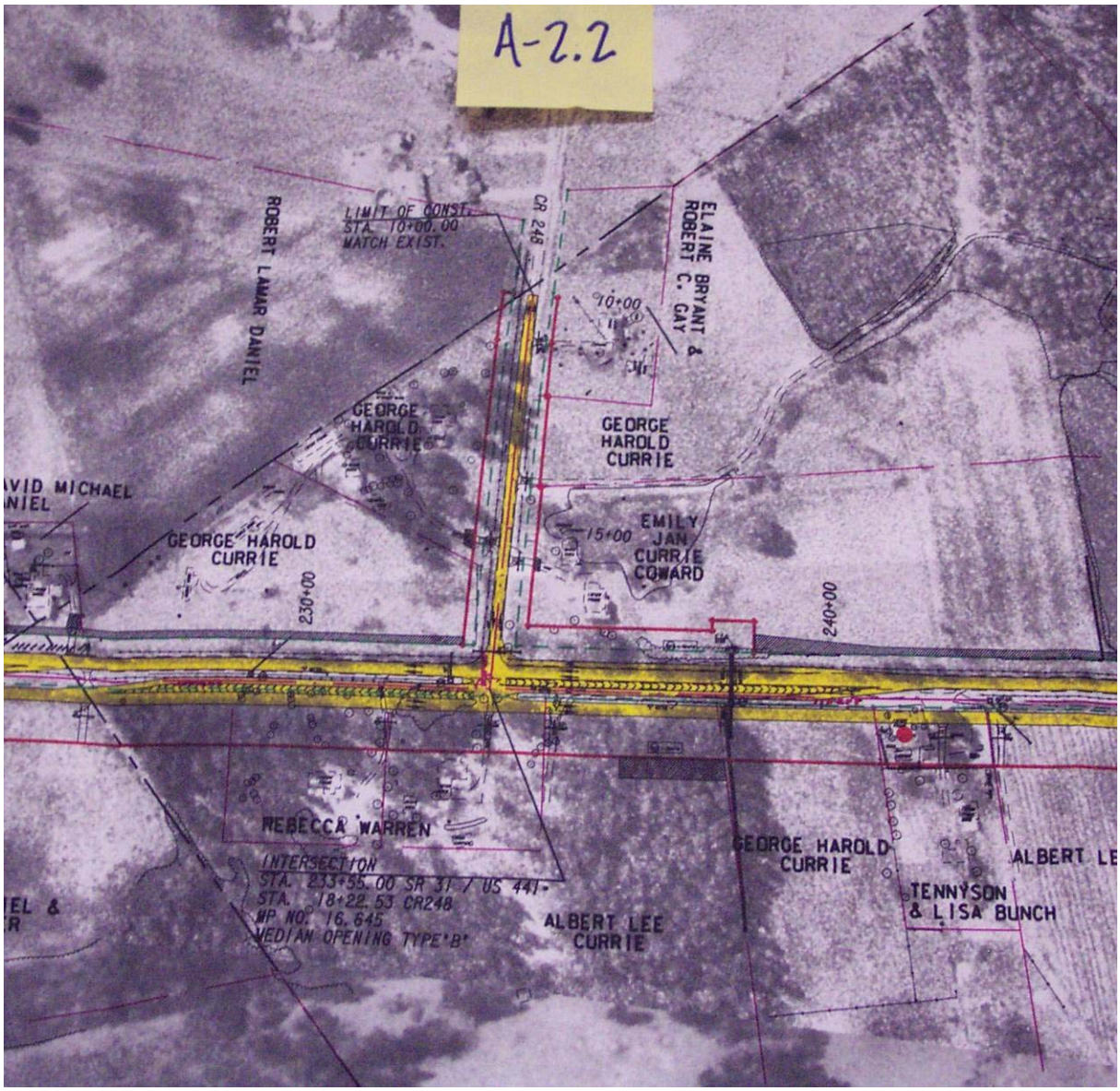
SKETCH

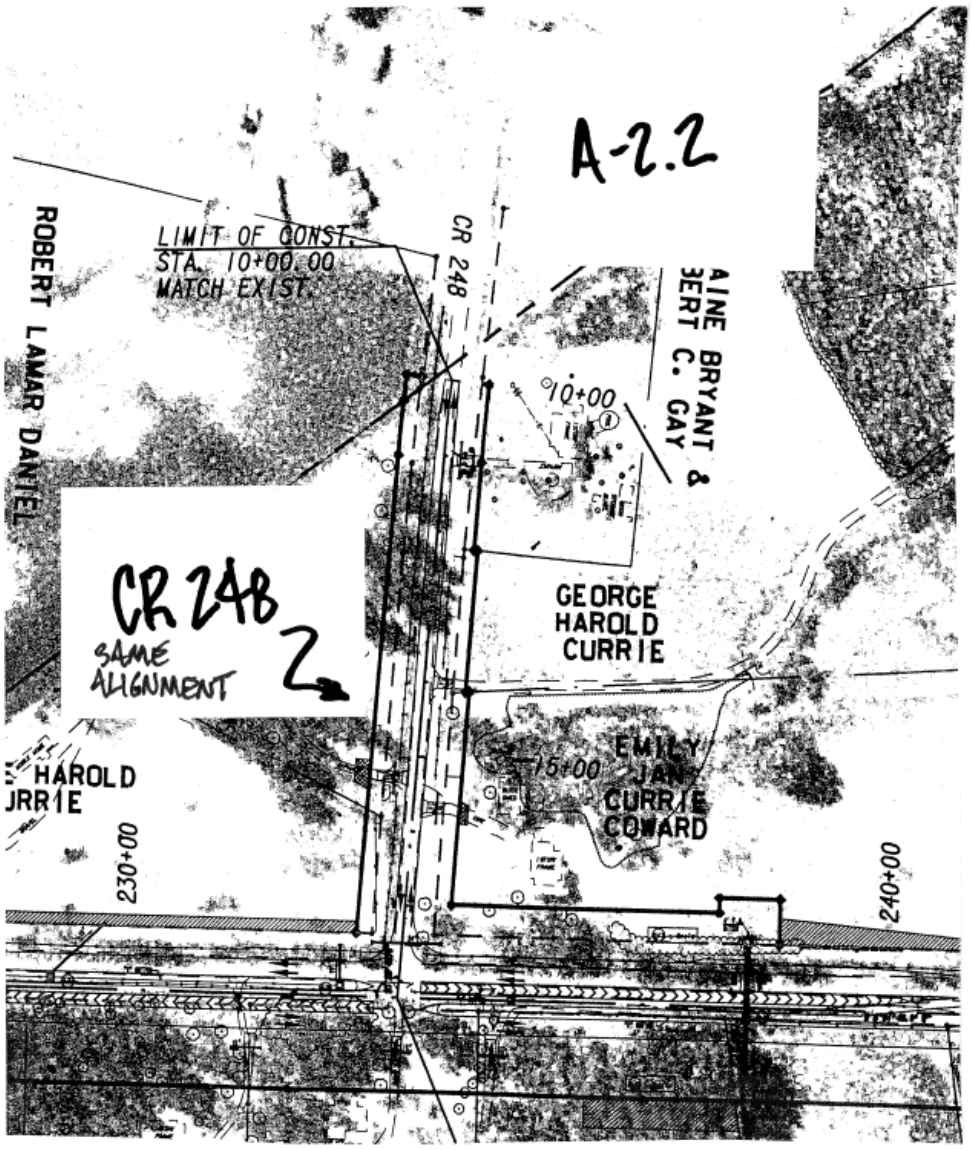
SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.2 CLIENT: GA DOT Sheet 2 of 5

Original Concept



SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.2 CLIENT: GA DOT Sheet 3 of 5



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.2 CLIENT: GADOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	1115	75	83,625	0	75	0
GAB	Ton	1422	19.24	27,359	0	19.24	0
SUBTOTAL				110,984			0
MARK-UP 10.00%				11,098			0
TOTAL				122,083			0
TOTAL ROUNDED				122,100			0

SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.2 CLIENT: GA DOT Sheet 5 of 5

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 800 ft

Width = 24 ft

Area = 19,200 SF

Tons Pavement = 1,115

Tons GAB = 1,422

PROPOSED PLAN

Length = 0 ft

Width = 0 ft

Area = 0 SF

Tons Pavement = 0

Tons GAB = 0

DEVELOPMENT AND RECOMMENDATION PHASE

SR 31 Improvements in Laurens County

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A-2.3	1 of 5	Re-evaluate Width of Side Roads @ SR 117/CR 195

Comp By: TG Date: 8/8/07 Checked By: DCW Date: 8/8/07

Original Concept:

Proposed re-alignment of Side Roads includes additional 12 ft for left turn lanes on to SR 31 over the majority of the re-alignment. SR 117 re-alignment is significant and CR 195 is minimal.
Note Functional Classifications:
SR 117 = Rural Arterial
CR 195 = Rural Local

Proposed Change:

Minimize or delete additional lanes for left turns.
Shift intersection to south to minimize re-alignment on SR 117.

