SR 30/US 280 @ Oconee River & Overflows

BR000-0001-00(366), P.I. No. 0001366

Wheeler & Montgomery Counties, Georgia

Value Engineering Study Report

September 2010

Designers

GDOT District 5

Value Engineering Consultant

Lewis & Zimmerman Associates, Inc.

an ARCADIS company

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Fax: 410.381.0109
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Mr. Matthew J. Sanders, AVS
Value Engineering Specialist
Georgia Department of Transportation - Engineering Services
One Georgia Center – 5th Floor
600 West Peachtree Street
Atlanta, Georgia 30308

Re: SR 30/US 280 @ Oconee River & Overflows
BR000-0001-00(366), P.I. No. 0001366
Value Engineering Study Report

Date:
September 14, 2010

Contact:
David Hamilton

Phone:
253.229.7703

Email:
dahamilton@lza.com

Our ref:
LZ083359.0000

Dear Mr. Sanders:

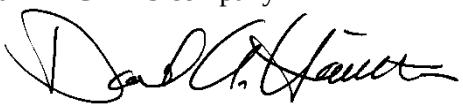
Lewis & Zimmerman Associates, Inc., an ARCADIS company, is pleased to submit two hard copies and one electronic copy of the referenced value engineering (VE) study report documenting the study that took place on August 30-September 2, 2010. The objective of the VE effort was to identify opportunities to enhance the value of the project that constructs three bridges over the Oconee River and two overflows.

The VE team developed several ideas to reduce the construction effort by lowering the profile on the western end of the main span bridge. Another key idea uses longer bridge spans with deeper beam sections. The second alternative would reduce the number of members, reduce backwater caused by the additional bents, and streamline construction.

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

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company



David A. Hamilton, PE, CVS, CCE, LEED^{AP}
Principal Engineer/VE Team Leader

Attachment

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Georgia Department of Transportation (GDOT). The subject of the study was the SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, project located in Wheeler and Montgomery Counties, GA. The project was at the preliminary design completion stage at the time of the VE study and had a total estimated construction cost of $19.8M. GDOT District 5 was designing the project and provided the needed information for the VE team to use as the basis for this study which was conducted August 30-September 2, 2010, at GDOT's Atlanta, Georgia headquarters.

Comprising the VE team were a highway engineer, a bridge engineer, a construction specialist, and a Certified Value Specialist (CVS) team leader. The team used the following six-phase VE job plan to guide its deliberations.

- Information Gathering Phase
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

PROJECT DESCRIPTION

Bridge project BR000-0001-00(366) P.I. No. 0001366, includes the replacement of three (3) narrow and structurally deficient bridges on SR 30/US 280 over the Oconee River, 2.0 miles east of Glenwood, Georgia. The project begins at Mile Point (MP) 16.95 and ends at MP 1.15, for a total project length of 1.69 miles. The existing Oconee River Bridge (2,378 ft. x 28 ft.) was built in 1956 and consists of concrete bents with concrete caps, a concrete T-beam superstructure, and a concrete deck with a sufficiency rating of 18. The existing roadway section consists of two paved 12-ft.-wide lanes, 8-ft.-wide shoulders (including 2-ft. paved) and V-ditches left and right. The road is classified as a Rural Principal Arterial and has a posted speed of 55 mph.

The existing Oconee River Overflows No.1 and No. 2, being 324 ft. x 28 ft. and 135 ft. x 28 ft., respectively, were built in 1956 and both have a sufficiency rating of 69. The existing approaches consist of two 12-ft.-wide lanes with 8-ft.-wide rural shoulders (including 2 ft. paved) on 300 ft. of existing right-of-way.

The State Route 30/US 280 corridor is part of the Governors Road Improvement Program (GRIP) and was approved for implementation by the governor and the state legislature. The State Route 30/US 280 will be widened in the future to four lanes with a 44-ft.-wide median under GRIP project MSL-0004-00(774), P.I. No.0004774. The construction of the GRIP project is scheduled in the Long

Range plan. The base year traffic (2008) on this section of SR 30/US 280 is 6,500 vehicles per day (VPD) and the 20-year traffic (2028) or design year projected volume is 10,000 VPD, with a design speed of 65 MPH.

This project replaces the existing bridges over the Oconee River and the two overflows with new 2,400 ft. x 44 ft., 350 ft. x 44 ft., and 200 ft. x 44 ft. concrete bridges, respectively, constructed on a new alignment south of the existing bridges. Foundations will be pile-supported bents. The relocated SR 30/US 280 will consist of two 12-ft.-wide lanes with 10 ft. rural shoulders (including 6.5 ft. paved) on 350 ft. of proposed right-of-way. Traffic will be maintained on the existing bridges while the proposed bridges are constructed.

Project Cost and Schedule
The total project cost is estimated at $19,839,000 including 5% engineering and inspection, and 4% construction contingency. Approximately 175,000 CY of fill material will be required for the new roadway.

CONCERNS AND OBJECTIVES

This project encompasses the replacement of the existing bridges over the Oconee River and two overflows and is at the preliminary design completion stage. The following key concerns were noted by the team as they reviewed the project:

- Right-of-way (ROW) is required to expand the ROW to 350 ft.;
- Wetland mitigation is required for several areas;
- Traffic must remain on the existing bridges during construction of the new facilities;
- A large amount of imported soil is required for the new alignment; and
- The demolition cost to remove the three structures is more than $1.7M.

With this background, the VE team was tasked with identifying opportunities that will enhance the functionality of the project, reduce life cycle costs and reduce the quantity of embankment required.

RESULTS OF THE STUDY

The value engineering team developed 12 alternatives to address the concerns noted above with the emphasis being on reducing the total life cycle cost to replace the bridges. All of the alternatives are shown on the following Summary of Potential Cost Savings table and detailed in Section Two of the report. The following highlights those alternatives having the greatest potential impact on the project:

Alignment
The main span structure has a sufficiency rating of approximately 18 and is clearly in need of replacement. Overflows No. 1 and No. 2 however, are in far better condition and have sufficiency ratings of 69. Although the geometry of the bridge section is narrow in comparison to the designed replacements, the two overflows are in serviceable condition. It would be feasible to shorten the project on the east side of the Oconee River and end the project at Station 200+00 rather than Station 230+00. This would defer construction of 3,000 feet of roadway, including Overflows No. 1 and No.

2 until the next phase of development. Deferring the two overflow structures and this section of roadway would result in cost savings in the range of $2.8M (Reference Alternative No. A-5).

Another alternative would modify the beginning point of the project on the west end from Station 153+00 to Station 141+50, reducing the total project length by approximately 1,150 ft. This reduction in roadway length would generate nearly $275,000 in cost avoidance. (Reference Alternative No. A-2).

Profile Adjustments

The fill depth on the west end of the alignment is significant in places and adjustments to the profile are possible to reduce the amount of embankment. Lowering the profile on the west end by 1 to 2 ft. would reduce the embankment quantity by more than 20,000 CY, resulting in a potential project cost savings of almost $190,000 (Reference Alternative No. P-2).