Justification:

Design year traffic projections indicate minimum traffic on SR 117, no data is provided for CR 195, and therefore it is assumed left turn lanes are not required or could be minimized to a large extent.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**ANNUAL COST**	**PRESENT WORTH**
INITIAL COST - Original	778,200		
- Proposed	442,500		
- Savings	335,700		335,700
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**335,700**

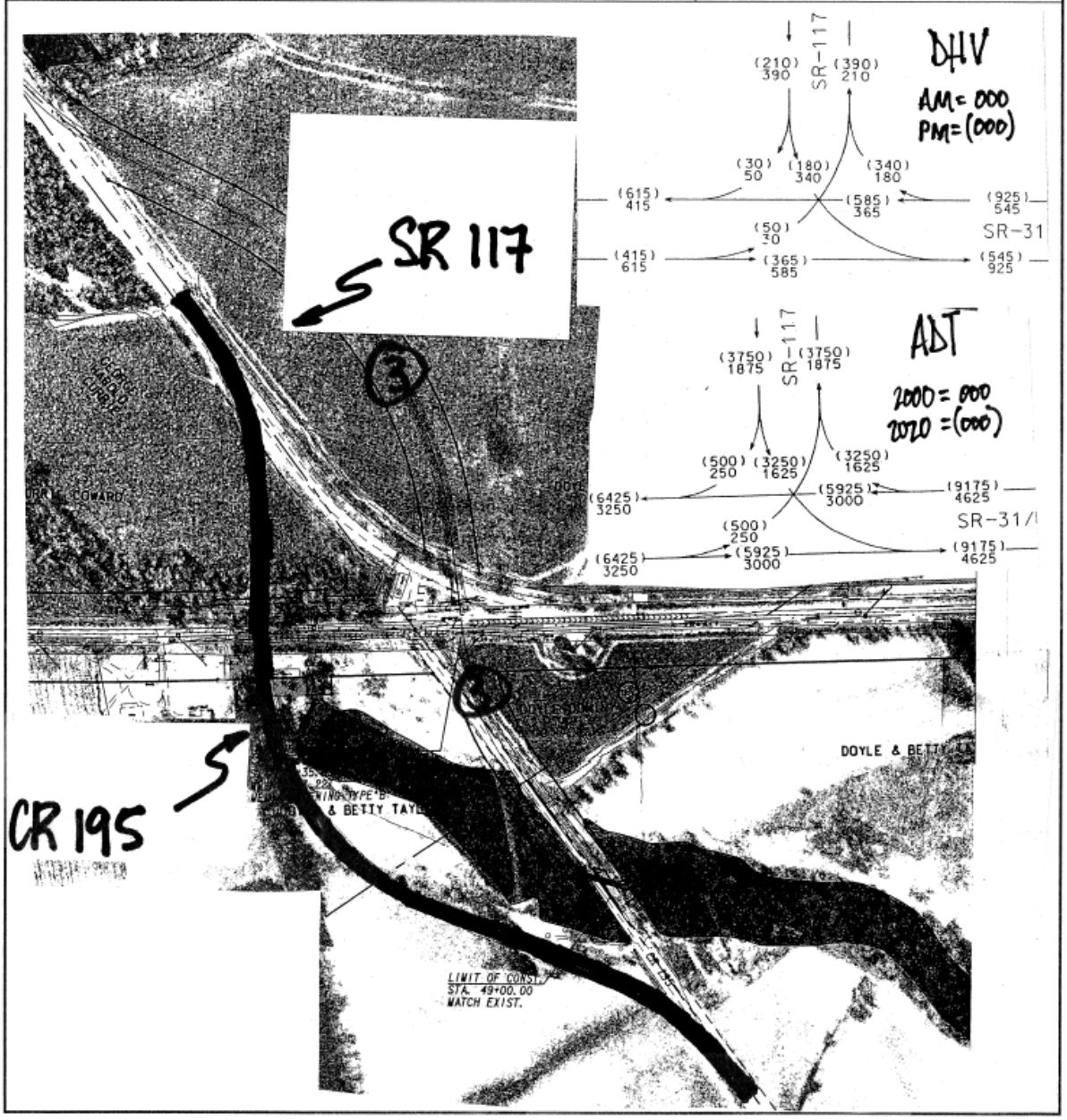
SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.3 CLIENT: GA DOT Sheet 2 of 5

Original Concept

SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.3 CLIENT: GA DOT Sheet 3 of 5



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.3 CLIENT: GADOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	7107	75	533,025	4041	75	303,075
GAB	Ton	9066	19.24	174,430	5155	19.24	99,182
SUBTOTAL				707,455			402,257
MARK-UP 10.00%				70,745			40,226
TOTAL				778,200			442,483
TOTAL ROUNDED				778,200			442,500

CALCULATIONS	
SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.3 CLIENT: GA DOT Sheet 5 of 5

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 3,400 ft

Width = 36 ft

Area = 122,400 SF

Tons Pavement = 7,107

Tons GAB = 9,066

PROPOSED PLAN

Length = 2,900 ft

Width = 24 ft

Area = 69,600 SF

Tons Pavement = 4,041

Tons GAB = 5,155

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A-2.4	1 of 5	Re-evaluate reconstruction of Side Road @ CR 302
Comp By: TG	Date: 8/8/07	Checked By: DCW Date: 8/8/07

Original Concept:

Proposed reconstruction Side Road on original alignment and approx original grade.
Note Functional Classification:
CR 302 = Rural Local

Proposed Change:

Utilize existing roadway alignment and typical section, minor adjustments can be accomplished with overlay at negligible cost at this level of estimate.

Justification:

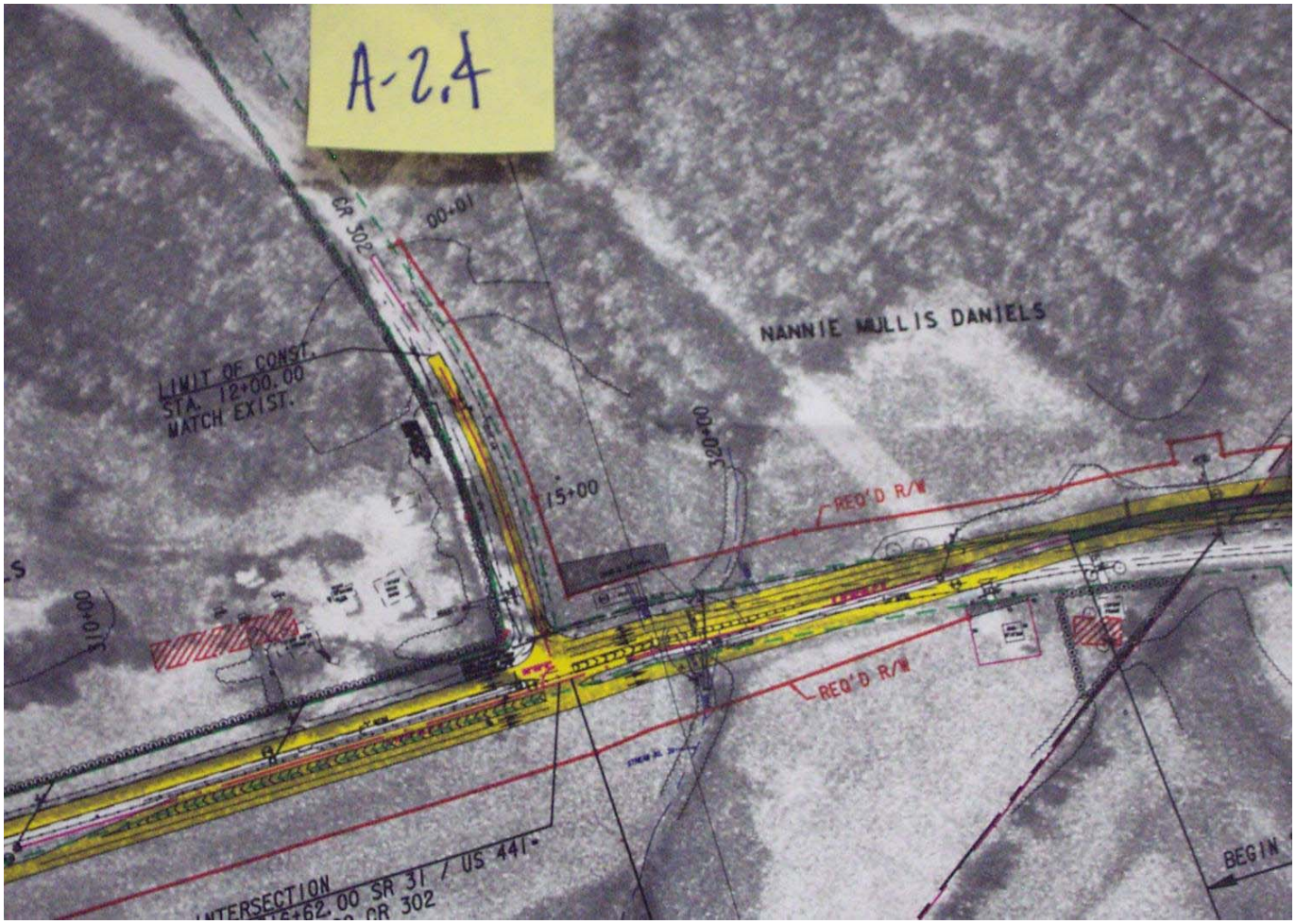
Design appears to be on same alignment with same typical section and approx profile. No traffic data is provided for CR 302, and therefore it is assumed no reconstruction is required.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	88,500		
- Proposed	0		
- Savings	88,500		88,500
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**88,500**

SKETCH

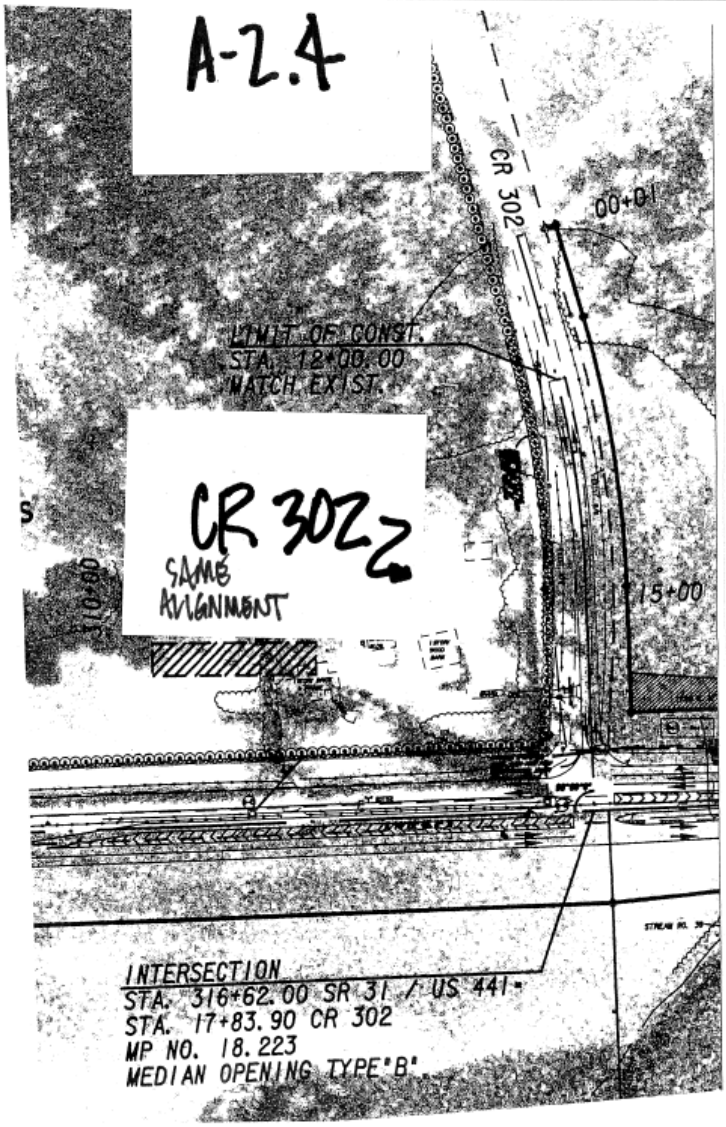
SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.4 CLIENT: GA DOT Sheet 2 of 5

Original Concept



SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.4 CLIENT: GA DOT Sheet 3 of 5



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.4 CLIENT: GADOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	808	75	60,600	0	75	0
GAB	Ton	1031	19.24	19,836	0	19.24	0
SUBTOTAL				80,436			0
MARK-UP 10.00%				8,044			0
TOTAL				88,480			0
TOTAL ROUNDED				88,500			0

SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.4 CLIENT: GA DOT Sheet 5 of 5

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 580 ft

Width = 24 ft

Area = 13,920 SF

Tons Pavement = 808

Tons GAB = 1,031

PROPOSED PLAN

Length = 0 ft

Width = 0 ft

Area = 0 SF

Tons Pavement = 0

Tons GAB = 0

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: A-2.5	**PAGE No.:** 1 of 4	**CREATIVE IDEA:** Re-evaluate reconstruction and widening of Side Roads @ CR 292/CR 521
Comp By: TG	Date: 8/8/07	Checked By: DCW Date: 8/8/07

Original Concept:

Proposed re-alignment of Side Roads includes additional 12 ft for left turn lanes on to SR 31 over the majority of the re-alignment. New alignment improves skew angle of intersection.
Note Functional Classification:
CR 292 = Rural Collector
CR 521 = Rural Arterial

Proposed Change:

Utilize existing roadway alignment and typical section on CR 292, minor adjustments can be accomplished with overlay at negligible cost at this level of estimate.
Minimize or delete additional lane for left turn on CR521.

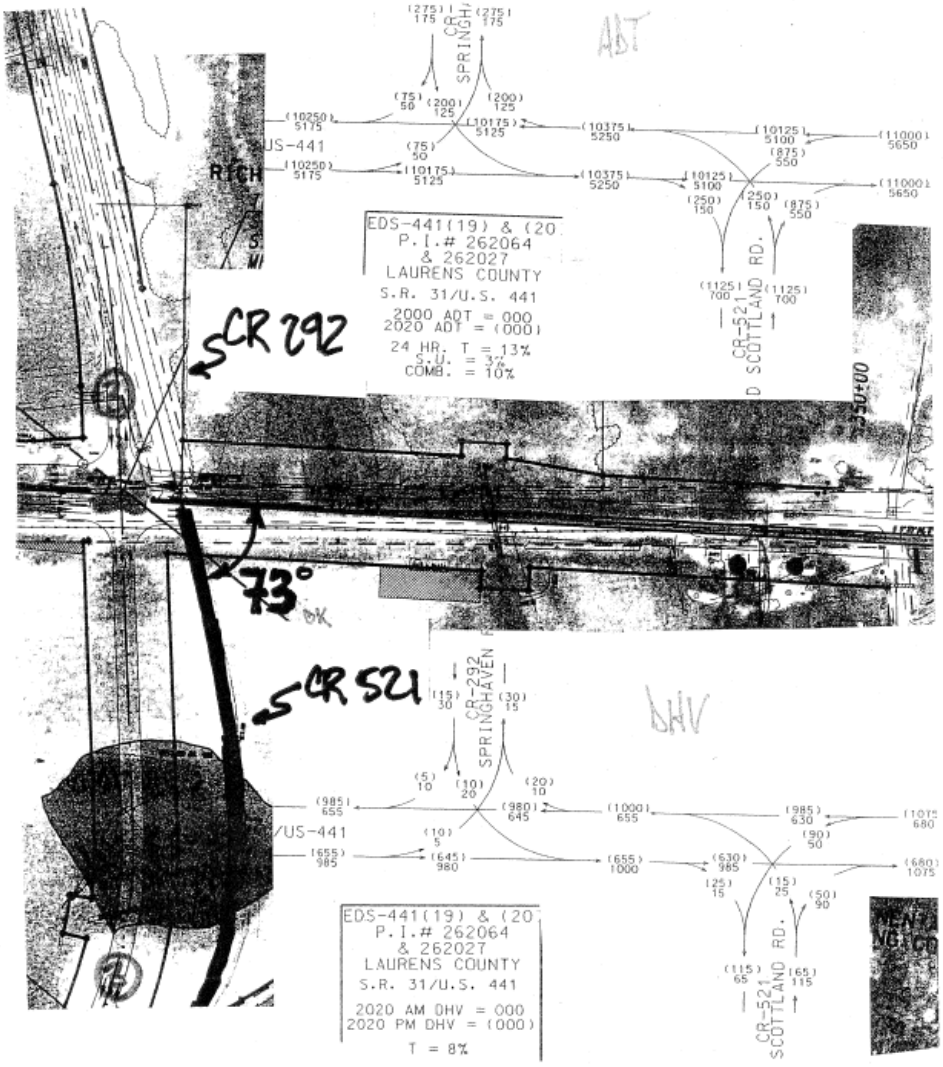
Justification:

Existing skew angle of intersection appears to be greater than 70 degrees at CR 292, which is acceptable.
Design year traffic projections indicate minimum traffic on CR 292 and CR 521 and therefore it is assumed left turn lanes are not required or could be minimized to a large extent.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	532,200		
- Proposed	213,600		
- Savings	318,600		318,600
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**318,600**

SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.5 CLIENT: GA DOT Sheet 2 of 4



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.5 CLIENT: GADOT		
					Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	4860	75	364,500	1951	75	146,325
GAB	Ton	6200	19.24	119,288	2489	19.24	47,888
SUBTOTAL				483,788			194,213
MARK-UP 10.00%				48,379			19,421
TOTAL				532,167			213,635
TOTAL ROUNDED				532,200			213,600

CALCULATIONS	
SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.5 CLIENT: GA DOT Sheet 4 of 4

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 2,325 ft

Width = 36 ft

Area = 83,700 SF

Tons Pavement = 4,860

Tons GAB = 6,200

PROPOSED PLAN

Length = 1,400 ft

Width = 24 ft

Area = 33,600 SF

Tons Pavement = 1,951

Tons GAB = 2,489

DEVELOPMENT AND RECOMMENDATION PHASE

SR 31 Improvements in Laurens County

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A-2.6	1 of 4	Re-evaluate alignment for Side Road @ CR 157

Comp By: TG Date: 8/8/07 Checked By: DCW Date: 8/8/07

Original Concept:

Proposed reconstruction of Side Road includes a median opening on SR 31.
Note Functional Classification:
CR 157 = Rural Local

Proposed Change:

Shift re-alignment to north to minimize length of re-alignment and relocate the median opening appropriately.

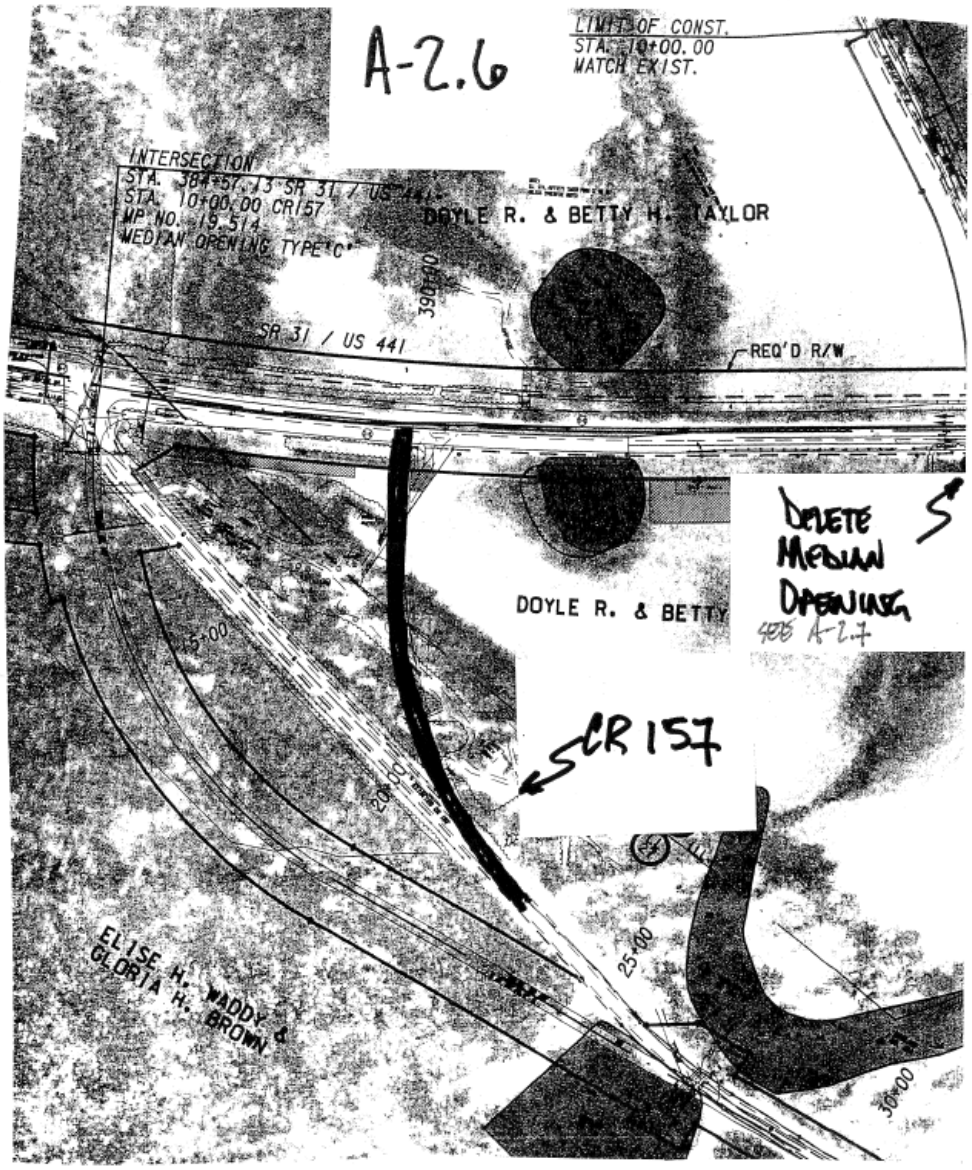
Justification:

No traffic data is provided for CR 157, original median opening at Dominy is proposed to be deleted (see A-2.7) and therefore it is assumed re-alignment can be shifted. This reduces the length of realignment needed for CR 157.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**ANNUAL COST**	**PRESENT WORTH**
INITIAL COST - Original	320,400		
- Proposed	167,800		
- Savings	152,600		152,600
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**152,600**

SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.6 CLIENT: GA DOT Sheet 2 of 4



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.6 CLIENT: GADOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	2926	75	219,450	1533	75	114,975
GAB	Ton	3733	19.24	71,823	1955	19.24	37,614
SUBTOTAL				291,273			152,589
MARK-UP 10.00%				29,127			15,259
TOTAL				320,400			167,848
TOTAL ROUNDED				320,400			167,800

CALCULATIONS	
SR 31 Improvements in Laurens County	ITEM N^{O} : A-2.6 CLIENT: GA DOT Sheet 4 of 4

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 2,100 ft

Width = 24 ft

Area = 50,400 SF

Tons Pavement = 2,926

Tons GAB = 3,733

PROPOSED PLAN

Length = 1,100 ft

Width = 24 ft

Area = 26,400 SF

Tons Pavement = 1,533

Tons GAB = 1,955

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: A-2.7	**PAGE No.:** 1 of 5	**CREATIVE IDEA:** Re-evaluate median opening for Side Road @ Dominy Camphouse Road (CR 355 South?)
Comp By: TG	Date: 8/8/07	Checked By: DCW Date: 8/8/07

Original Concept:

Proposed reconstruction of Side Road includes a median opening on SR 31.
Note Functional Classification:
Dominy Road = N/A or Rural Local

Proposed Change:

Delete median opening on SR 31.