Travel Lane Width

The travel lanes are currently designed using a 12 ft. width, which appears appropriate for the design speed, however the traffic is relatively modest and some consideration could be given to 11-ft.-wide or 11.5-ft-wide lanes. Other possibilities for the section would include using 4 ft. paved shoulder sections in lieu of the 6.5 ft. sections. Reducing the travel lane width has minimal cost advantages, but reducing the paved shoulder width to 4 ft. would result in cost savings on the order of $90,000 (Reference Alternative Nos. S-1, S-3, S-4).

Bridge Design

The current bridge design for the main span structure includes a number of shorter 70 ft. spans. Increasing the length of these spans from 70 ft. to either 84 ft. or 110 ft. would reduce the number of foundations and result in saving in the range of $240,000 (Reference Alternative No. B-3). Another option would be to change the foundations on the shorter 70 ft. span sections from concrete piers to pile bents. This would reduce the construction effort and generate a potential cost savings in the range of $140,000 (Reference Alternative No. B-13).

Much of the project cost is in the demolition of the main span bridge, Overflows No. 1 and No. 2. Thought should be given to deferring this expense until the future expansion is required to meet traffic demand. If the demolition of all three bridges is deferred, a reduction in project cost of $1.7M could be achieved (Reference Alternative No. B-12). Another option would be to demolish only that portion of the main span bridge directly over the Oconee River and defer the remaining sections. This reduction in demolition cost would defer approximately $1.3M until the future 4-lane expansion (Reference Alternative No. B-12.1).

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Prelim. Engineering

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	PRESENT WORTH OF COST SAVINGS: RECURRING COST SAVINGS	PRESENT WORTH OF COST SAVINGS: TOTAL PW LCC SAVINGS
ALIGNMENT (A)						
A-2	Shorten the project length by 1,150 ft. by shifting the beginning point on the west end from STA 141+50 to STA 153+00 and shortening the roadway approach to the mainline bridge	$273,000	$0	$273,000	$0	$273,000
A-5	Shorten the project length by ending construction at Sta. 200+00 in lieu of Sta. 230+00 and by deferring the replacement of Overflow Bridges #1 & #2 to a future project	$2,876,000	$0	$2,876,000	$0	$2,876,000
PROFILE (P)						
P-2	Lower the profile on the west end by 1 to 2 feet to reduce borrow quantities	$187,000	$0	$187,000	$0	$187,000
SECTION (S)						
S-1	Use a 4-ft.-wide paved shoulder section in lieu of 6.5-ft-wide	$91,000	$0	$91,000	$0	$91,000
S-3	Use 11.5-ft.-wide travel lanes in lieu of 12-ft.-wide	$36,000	$0	$36,000	$0	$36,000
S-4	Use 11-ft.-wide lanes on the boat ramp and CR 179 in lieu of 12-ft.-wide	$6,000	$0	$6,000	$0	$6,000
S-5	Use 2:1 slopes in lieu of 4:1 slopes where feasible	$11,000	$0	$11,000	$0	$11,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
BRIDGE (B)						
B-3	Use longer spans on the east end of Bridge No. 1 (Main Span)	$1,780,000	$1,540,000	$240,000	$0	$240,000
B-12	Abandon the old bridges in place and defer demolition until the future 4-lane expansion project (2028)	$1,732,000	$16,000	$1,716,000	$0	$1,716,000
B-12.1	Demolish only the portion of Bridge No. 1 (Main Span) which is located directly over the river (STA 166+00 to STA 173+00) and abandon the remainder in place until the future 4-lane expansion project (2028)	$1,732,000	$442,000	$1,290,000	$0	$1,290,000
B-13	Replace the concrete piers on the 70 ft. spans with a pile bent substructure on Bridge No. 1 (Main Span)	$889,000	$746,000	$143,000	$0	$143,000
CONSTRUCTION MANAGEMENT (CM)						
CM-3	Revise the earthwork quantities for borrow material to reduce the risk during the bidding phase	$282,000	$0	$282,000	$0	$282,000

STUDY RESULTS

GENERAL

The results of this value engineering study conducted on the SR 30/US 280 over Oconee River & Overflows bridge replacement project portray the benefits that can be realized by GDOT, the owner, Wheeler and Montgomery Counties, the users and the GDOT design team. The results will directly affect the project's design and will require coordination among GDOT staff to determine the disposition of each alternative.

During the VE study, many ideas for potential value enhance were conceived and evaluated by the team for technical merit, applicability to the project, implementability considering the project's status, 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 (typically without cost estimates). For each alternative developed, the following information is 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 (where 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 used unit quantities contained in the project cost estimate prepared by the designers, whenever possible. If unit quantities were not available, published data bases, such as the one produced by the RS Means Company, or team member or owner data bases were consulted. A composite markup of 9%, as described in Section Four of the report, was used to generate an all-inclusive project cost for the construction items being compared.

Each alternative developed is identified with an alternative number (Alt. No.) track it through the value analysis process and thus facilitating 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 a major project element listed below:

PROJECT ELEMENT	PREFIX
Alignment	A
Profile	P
Section	S
Bridges	B
Construction Management	CM

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

KEY ISSUES

This project is being developed to improve traffic operations, replace the structurally deficient bridges on SR 30/US 280 with three new 44-ft.-wide reinforced concrete bridges, and reduce future maintenance costs. To achieve these goals it will be necessary to route traffic onto a new parallel alignment, construct the three new bridges, raise the profile to meet the 100 yr. flood elevation, and tie the alignment back into SR 30/US 280 on the west and east banks of the Oconee River. The new alignment will require a substantial amount of new embankment, necessitating a major trucking operation to import the needed fill material. Another major component of the project is the $1.7M effort required to demolish the three existing structures after the new alignment is operational.

STUDY OBJECTIVES

To assist GDOT achieve its project goals in a cost-effective manner, it convened this VE study. The study team was tasked with identifying specific changes to the current design that will enhance its value by improving functionality, saving life cycle costs or a combination of the two.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 12 alternatives for consideration by GDOT. These alternatives address the key issues described above and are detailed in the remainder of this section of the report. The alternatives with the greatest potential to impact the key issues noted above include the following:

Alignment

The main span structure has a sufficiency rating of approximately 18 and is clearly in need of replacement. Overflows No. 1 and No. 2 however, are in far better condition and have sufficiency ratings of 69. Although the geometry of the bridge section is narrow in comparison to the designed replacements, the two overflows are in serviceable condition. It would be feasible to shorten the project on the east side of the Oconee River and end the project at Station 200+00 rather than Station 230+00. This would defer construction of 3,000 feet of roadway, including Overflows No. 1 and No. 2 until the next phase of development. Deferring the two overflow structures and this section of roadway would result in cost savings in the range of $2.8M (Reference Alternative No. A-5).

Another alternative would modify the beginning point of the project on the west end from Station 153+00 to Station 141+50, reducing the total project length by approximately 1,150 ft. This reduction in roadway length would generate nearly $275,000 in cost avoidance. (Reference Alternative No. A-2).

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EVALUATION OF ALTERNATIVES

When reviewing the study results, the reader 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 that is acceptable should be considered for use in the final design, even if the entire alternative is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives 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.

The reader 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.

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S-4	Use 11-ft.-wide lanes on the boat ramp and CR 179 in lieu of 12-ft.-wide	$6,000	$0	$6,000	$0	$6,000
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VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **A-2**

DESCRIPTION: **SHORTEN THE PROJECT LENGTH BY 1,150 FT. BY MOVING THE BEGINNING POINT ON THE WEST END FROM STA. 141+50 TO STA. 153+00 AND SHORTENING THE ROADWAY APPROACH TO THE MAILINE BRIDGE**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN:

The new roadway approach begins at Station 141+50 and the total project has a length of 1.68 miles.