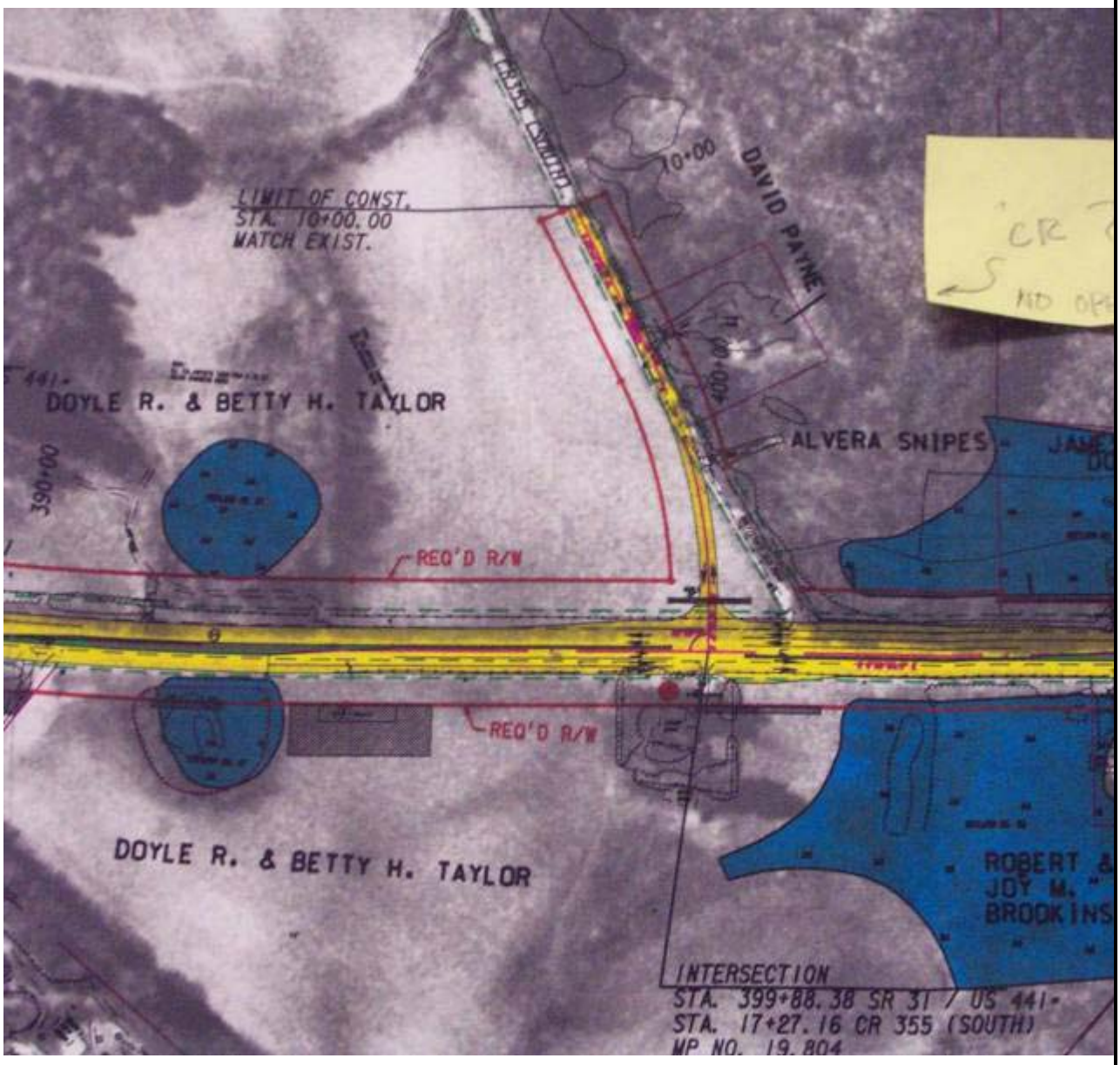
Justification:

No traffic data is provided for Dominy Camphouse Road. Proposed median openings are within approximately 1000 ft to the south, and 2400 ft to the north of the intersection and therefore it is assumed no median opening is required.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	89,000		
- Proposed	0		
- Savings	89,000		89,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**$89,000**

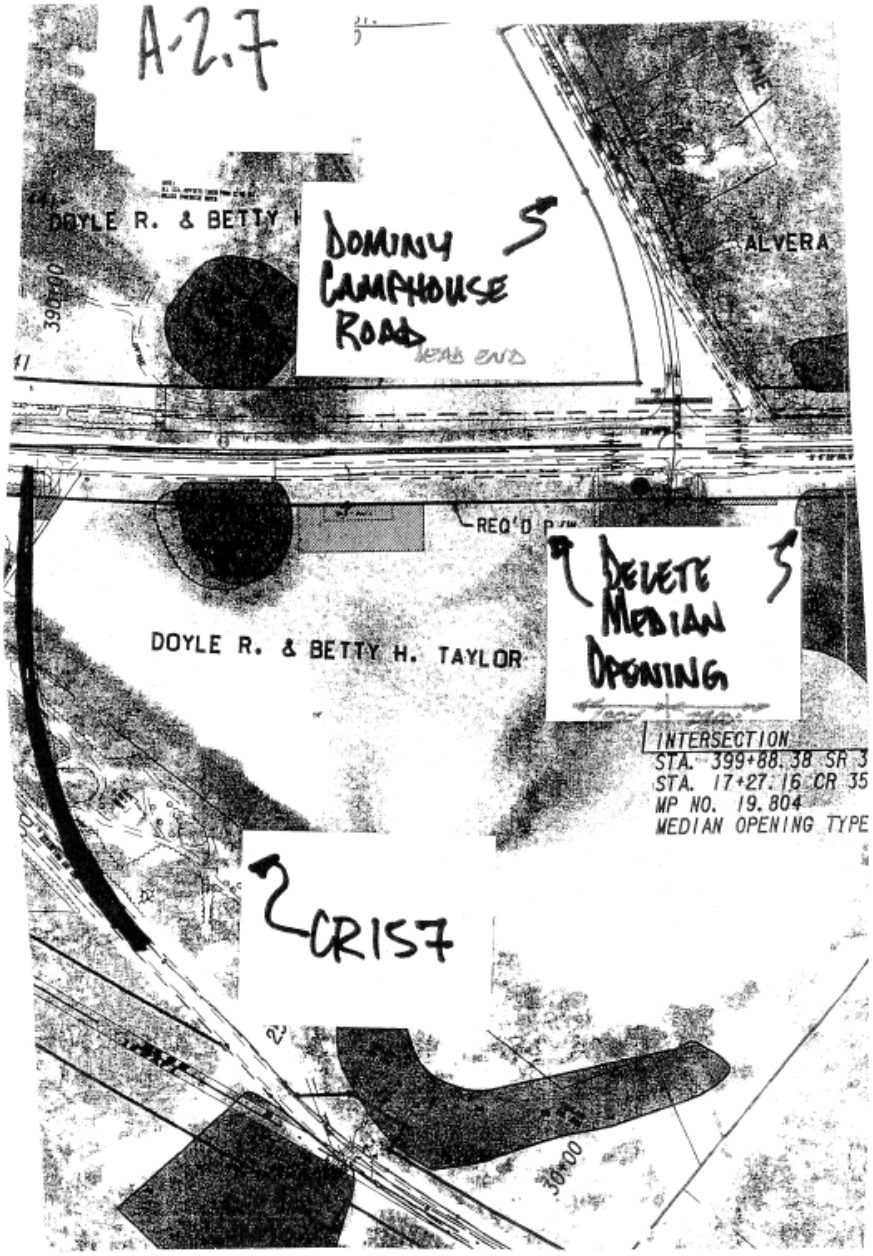
SKETCH	
SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.7 CLIENT: GA DOT Sheet 2 of 5

Original Concept



SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} :A-2.7 CLIENT: GA DOT Sheet 3 of 5



COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A-2.7 CLIENT: GADOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Pavement	Ton	813	75	60,975	0	75	0
GAB	Ton	1037	19.24	19,952	0	19.24	0
SUBTOTAL				80,927			0
MARK-UP 10.00%				8,093			0
TOTAL				89,020			0
TOTAL ROUNDED				89,000			0

SR 31 Improvements in Laurens County	ITEM NO: A-2.7 CLIENT: GA DOT Sheet 5 of 5

Typical Section = 9.5" pavement; 12" GAB

Assume pavement = 110#/inch/SY

Assume GAB = 2 tons/CY

ORIGINAL PLAN

Length = 1,000 ft (left turn lanes on SR 31); Length = 100 ft (at median opening)

Width = 12 ft (left turn lanes on SR 31); Width = 20 ft (at median opening)

Area = 14,000 SF

Tons Pavement = 813

Tons GAB = 1,037

PROPOSED PLAN

Length = 0 ft

Width = 0 ft

Area = 0 SF

Tons Pavement = 0

Tons GAB = 0

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: A-4	**PAGE No.:** 1 of 3	**CREATIVE IDEA:** Delete Asphaltic Concrete Leveling Used to Remove Adverse Crown on Existing Pavement
Comp By: JRC	Date: 8/08/07	Checked By: DCW Date: 08/08/07

Original Concept:

The baseline concept utilizes a substantial amount of asphaltic concrete leveling. Leveling is used to adjust the cross slope of the existing pavement and to provide a smooth surface for overlay pavement courses.

Proposed Change:

The VE recommendation is to reduce the amount of asphaltic concrete leveling in those locations where leveling is used to adjust the cross slope of the existing road. This recommendation applies only to those locations where leveling is being used to provide a 2.08% constant cross slope across the pavement. Refer to Typical Section No. 1 in the preliminary plans. The recommendation will significantly reduce the amount of required leveling.

Justification:

The baseline concept provides for a normal crown (2.08%), with the pavement surface sloping uniformly down and away from the median. This is customary practice for a divided roadway; however, other than to reduce median drainage, there is no compelling reason for the road surface to slope down from the driver's left to right. For larger divided roads, crown breaks are located within the travelway itself in order to prevent large sheet flows of runoff.

Note that asphaltic concrete leveling will still be used to provide a smooth surface for other overlay courses and to achieve the design superelevation on curves.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	3,520,000		
- Proposed	3,301,000		
- Savings	219,000		219,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**219,000**

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A4 CLIENT: GADOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Asphaltic Concrete Leveling	Tons	42030	75	3,152,250	39,404	75	2,955,300
Bituminous Tack Coat	Gal	23950	2	48,140	22500	2.01	45,225
SUBTOTAL				3,200,390			3,000,525
MARK-UP 10.00%				320,039			300,053
TOTAL				3,520,428			3,300,578
TOTAL ROUNDED				3,520,000			3,301,000

SR 31 Improvements in Laurens County	ITEM NO : A-4 CLIENT: GA DOT Sheet 3 of 3

The applicable locations where leveling is used to achieve a normal crown (2.08%) are as follows:

Station	Station	Distance (feet)
130+11	149+50	1,939
175+00	205+72	3,072
227+20	245+65	1,845
260+68	269+00	832
272+50	315+00	4,250
TOTAL		11,938

Assume that the existing cross slope is 2.08%. The additional asphaltic concrete leveling would be a wedge 12-ft wide with a height of 0.0 at the existing centerline and a height of 0.50 ft at the outside edge of the existing road. The average depth of the leveling wedge is 0.25 ft (3 inches).

The total area of the leveling wedge is 11,938 ft x 12 ft = 143,256 sq ft or 15,917 sq yd. The average leveling depth is 3 inches, which is 330 lb per sq yd. The total quantity of leveling is 15,917 x 330 / 2,000 = 2,626 tons.

Assume a comparable reduction in the amount of bituminous tack coat.

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A5	1 of 3	Reduce Thickness of Cross Road Paving
Comp By: JRC	Date: 8/08/07	Checked By: DCW Date: 8/08/07

Original Concept:

The baseline concept indicates that cross street relocations will be paved using the same pavement structure as the mainline.

Proposed Change:

The VE recommendation is to reduce the pavement thickness for relocated county roads. The proposed pavement for SR 117 would not be changed.

Justification:

The mainline pavement structure is designed for traffic volumes of 21,000 vpd in the design year. The truck volume is very high – 17%. This results in a heavy pavement structure with 9.5 inches of asphaltic concrete and 12 inches of GAB. For intersecting county roads, however, the mainline structure is more than is required.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	1,060,000		
- Proposed	-0-		
- Savings	1,060,000		1,060,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,060,000**

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: A5 CLIENT: GADOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
19 mm Superpave	Ton				2327	75	174,525
25 mm Superpave	Ton				-13951	75	-1,046,325
GAB	Ton				-4934	19.24	-94,930
Bituminous Tack	Gal				-500	2.01	-1,005
SUBTOTAL				0			(967,735)
MARK-UP 10.00%				0			(96,774)
TOTAL				0			(1,064,509)
TOTAL ROUNDED				0			(1,060,000)

SR 31 Improvements in Laurens County	ITEM NO: A-5 CLIENT: GA DOT Sheet 3 of 3

An asphalt pavement design was done for a typical intersecting street. The design parameters were as follows:

24-hour truck percentage: 10%

One-way AADT in base year: 175 vpd

One-way AADT in design year: 300 vpd

The APD software indicates that a structural number of 2.82 is required. The following pavement structure has a structural number of 3.58.

12.5 mm Superpave	1.50 inches (165 lb/sq yd)
19 mm Superpave	3.00 inches (330 lb/sq yd)
GAB	10.00 inches

This pavement is over designed approximately 27%, but the over design allows for occasional heavy vehicles to pass without causing a pavement failure.

For cross streets, pavement quantities would be reduced as follows:

12.5 mm Superpave	No change
19 mm Superpave	+ 2327 tons
25 mm Superpave	- 13,951 tons (all 25 mm Superpave is deleted for cross streets)
GAB	- 4,934 tons
Bituminous Tack	- 500 gallons

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: B1	**PAGE No.:** 1 of 3	**CREATIVE IDEA:** Reduce Median Width (south portion of project)
Comp By: JRC	Date: 8/07/07	Checked By: DCW Date: 8/7/2007

Original Concept: The baseline concept specifies two basic median types for this project:

1. Sta. 127+00 to sta. 325+00. 44-foot depressed median (19,800 feet/3.75 miles).
2. Sta. 325+00 to sta. 479+00. 20-foot raised median (25,400 feet/2.92 miles)

The preferred section for a four-lane rural GRIP project such as this is a 44-foot median. A narrower 20-foot median is proposed for the northern section of the project in order to minimize right of way impacts.

Proposed Change:
The VE recommendation is to construct a 20-foot raised median throughout the length of the project.

Justification: Although a 44-foot median is the standard median for a GRIP project, the baseline concept indicates that approximately 44% of this project will have a 20-foot raised median in order to minimize right of way impacts.

The function of any median is to separate opposing traffic flows and, to a certain extent, to control access to the road. A 20-foot raised median will perform these functions satisfactorily, although with a slightly higher probability of a vehicle crossing the median into the opposing lanes. With the relatively low traffic volumes and the moderately well developed exurban nature of the project corridor, a 20-foot raised median would be appropriate for the entire project. The 20-foot median would reduce right of way impacts and would result in reduced construction and right of way costs.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	367,000		
- Proposed	-0-		
- Savings	367,000		367,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**367,000**

							COST WORKSHEET
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: B1 CLIENT: GADOT		
					Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Curb and Gutter	LF				39600	15	596,376
Earthwork	CY				-35200	5	(176,000)
Asphaltic Concrete	Ton				-4600	75	(345,000)
GAB	Ton				-7300	19.24	(140,452)
Clear and Grub	Acre				-11	1000	(11,000)
Right of Way	**Acre				-11	7000	(77,000)
Drop Inlets	Each				-32	4000	(128,000)
24-in pipe	LF				-500	56	(28,000)
Miscellaneous	Lump				-1	25000	(25,000)
**ROW=$5000/Ac + 40% inflation=							
$7,000							
SUBTOTAL				0			(334,076)
MARK-UP 10.00%				0			(33,408)
TOTAL				0			(367,484)
TOTAL ROUNDED				0			(367,000)

SR 31 Improvements in Laurens County	ITEM NO : B-1 CLIENT: GA DOT Sheet 3 of 3

For cost reduction, assume:

An additional cost for the concrete curb and gutter.

Cost reduction for less earthwork.

Cost reduction for less asphaltic concrete and GAB base (shoulder paving).

Cost reduction for less required right of way.

Cost reduction for less clearing and grubbing.

With no median drainage (except in superelevated sections), a cost reduction for drainage.

Other costs (erosion control, signing and marking, etc.) would be reduced, but these are difficult to quantify at this level of study.

For earthwork, assume a reduction of 24 feet in width by an average grading height/depth of 2.0 feet = 19,800 ft x 24 ft x 2.0 ft /27 = 35,200 cubic yards.

For asphaltic concrete (shoulders), assume a reduction of 4 feet in width x 19,800 feet. 4 ft x 19,800 feet = 79,200 sq ft/9 = 8,800 sq yd. Total asphaltic concrete = 1,045 lb/sq yd x 8,800 sq yd / 2,000 = 4,600 tons

For GAB (shoulders), assume a reduction of 5 feet in width x 19,800 feet. 5 ft x 19,800 ft = 99,000 sq ft. Since the GAB is 12 inches thick, the total is 99,000 cu ft = 3,650 cu yd. Assuming 2.0 tons/cu yd, the total is 7,300 tons.