ALTERNATIVE:

Begin the project at Station 153+00 and shorten the project by 1,150 ft. Reduce the total project length to 1.48 miles.

ADVANTAGES:

- Reduces roadway material and labor requirements
- Reduces construction time
- Reduces borrow material quantity

DISADVANTAGES:

- Less new pavement in the corridor

DISCUSSION:

The current design uses 2,450 ft. of new roadway alignment to tie the existing SR 30/US 280 into the new mainline bridge. This alternative would require only 1,400 ft. of new roadway. The alternative design for the horizontal alignment uses two 2,000 ft. radii with 5.8% super elevation for 55 mph. If a design speed of 65 mph is desired, a 2,000 ft. radius with more super elevation could be used. However, the alternative roadway design is appropriate for existing conditions using a posted speed of 55 mph. The alternative design retains the provisions for a right-turn lane onto CR 179.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 273,000	—	$ 273,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 273,000	—	$ 273,000

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J:\DESIGN\0001366\DGN FILES\001366CP02.dgn

C:\TMP\000\001366CP02.prf

\\gdot-dsnl\gocfg\resources\Gdot2007half_Klp.tbl

24 16:09:42 2010

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR000-0001-00(366)		

CURVE DATA KC103
PI Sta = 136+25.15
PI North = 797178.67
PI East = 508979.35
Delta = 45°54'04.2"
D = 2°28'20.8"
T = 1005.25
L = 1896.96
R = 2317.38
E = 208.64
e = 4.84%

BEG. PROJECT
BEG. CONSTRUCTION
BR000-0001-00(366)
US 280/SR 30
STA. 141+50.00
M.P. 16.95

BM 601
18" WATER OAK
STA. 138+60.75
53.52 LT
ELEV. 146.43

STA 141+50

140+00

145+00

150+00

LIMITS OF PVMT REMOVAL
US 280/SR 30
STA. 144+43.00

BEGIN SPECIAL DITCH
STA. 145+00

REMOVE PVMT
RETAIN EXIST. FILL
GRASSGRADE TO DRAIN

EXIST. R/W

EXISTING PIPE
TO BE REMOVED

US 280/SR 30

CONSTR. Q

EXISTING US 280/SR 30

S 87°12'42.1" E
357.35'

EXIST. R/W

REQ'D. R/W

EOP

CONSTR. Q

C KC 104

50+00

PI 50+0

KC10652
KC10653
KC10654
KC10655
KC10293
KC10294
KC10295
KC10296
KC10297
KC10298
KC10299
KC10300
KC10301
KC10302
KC10303
KC10304
KC10305
KC10306
KC10307
KC10308
KC10309
KC10287
KC10288
KC10547

STA. 141+50.00
50.00'
60.00'

BEGIN SPECIAL DITCH
STA. 141+60

EFS
144+75.53

STA. 145+16.86
60.00'

PT 145+16.86

FLAT
145+99.53

BC
145+48.29

BEGIN NC
146+50.71

SH. BEG/END NC
147+11.80

END NC
147+78.67

STA. 148+74.21
60.00'

BFS
148+96.60

BC
148+80.25

FLAT
148+29.46

END SPECIAL DITCH
STA. 150+19.49

PI 151+24.43

EFS
153+51.83

BC
153+68.18

STA. 153+74.22
60.00'

STA. 154+00.00
60.00'
90.00'

154+38
90'&100'

1
NANCY G. PINCKNEY TRUST

3
NANCY G. PINCKNEY TRUST

4
RODNEY R

LIMITS OF CONSTRUCTION
CR 170 (OCHWALKEE CREEK RD)
STA. 56+55.00

LIMITS OF OVERLAY
CR 179/OCHWALKEE CREEK RD
STA. 55+55.85

STA. 55+55.85
-40.00' CR 179 (KC2)
-60.00' CR 179 (KC2)

PI 55+55.85

BEGIN NC
55+47.12

(2) 18" S.E.S.

226.02'
N 44°11'47" W

55+00

REQ'D. R/W

FLAT
54+49.82

STA. 53+29.84
-60.00' CR 179 (KC2)

PT 53+29.84

STA. 53+29.84
60.00' CR 179 (

LIMITS OF OVERLAY
CR 179/OCHWALKEE CREEK RD
STA. 52+17.24

STA. 51+26.10
-60.00' CR 179 (KC2)

PT 51+14.37

(2) 18" SAFETY INLET
W/GRATE

R 40

CURVE DATA KC104
PI Sta = 151+24.43
PI North = 797100.22
PI East = 510590.26
Delta = 5°59'00"
D = 1°10'00"
T = 250.22
L = 500.00
R = 4911.07
E = 46.37
e = 2.64%

Original Design

US280/SR30
STA. 154+00.00
M.P. 17.19
CR 179 (OCHWALKEE CREEK RD)
STA. 50+00.00

BEGIN
153+00(A

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

Sketch
Alt. A-2 2/6

PRELIMINARY PLANS

BLA
ELA
ESS

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

SCALE IN FEET

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: JESUP ROAD DESIGN
MAINLINE PLAN

Wed Mar 24 16:09:29 2010 C:\TMP\001\001366CP03.prf
\\gdot-dsn\gacfg\resources\Gdot2007half_Kip.tbl
J:\DESIGN\0001366\DGN FILES\001366CP02.prf D5-Jesup

RODNEY R. BROOKS

MONTGOMERY SAND COMPANY

CALVARY'S GRACE BAPTIST CHURCH

CALVARY'S GRACE BAPTIST CHURCH

CALVARY'S GRACE BAPTIST CHURCH

GUY HUGHES

GUY HUGHES

PINCKNEY TRUST

PINCKNEY TRUST

CURVE DATA KC22
PI Sta • 52+26.99
PI North • 797341.54
PI East • 510853.82
Delta • 41°09'05"
D • 19°05'55"
T • 112.62
L • 215.47
R • 300.00
E • 20.44
e • 3.70 %

CURVE DATA KC33
PI Sta • 26+52.09
PI North • 797313.23
PI East • 511731.56
Delta • 90°02'54"
D • 57°17'45"
T • 100.08
L • 157.16
R • 100.00
E • 41.48
e • N/A %