For right of way, assume that the width of required right of way can be reduced by 24 feet. Total area = 19,800 ft x 24 = 475,200 sq ft = 11.0 acres. Assume an average value of $5,000 per acre.

For drainage: there are approximately median drop inlets that will not be required. Pipe lengths will be shorter with the 20-foot median. Assume a 24-inch pipe length of 500 feet to estimate cost reduction.

For miscellaneous items, estimate $25,000 total.

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
C-1	1 of 3	Use Soil-Cement Base Course Material as an Alternate
Comp By: JRC	Date: 08/07/07	Checked By: DCW Date:08/07/07

Original Concept:

The baseline concept specifies graded aggregate base course for the pavement structure.

Proposed Change:

The VE recommendation is to add an alternate base course of soil-cement, with both soil-cement and graded aggregate to be bid as alternates. To be structurally equivalent, 12 inches GAB = 9 inches soil-cement.

Justification:

The project is located in that part of the State where soil-cement base courses are acceptable, and unless there are geotechnical objections, soil-cement should be considered and bid as an alternate base course material. Calculations indicate a potential substantial savings may be possible.

LIFE CYCLE COST SUMMARY	CAPITAL COST	ANNUAL COST	PRESENT WORTH
INITIAL COST - Original	4,169,000		
- Proposed	3,146,000		
- Savings	1,023,000		1,023,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,023,000**

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: C1 CLIENT: GADOT Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Graded Aggregate Base	Tons	196970	19	3,789,703			
Soil-Cement Base	SY				286000	10	2,860,000
SUBTOTAL				3,789,703			2,860,000
MARK-UP 10.00%				378,970			286,000
TOTAL				4,168,673			3,146,000
TOTAL ROUNDED				4,169,000			3,146,000

SR 31 Improvements in Laurens County	ITEM NO : C-1 CLIENT: GA DOT Sheet 3 of 3

The most recent GDOT bid item index shows only one comparable item – an 8-inch premixed soil-cement base bid at $7.70/sq yd. The area for the GAB was determined, and an estimated bid price of $9.00/sq yd was used for the same area of soil-cement. A conservative unit price of $10.00 was used to account for the 9-inch thickness.

DEVELOPMENT AND RECOMMENDATION PHASE

SR 31 Improvements in Laurens County

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
D-1	1 of 2	Base Clear Zones on 55 mph Design Speed

Comp By: JRC Date: 08/07/07 Checked By: DCW Date: 08/07/07

Original Concept:

The baseline concept provides for a 65 mph design speed for the section from sta. 127+00 to sta. 325+00 (3.75 miles). The highway will be posted for 55 mph. For a 6:1 fill section with a 65 mph design speed, the recommended clear zone is 30-34 feet. The typical sections and cross sections indicate that a minimum clear zone width of 32 feet has been used.

Proposed Change:

The VE recommendation is to reduce the design speed to 55 mph in the section from sta. 127+00 to sta. 325+00. Accordingly, the recommended clear zone would be reduced. For a 6:1 fill slope we recommend a 24-foot clear zone.

Justification:

Reducing the design speed to the posted speed would allow the use of slightly reduced clear zone widths. This would have a small but significant effect on earthwork quantities, right of way requirements, drainage pipe lengths, and other miscellaneous items.

It is difficult to quantify cost savings at this level of study. However, we will assume that earthwork is reduced by 0.75 cubic yard per linear foot of the project. The total amount of reduced earthwork is then approximately 19,800 lin ft x 0.75 = 14,850 cy. The savings based on this estimated number will include other related incidentals such as clearing and grubbing, erosion control, and drainage. ROW is reduced (19,800 X 8) / 43,560 = 3.6 acres.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**ANNUAL COST**	**PRESENT WORTH**
INITIAL COST - Original	109,000		
- Proposed	-0-		
- Savings	109,000		109,000
ANNUAL COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**109,000**

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: D1 CLIENT: GADOT Sheet 2 of 2		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Earthwork	CY				-14,850	5	(74,250)
ROW	acres				-3.6	7000	(25,200)
SUBTOTAL				0			(99,450)
MARK-UP 10.00%				0			(9,945)
TOTAL				0			(109,395)
TOTAL ROUNDED				0			(109,000)

DEVELOPMENT AND RECOMMENDATION PHASE

SR 31 Improvements in Laurens County

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
I-1	1 of 5	Retain the existing width for Turkey Creek bridge

Comp By: DC Date: 8/7/07 Checked By: DCW Date: 8/8/07

Original Concept:
Widen the Turkey Creek bridge by 6 feet to match the width of approach roadways. Baseline approach roadway would consist of a total pavement width of 88 feet. The current width of Turkey Creek bridge (from inside of barrier to barrier) is 82 feet. Therefore, the deck of this bridge is to be widened by 6 feet on the eastern edge.

Proposed Change:
Do not widen the Turkey Creek bridge.

Justification:
1. Widening the Turkey Creek bridge on eastern edge would cause the bridge to be unsymmetric with respect to the existing substructure. Unless the substructure of the bridge is retrofitted properly (no plan is presented so far from the design team in this regard), this would cause undesirable stresses in the substructure.
2. Despite high sufficiency rating (86.6% per 1999 inspection), Turkey Creek bridge is now 50 years old and shows such problems as cracking, efflorescence, etc. In the Baseline approach, the weight of raised median is to be located entirely within the old central portion of the bridge (the bridge was originally about 26 feet wide and it was once widened symmetrically on both sides to the total width of 82 feet) and that may require some local retrofitting for this part of the bridge. Eventually, when this bridge is to be replaced, its old central portion along with the raised median might also pose construction difficulty during MOT staging.
3. If Turkey Creek bridge is not widened, there would be a cost saving of about $459,400. Although this cost saving does not seem substantial and would lead to narrower shoulder width (7 feet compared to 10 feet in Baseline), this would, however eliminate future maintenance issues that might arise due to widening (such as corrosion at or near the new longitudinal joint in the deck).

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**ANNUAL COST**	**PRESENT WORTH**
INITIAL COST - Original	412,500		
- Proposed	0		
- Savings	412,500		412,500
ANNUAL COST - Savings		$3,000	46,900
TOTAL PRESENT WORTH SAVINGS			**459,400**

SKETCH

SR 31 Improvements in Laurens County	ITEM N^{O} : I-1 CLIENT: GA DOT Sheet 2 of 5

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: I-1 CLIENT: GADOT Sheet 3 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Bridge Widening	LS	1	375,000	375,000	0	375,000	0
SUBTOTAL				375,000			0
MARK-UP 10.00%				37,500			0
TOTAL				412,500			0
TOTAL ROUNDED				412,500			0

Life Cycle Cost Analysis – Present Worth Method
Future Cost Calculation

SR 31 Improvements in Laurens County

Creative Idea No. I-1 Sheet 4 of 5

Discount Rate: 4.0% Economic Life: 25 Years

	Original Design		**Alternate Design**	
	Cost	PW	Cost	PW
1. Single Expenditures: (i.e., stage Construction, Major Maintenance)				
a. Year ____ PWF _____				
b. Year ____ PWF _____				
c. Year ____ PWF _____				
d. Salvage / Unused Service Life Year ____ PWF _____				
1. Total Future Single Costs:				
2. Annual Costs:				
a. General Maintenance PWF' 15.622	3,000	46,866	0	0
b. Other Annual Costs PWF' 15.622				
2. Total Future Annual Costs		46,866		0
3. Total Future Costs: (1 + 2)		46,866		0
4. Total Future Cost Savings on a Present Worth Basis (3B-3D)		46,900		
4. Total Future Cost Savings on an Annual Basis (4B X crf_ 0.06401)		3,000		

SR 31 Improvements in Laurens County	ITEM N^{O} : I-1 CLIENT: GA DOT Sheet 5 of 5

Cost of Bridge widening as shown in the project cost estimate = $375,000

Assume, average annual maintenance cost increase due to widening = $3,000

Assume, economic life-span of bridge after widening = 25 years

Therefore, total increase in maintenance cost throughout the life of bridge due to widening =

15.622 X $3,000 = $46,866

Therefore, present worth of total saving by not widening the bridge = $375,000 + $46,866 = $421,866

With 10% mark-up for capital cost, the total saving is 1.1 X $375,000 + $46,866 = $459,400

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 31 Improvements in Laurens County		
IDEA No.: I-2	**PAGE No.:** 1 of 5	**CREATIVE IDEA:** Replace Turkey Creek bridge with a new one
Comp By: DC	Date: 8/7/07	Checked By: DCW Date: 8/8/07

Original Concept:

Widen the Turkey Creek bridge by 6 feet to match the width of approach roadways. Baseline approach roadway would consist of a total pavement width of 88 feet. The current width of Turkey Creek bridge (from inside of barrier to barrier) is 82 feet. Therefore, the deck of this bridge is to be widened by 6 feet on the eastern edge.