BEGIN NC 55+47.12
PI 55+55.85
(2) 18" S.E.S.
KC10301
KC10547
KC10305
KC10306
KC10299
KC10298
KC10308
KC10287
KC10288
KC10297
KC10530
KC10531
KC10537
KC10538
SVA3236
SVA3237
SVA3225
SVA3251
KC10564
STA. 53+29.84 60.00' CR 179 (KC2)
STA. 52+29.89 60.00' CR 179 (KC2)
52+27 & 52+29.75 61' 70.5'
52+01 & 52+04.5 74' 83'
PI 52+26.99
PI 53+29.84
STA. 51+26.10 -60.00' CR 179 (KC2)
PC 51+14.37
BEGIN NC 154+09.76
EXISTING 18" PIPE TO BE REMOVED
FLAT 154+18.97
BES 51+74.38
RC 50+91.68
EFS 52+69.82
RC 53+52.53
EFS 51+83
RC 53+68.18
STA. 153+74.22 60.00'
STA. 154+00.00 60.00' 90.00'
154+38 90'&100'
154+72 90'&100'
158+52 90'&120'
158+86 90'&120'
STA. 162+50 -243.75' -223.75'
STA. 165+50 -243.75' -223.75'
PT 27+09.17
BM 1 24" PINE TREE STA. 156+63.63 23.64 LT ELEV. 138.680
BM 2 18" PINE TREE STA. 165+73.83 230.26 LT ELEV. = 121.23
LIMITS OF OVERLAY CR 179OCHWALKEE CREEK RD STA. 52+17.24
LIMITS OF PVMT REMOVAL CR 179OCHWALKEE CREEK RD STA. 52+98.82
LIMITS OF CONSTRUCTION BOAT LANDING RD STA. 29+03.68
LIMITS OF FULL DEPTH PVMT BOAT LANDING RD STA. 29+03.68
REMOVE PVMT RETAIN EXIST. FILL GRASSGRADE TO DRAIN
EXISTING USGS STREAMGAGE HOUSING
(2) 30" SAFETY INLET W/GRATE
(2) 18" SAFETY INLET W/GRATE
(2) 18" S.E.S.
EXISTING R/W
REQ'D. R/W
LIMITS OF PVMT REMOVAL US 280SR 30 STA. 154+70.00
EXISTING GPC STRUCTURE
ESA-WETLAND BOUNDARY
ESA - 25' STREAM BUFFER
POND 1
POND 2
BOAT LANDING RD
US 280/SR 30 - CONSTR.
US280SR30 STA. 162+75.00 M.P. 17.36 BOAT LANDING RD STA. 25+00.00
S280SR30 154+00.00 M.P. 17.19 HWALKEE CREEK RD) A. 50+00.00
BEG. EXIST. BRID STA. 166+07.62 M.P.
BEGIN PROPOSED 2310' X 40' BRIDGE NO.1 STA. 166+28.00
N 86°57'17.9" E 6270.46'
N 87°00'12" E 223.32'
R=2000' TL=150' SE=5.8%
Alternate A=2
BEGIN 153+00 (Alt.)
Sketch 3/6
Alt. A-2

OF ACCESS..... BLA
F ACCESS..... ELA
CESS
LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: JESUP ROAD DESIGN
MAINLINE PLAN

DRAWING 13-

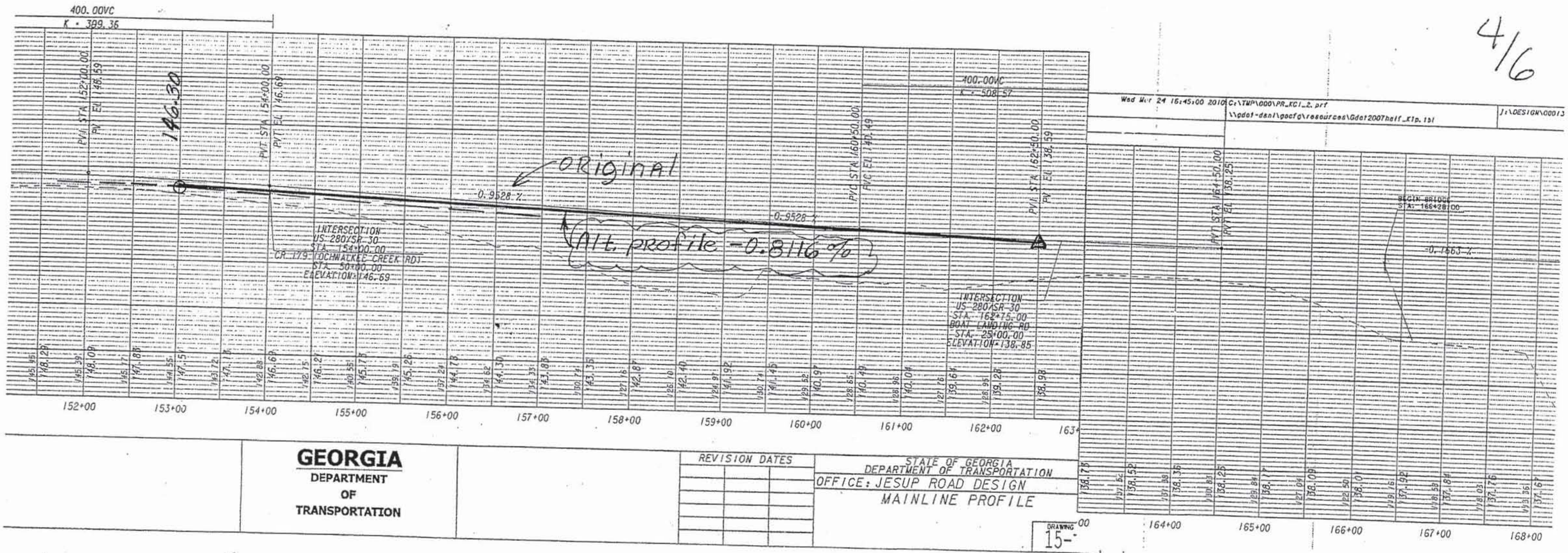
OPERTY AND EXISTING R/W
QUIRED R/W LINE
NSTRUCTION LIMITS
SEMENT FOR CONSTR
MAINTENANCE OF SLOPE
SEMENT FOR CONSTR OF S
SEMENT FOR CONSTR OF L

LA
LA

Sketch

Alt. A-2

4/6



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GEORGIA
DEPARTMENT OF TRANSPORTATION

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: JESUP ROAD DESIGN
MAINLINE PROFILE

DRAWING 15-

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PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366) P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **A-2**

SHEET NO.: **5 of 6**

Shorten the roadway approach at the beginning of the project.

Begin project at Sta 153+00 instead of Sta 141+50, which would shorten the new roadway by approximately 1,150 ft.

Roadway pavement saved :

Travel lanes = (24 ft.x 1,150 ft.)/ 9 sf/sy = **3,060 SY @ $47.66/sy** (calculate from plans pavement section)

Paved shoulders = (6.5 ft. x 2 sides x 1,150 ft.)/ 9sf/sy = **1,660 SY @ $24.29/sy** (calculate from plans pavement section)

Earthwork saved:

(600 ft. x 3 ft. x 50 ft.)/ 27 cf/cy = 3,300 CY

(550 ft. x 3.5 ft. x 35 ft.)/ 27 cf/cy = 2,500 CY

Total embankment saved = 5,800 CY

Borrow saved = 5,800 cy x 1.3 (swell) = 7,540 CY

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **A-2**

SHEET NO.: **6 of 6**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full-Fepth Pavement Saved:	SY	3,060	$47.66	$145,840.00			
Shoulder Pavemenr saved	SY	1,660	$24.29	$40,321.00			
Borrow Material Saved	CY	7,540	$7.50	$56,550.00			
Erosion Control & grassing saved	Mile	0.20	$20,000.00	$4,000.00			
Signing and Marking	Mile	0.20	$20,000.00	$4,000.00			
Subtotal				$250,711			
Markup (%) at 9.00%				$22,564			
TOTAL				$273,275			
TOTAL ROUNDED				$273,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **A-5**

DESCRIPTION: **SHORTEN THE PROJECT LENGTH BY ENDING CONSTRUCTION AT STA. 200+00 IN LIEU OF STA 230+00 AND BY DEFERRING REPLACEMENT OF OVERFLOW BRIDGES NO. 1 AND NO. 2 TO A FUTURE PROJECT**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The current design ends at Station 230+00 with a total project length of 1.68 miles.