Proposed Change:

Replace the Turkey Creek bridge with a new one.

Justification:

1. Widening the Turkey Creek bridge on eastern edge would cause the bridge to be unsymmetric with respect to the existing substructure. Unless the substructure of the bridge is retrofitted properly (no plan is presented so far from the design team in this regard), this would cause undesirable stresses in the substructure. Construction of a new bridge would eliminate the possibility of such distress.
2. Despite high sufficiency rating (86.6% per 1999 inspection), Turkey Creek bridge is now 50 years old and shows such problems as cracking, efflorescence, etc. The bridge was originally about 26 feet wide and it was once widened symmetrically on both sides to the total width of 82 feet. Hence, widening for the second time would render the bridge composed of concrete components with three different ages having three different creep-shrinkage characteristics. This would entail a complicated design process. Whereas, a new bridge would require a much simpler design.
3. Although, overall cost of a new bridge is more than that for widening it, a new bridge could still be a viable option from the perspective of design simplicity, ease of construction and future maintenance.
4. While retrofitting an old bridge like Turkey Creek bridge, some unforeseen problems often get detected which would make replacement more viable option than retrofitting.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	412,500		
- Proposed	2,808,700		
- Savings	(2,396,200)		(2,396,200)
ANNUAL COST - Savings		114,800	1,890,700
TOTAL PRESENT WORTH SAVINGS			**(505,500)**

SR 31 Improvements in Laurens County	ITEM N^{O} : I-2 CLIENT: GA DOT Sheet 2 of 5

COST WORKSHEET							
PROJECT: **SR31 Improvements in Laurens County**					ITEM No: I-2 CLIENT: GADOT Sheet 3 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Bridge Widening	LS	1	375,000	375,000	0		0
New bridge construction	LS				1	2,808,700	2,808,700
SUBTOTAL				375,000			2,808,700
MARK-UP 10.00%				37,500			0
(Inc in New Est)							
TOTAL				412,500			2,808,700
TOTAL ROUNDED				412,500			2,808,700

Life Cycle Cost Analysis – Present Worth Method
Future Cost Calculation

SR 31 Improvements in Laurens County

Creative Idea No. I-2 Sheet 4 of 5

Discount Rate: 4.0% Economic Life: 25 Years

	Original Design		**Alternate Design**	
	Cost	PW	Cost	PW
1. Single Expenditures: (i.e., stage Construction, Major Maintenance)				
a. Year _0_ PWF _1_	0	0		
b. Year _0_ PWF _1_			0	0
c. Year _25_ PWF _0.37512_	2,808,675	1,053,590	0	0
d. Salvage / Unused Service Life Year _25_ PWF _0.37512_			-2,106,000	-790,193
1. Total Future Single Costs:		1,053,600		-790,200
2. Annual Costs:				
a. General Maintenance PWF' 15.622	3,000	46,866	0	0
b. Other Annual Costs PWF' 15.622				
2. Total Future Annual Costs		46,900		0
3. Total Future Costs: (1 + 2)		1,100,500		-790,200
4. Total Future Cost Savings on a Present Worth Basis (3B-3D)		1,890,700		
4. Total Future Cost Savings on an Annual Basis (4B X crf_ 0.06401)		114,800		

SR 31 Improvements in Laurens County	ITEM N^{O} : I-2 CLIENT: GA DOT Sheet 5 of 5

Length of the new bridge = 324 ft

Width of new bridge = 91'-3"

Width of old bridge = 85'-3"

Cost of new bridge per ft^2 = $95

Cost of new bridge = 324 X 91.25 X $95 = $2,808,000

Cost of Bridge widening as shown in the project cost estimate = $375,000 + 10% = 412,500

Assume, average annual maintenance cost increase due to widening = $3,000

Assume, economic life-span of existing bridge after widening = 25 years

Therefore, total increase in maintenance cost throughout the life of bridge due to widening = 15.622 X $3,000 = $46,866

Present worth of salvage of new bridge constructed today = 0.37512*(75/100)*$2,808,675 = $790,193

Present worth of new bridge constructed 25 years later = 0.37512*$2,808,675 = $1,053,590 (assuming life of new bridge to be 100 years and a straight line depreciation).

A negative saving indicates a cost increase for the new bridge option over the Baseline widening option. However, this cost increase could be offset by simplistic design, ease of construction and maintenance associated with the new bridge, etc. that are difficult to quantify.

Appendix

COST DISTRIBUTION

By

Decreasing Item Number

SR 31 Improvements in Laurens County

Element ID.	Item Description	Cost x $1,000	%
A	Pavement	17,317	43
B	Right of Way	12,250	30
C	Base Materials	4,277	11
80% Cost Line			
D	Earthwork	1,657	4
E	Drainage	1,651	4
F	Erosion Control	1,023	3
G	Concrete	974	2
H	Traffic Signs and Marking	418	1
I	Bridge Widening	412	1
J	Traffic Control	207	1
K	Guardrail	135	-0-
L	Misc.	117	-0-
	TOTALS	**$40,438**	**100**

FIGURE B-3
Worksheet No. 2

INFORMATION PHASE FUNCTION ANALYSIS

SR 31 Improvements in Laurens County

System: Road Improvements
Function: Increase Capacity

ITEM No.	DESCRIPTION	FUNCTION			INITIAL DOLLARS (x 1,000)		
		Verb	Noun	Kind*	Cost	% of Total	Worth
A	Pavement	Support	Vehicles	B	17,317	43	17,000
		Delineates	Roadway				
		Redirect	Fluids				
		Increases	Friction				
B	Right of way	Provides	Space	S	12,250	30	9,300
C	Base Material	Support	Pavement	B	4,277	10	4,100
D	Earthwork	Achieve	Alignment	S	1,657	4	1,500
E	Drainage	Redirect	Fluids	S	1,651	4	1,651
F	Erosion Control	Prevent	Erosion	S	1,023	3	900
G	Concrete	Access	Highway	S	974	2	2,000
		Separate	Traffic				
H	Traffic Signs / Markings	Inform	Motorist	S	418	1	418
I	Bridge Widening	Match	Approach	S	412	1	0
					39,879	98	36,869

FIGURE B-4
Worksheet No. 3

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
SR 31 Improvements in Laurens County			
NO.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A	**Pavement**		
A-1	Reduce lane widths		**X**
A-2.1	Re-evaluate the extent of side road realignment – CR 249 / CR 165		✓
A-2.2	Re-evaluate the extent of side road realignment – CR 248		✓
A-2.3	Re-evaluate the extent of side road realignment – SR 117 / CR 248		✓
A-2.4	Re-evaluate the extent of side road realignment – CR 302		✓
A-2.5	Re-evaluate the extent of side road realignment – CR 292 / CR 521		✓
A-2.6	Re-evaluate the extent of side road realignment – CR 157		✓
A-2.7	Re-evaluate the extent of side road realignment – Dominy Camphouse Rd		✓
A-3	Reduce pavement thickness		**X**
A-4	Delete leveling for adverse crown		✓
B	**Right of way**		
B-1	Reduce median width		✓
B-2	Evaluate limits of work in select areas		**See D-1**

NO.	CREATIVE IDEA	COMMENTS	IDEA RATING
C	**Base Materials**		
C-1	Evaluate alternative sub-base design		✓
D	**Earthwork**		
D-1	Reduce design speed to 55 (reduce design speed)		✓
E	**Drainage**		
	No ideas generated		
F	**Erosion Control**		
	No ideas generated		
G	**Concrete**		
	No ideas generated		
H	**Signs / Markings**		
	No ideas generated		
I	**Bridge widening**		
I-1	Retain existing bridge width		✓
I-2	Build all new bridge now		✓

VE STUDY SIGN-IN SHEET

Project No.: EDS-441(20) County: Laurens PI No.: 262027 Date: August 6-9, 2007

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