ALTERNATIVE:

End the project at Station 200+00 and shorten the project by 3,000 ft. Reduce the project length to 1.11 miles.

ADVANTAGES:

- Reduces roadway material and labor requirements
- Postpones bridge replacement until necessary – extends useful life
- Reduces construction time
- Reduces borrow material quantity
- Reduces Right-of-Way requirements

DISADVANTAGES:

- Construction of Overflow No. 1 & No. 2 bridges is deferred

DISCUSSION:

The current design replaces three bridges and extends a double 6 ft. x 5 ft. culvert along SR 30/US 280. The alternative design replaces only the main span bridge over the Oconee River and retains bridges over Overflows No. 1 & No. 2 since they are structurally sound, both having a sufficiently rating of 69. The double 6 ft. x 5 ft. box culvert would be outside the project limits, therefore it would not be extended. These two bridges and concrete box culvert only require replacement to accommodate the future widening to four-lanes which is part of the GRIP program for SR 30/US 280. The intent of this alternative is to postpone this particular work until the future GRIP widening project, which is scheduled as Long Range and does not have an approved concept, is implemented.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 2,876,000	—	$ 2,876,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 2,876,000	—	$ 2,876,000

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **A-5**

SHEET NO.: **2 of 3**

Shorten the alignment at the end of the project from Sta 230+00 to 200+00

Would save 2500 ft. = 0.473 mi. of roadway

(2500 ft. x 24 ft.)/ 9sf/sy = 6,670 SY (Full-depth pavement)

(2500 ft. x 6.5 ft. 2 sides)/ 9sf/sy = 3,600 SY (Shoulder Pavement)

Bridge Overflow #1 saved = (320 ft. x 40 ft.) = 12,800 sf

Bridge Overflow #2 saved = (120 ft. x 40 ft.) = 4,800 sf

Earth embankment saved = [(2,500 ft. - 120 ft.) x 8 ft. average x 70 ft.]/27 cf/cy = 49,400 CY

Borrow = 49,400 CY x 1.3 = 64,200 CY

Alternate would save extending the Dbl. 6 ft. x 5 ft. concrete box culvert

Class "A" concrete (Barrel) = 1.183 cy/lf x 73 lf = 86.36 CY

Class "A" concrete (Wingwalls & Parapet on one side) = 16.74cy / 2 = 8.37 CY

Total class "A" concrete = 94.73 CY

Bar Reinforcing Steel (Barrel) = 131.9 lbs/lf x 73 lf = 9,628.7 lbs

Bar Reinforcing Steel (Wingwalls & Parapet) = 557 lbs / 2 = 278.5 lbs

Total Bar Reinf. Steel = 9,907.2 lbs

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **A-5**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			Alternate ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Costs savings							
Full-depth pavement saved	SY	6,670	$47.66	$317,892			
Borrow Material Saved	CY	64,200	$7.50	$481,500			
Shoulder pavement saved	SY	3,600	$24.29	$87,444			
Less Clearing and grubbing	AC	6	$10,000.00	$60,000			
Overflow Bridge #1 saved	SF	12,800	$78.00	$998,400			
Overflow Bridge #2 saved	SF	4,800	$78.00	$374,400			
Erosion Control and grassing	Mi	0.473	$20,000.00	$9,460			
Signing and Marking	Mi	0.473	$20,000.00	$9,460			
OF Bridge #1 demolition saved	SF	9,072	$20.00	$181,440			
OF Bridge #2 demolition saved	SF	3,780	$20.00	$75,600			
Saves Dbl 6' x 5' box culvt extention							
Class "A" Concrete	CY	95	$363.00	$34,485			
Bar Reinforcing Steel	LB	9,907	$0.85	$8,421			
Subtotal				$2,638,502			
Markup (%) at 9.00%				$237,465			
TOTAL				$2,875,967			
TOTAL ROUNDED				$2,876,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **P-2**

DESCRIPTION: **LOWER PROFILE ON THE WEST END BY 1 TO 2 FT. TO TO REDUCE BORROW QUANTITIES**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (sketch attached)

The current roadway design profile is higher than the 100 yr. flood elevation.

ALTERNATIVE: (sketch attached)

Lower the proposed profile from Station 152+00 to Station 178+00 and from Station 197+00 to Station 219+50 to reduce embankment (borrow).

ADVANTAGES:

- Reduces borrow quantity
- Reduces construction effort
- Fewer truckloads of fill required
- Accommodates flatter side road profiles

DISADVANTAGES:

- None apparent

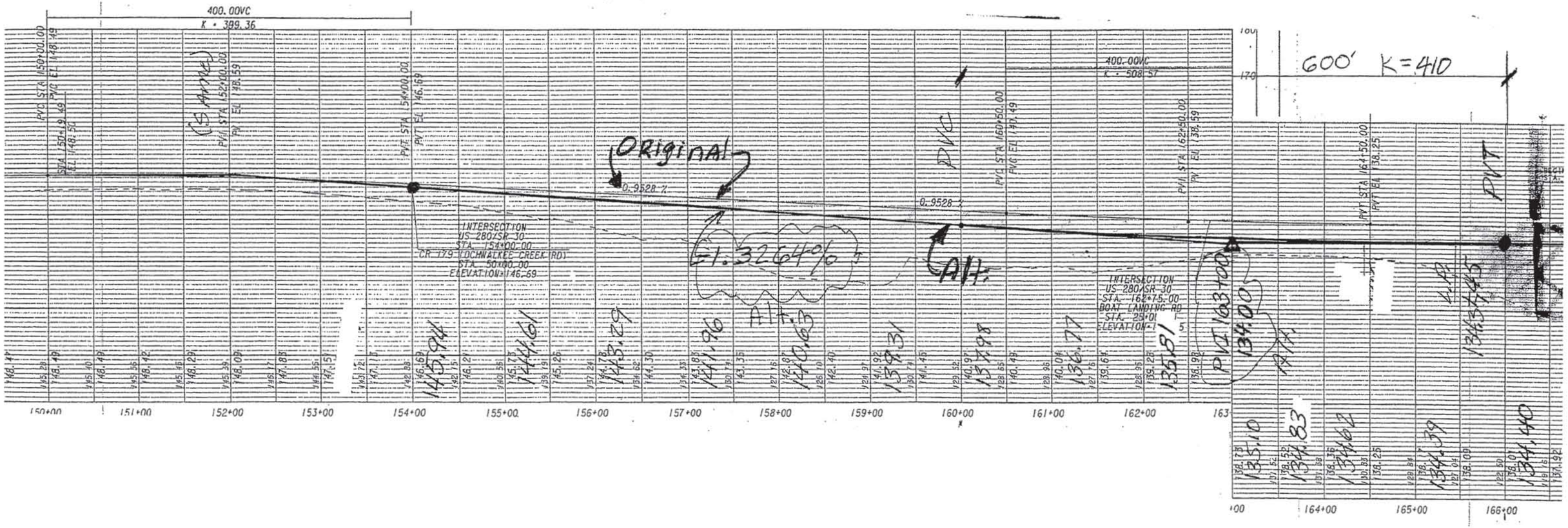
DISCUSSION:

The current design will require approximately 150,000 CY of borrow material mainly because of the profile that is required to "clear" the 100 yr. flood stage elevation. However there is enough clearance over the 100 yr. flood elevation to lower the roadway profile at select areas to reduce the amount of earthwork embankment. The alternative profile design will meet the design criteria for 65 mph. All of the side roads are lower in elevation than the mainline, therefore lowering the mainline profile will provide for flatter side road tie-in grades.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 187,000	—	$ 187,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 187,000	—	$ 187,000

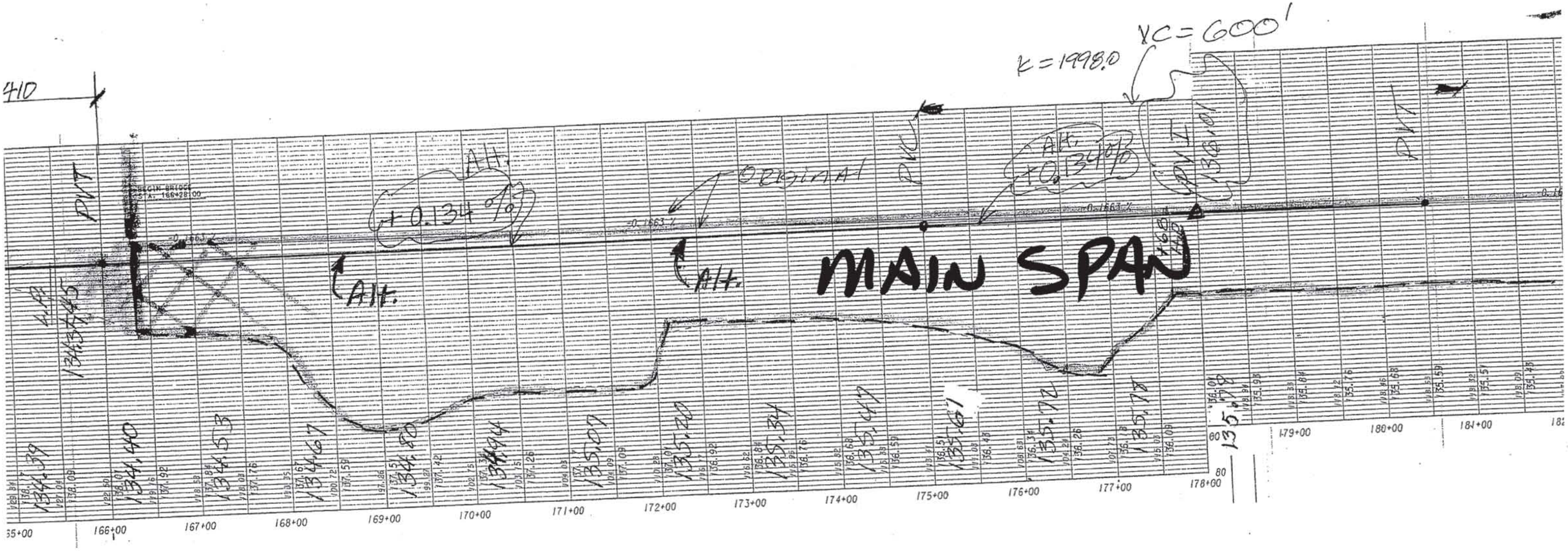
Sketch 2/1

Alt. P-2



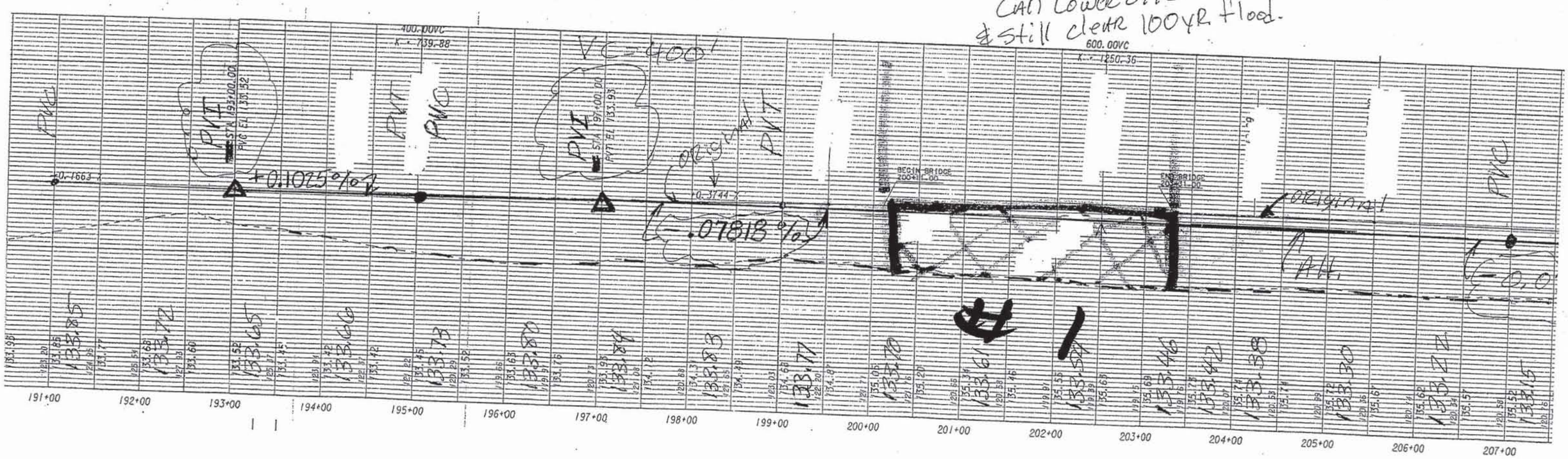
Sketch 3/7

Alt. P-2



Sketch 4/7

Alt. P-2



5/7

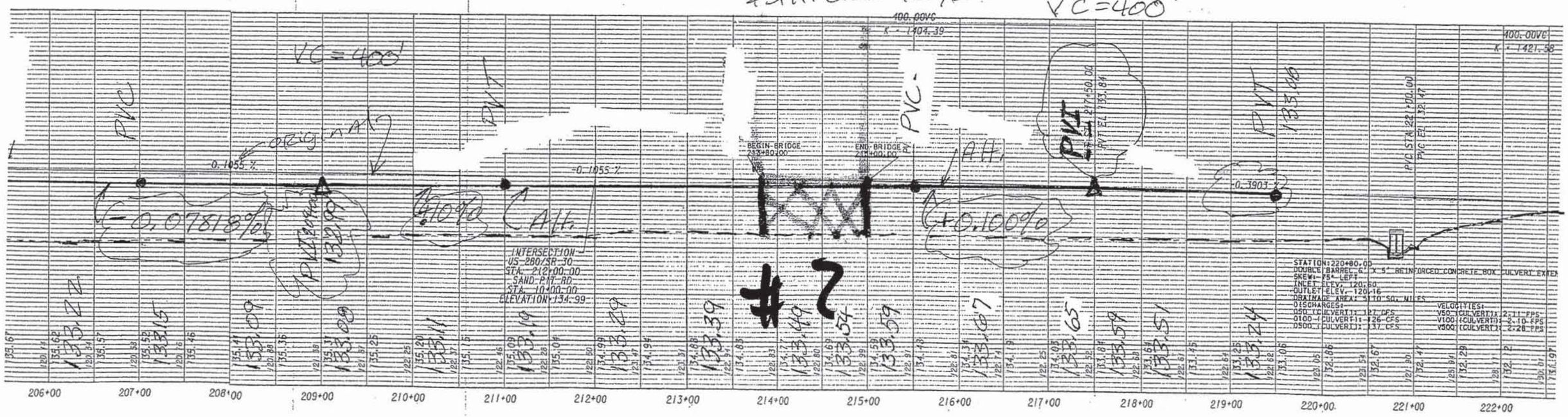
2.3' Sketch

Alt. P-2

Can Lower 1.24'
& still clear 100 yr. flood

VC=400'

VC=400'



PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **P-2**

SHEET NO.: **6 of 7**

SR 30 / US 280 Mainline

Lower proposed profile from Sta 152+00 to 178+00 and from 197+00 - 219+50 to save embankment (borrow) see attached sketch for alternative P-2 profiles.

[1100 ft. x (4 ft./2) x 75 ft.]/27 cf/cy	=	6,100 CY	Sta 152+00 to 163+00
[330 ft. x (4 ft./2) x 75 ft.]/27 cf/cy	=	1,800 CY	Sta 163+00 to 166+28 (begin bridge)
[320 ft. x (1.5 ft./2) x 75 ft.]/27 cf/cy	=	700 CY	Sta 197+00 to 200+11 (begin bridge OF #1)
[580 ft. x (2.5 ft.) x 80 ft.] /27 cf/cy	=	4,300 CY	Sta 203+31(end bridge OF #1) to 209+00
[500 ft. x (2 ft.) x 80 ft.] /27 cf/cy	=	3,000 CY	Sta 209+00 to 213+80 (begin bridge OF #2)
[450 ft. x (1 ft./2) x 55 ft.]/27 cf/cy	=	500 CY	Sta 215+00 to 219+50

Total Embankment / Borrow saved = 16,400 CY

Borrow = 1.3 (swell 30% from soil survey report) x 16,400 CY = 21,320 CY

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **P-2**

SHEET NO.: **7 of 7**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow Material Saved	CY	21,400	$8.00	$171,200			
Subtotal				171,200			
Markup (%) at 9.00%				15,408			
TOTAL				186,608			
TOTAL ROUNDED				187,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS** ***BR000-0001-00(366), P.I. No. 0001366*** ***Wheeler & Montgomery Counties, GA – Preliminary Engineering***	ALTERNATIVE NO.: **S-1**
DESCRIPTION:	**USE 4-FT.-WIDE PAVED SHOULDERS IN LIEU OF 6.5-FT.-WIDE PAVED SHOULDERS**	SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

Construct 6.5-ft-wide paved shoulders on both sides of the road.

ALTERNATIVE: (sketch attached)

Construct 4-ft.-wide paved shoulders on both sides of the road.

ADVANTAGES:

- Reduces material and labor requirements
- Less impervious area reduces storm water runoff

DISADVANTAGES:

- Less pavement on the shoulder

DISCUSSION:

With an ADT of 10,000 vehicles per day for the design year 2028, the shoulders are not expected to be heavily used. As a result, reducing the width of paved shoulders from 6.5 ft. to 4 ft. is feasible. The overall total width of shoulders will still remain 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 91,000	—	$ 91,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 91,000	—	$ 91,000

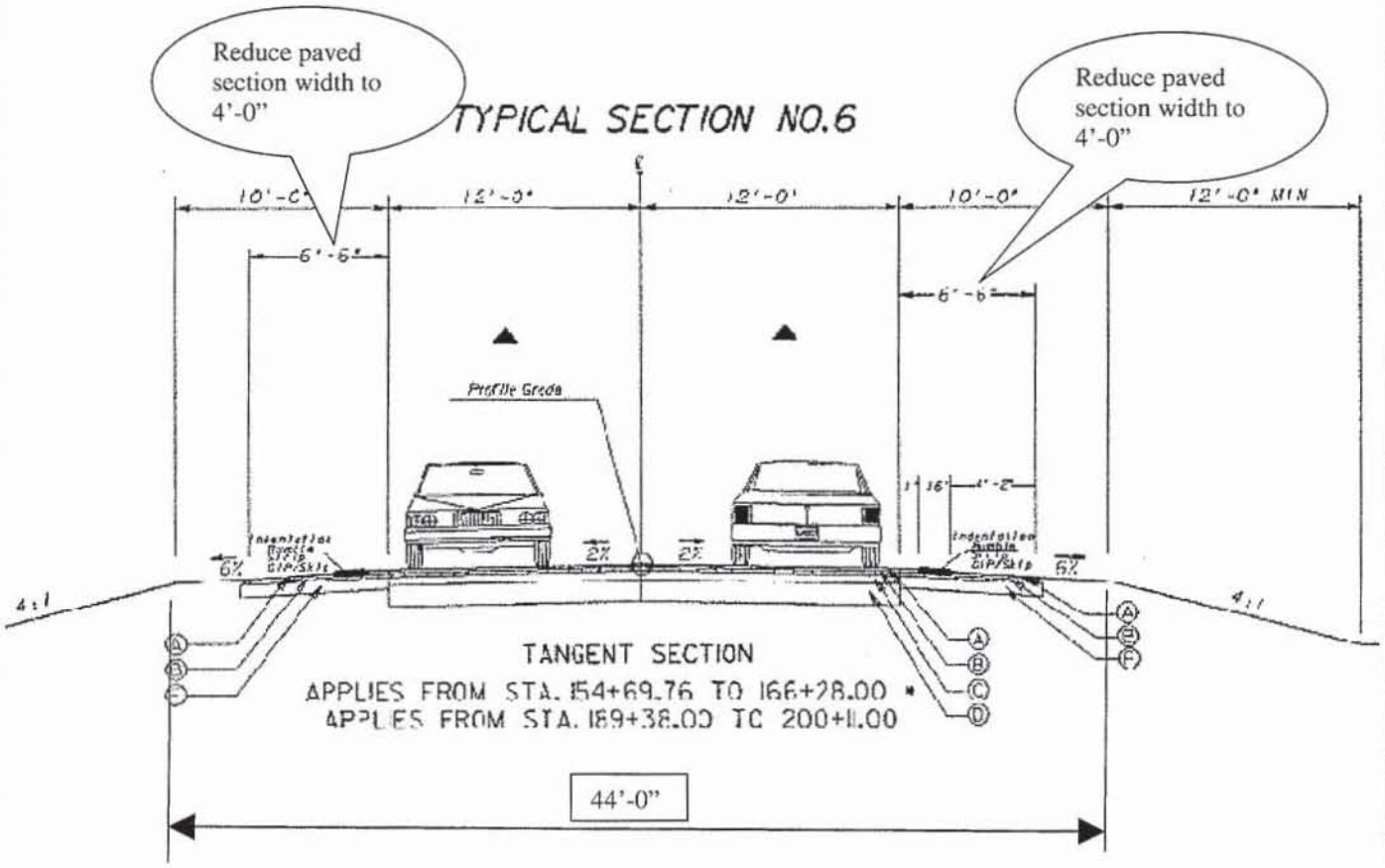
SKETCH

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-1**

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: **2 of 4**



PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-1**

SHEET NO.: **3 of 4**

SR 30 Paved Shoulder Unit Cost ($/SY):

9.5mm:	135#/SY x Ton/2,000# x $81.41/Ton	= $5.50/SY
19.0mm:	220#/SY x Ton/2,000# x $76.22/Ton	= $8.38/SY
6" GAB:		= $10.41/SY

Total Pavement Unit Cost = $24.29/SY

Roadway Lane Length:

1.169 miles x 5,280 feet = 6,172 feet

Total One-way Length: 6,172 feet
Both ways: 6,172 x 2 = 12,344 feet
Lane Width Reduction: 6.5 ft. – 4.0 ft. = 2.5 feet

Area: 12,344 x 2.5/9 = 3,429 sy

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **S-1**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Paved Shoulder	SY	3,429	24.29	83,290			
Subtotal				83,290			
Markup (%) at 9.00%				7,496			
TOTAL				90,786			
TOTAL ROUNDED				91,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-3**

DESCRIPTION: **USE 11.5-FT.-WIDE TRAVEL LANES IN LIEU OF 12-FT.-WIDE TRAVEL LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

Construct 12-ft.-wide travel lanes in both directions on SR30.

ALTERNATIVE: (sketch attached)

Construct 11.5-ft.-wide travel lanes in both directions on SR30.

ADVANTAGES:

- Reduces pavement requirements
- Less impervious area reduces stormwater runoff
- Reduces amount of embankment material to import to the site

DISADVANTAGES:

- Narrower travel lanes

DISCUSSION:

With an ADT of 10,000 vehicles per day for the design year 2028, reducing the width of travel lanes on SR30 by only six inches in both directions will not affect its collision rate when considering that 10-ft. shoulders will be constructed on both sides of the road for the length of the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 36,000	—	$ 36,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 36,000	—	$ 36,000

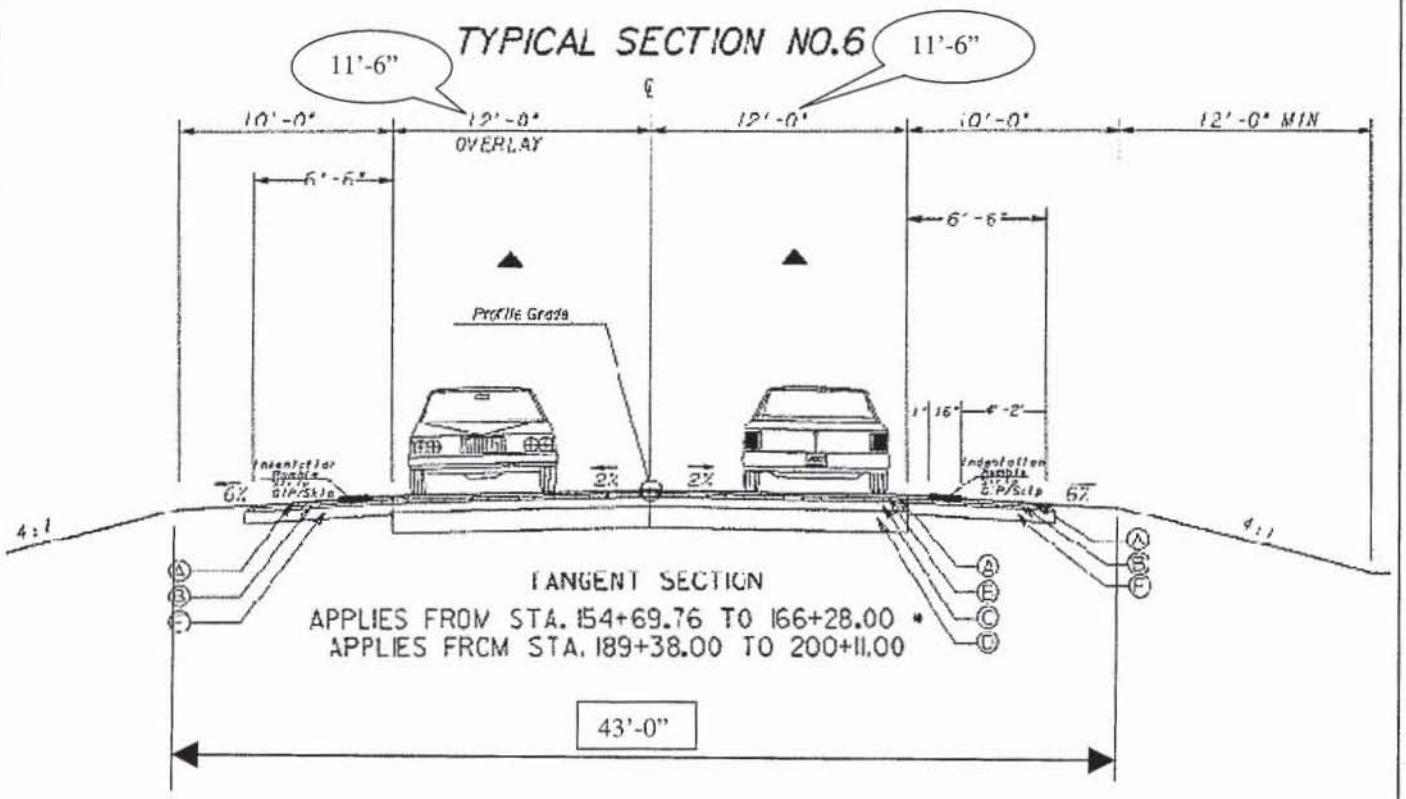
SKETCH

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-3**

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: **2 of 4**



PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-3**

SHEET NO.: **3 of 4**

Full Depth Pavement Unit Cost ($/SY):

9.5mm:	135#/SY x Ton/2,000# x $81.41/Ton	= $5.50/SY
19.0mm:	220#/SY x Ton/2,000# x $76.22/Ton	= $8.38/SY
25.0mm:	440#/SY x Ton/2,000# x $68.01/Ton	= $14.96/SY
12 in. GAB:		= $18.82/SY

Total Pavement Unit Cost = $47.66/SY

Roadway Lane Length:

1.169 miles x 5,280 ft. = 6,172 ft.

Total One-way Length: 6,172 ft.
Both ways: 6,172 x 2 = 12,344 ft.
Lane Width Reduction: 12 ft. – 11.5 ft. = 0.5 ft.

Area: 12,344 x 0.5/9 = 686 sy

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **S-3**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement: SR30/US280	SY	686	47.66	32,695			
Subtotal				32,695			
Markup (%) at 9.00%				2,943			
TOTAL				35,638			
TOTAL ROUNDED				36,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-4**

DESCRIPTION: **USE 11-FT.-WIDE LANES ON THE BOAT RAMP AND CR179 IN LIEU OF 12-FT.-WIDE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

Construct 12-ft.-wide lanes in both directions on the boat ramp and CR 179.

ALTERNATIVE: (sketch attached)

Construct 11-ft.-wide lanes in both directions on the boat ramp and CR 179.

ADVANTAGES:

- Reduces pavement requirements
- Less impervious area results in less stormwater runoff

DISADVANTAGES:

- Narrower lanes provided

DISCUSSION:

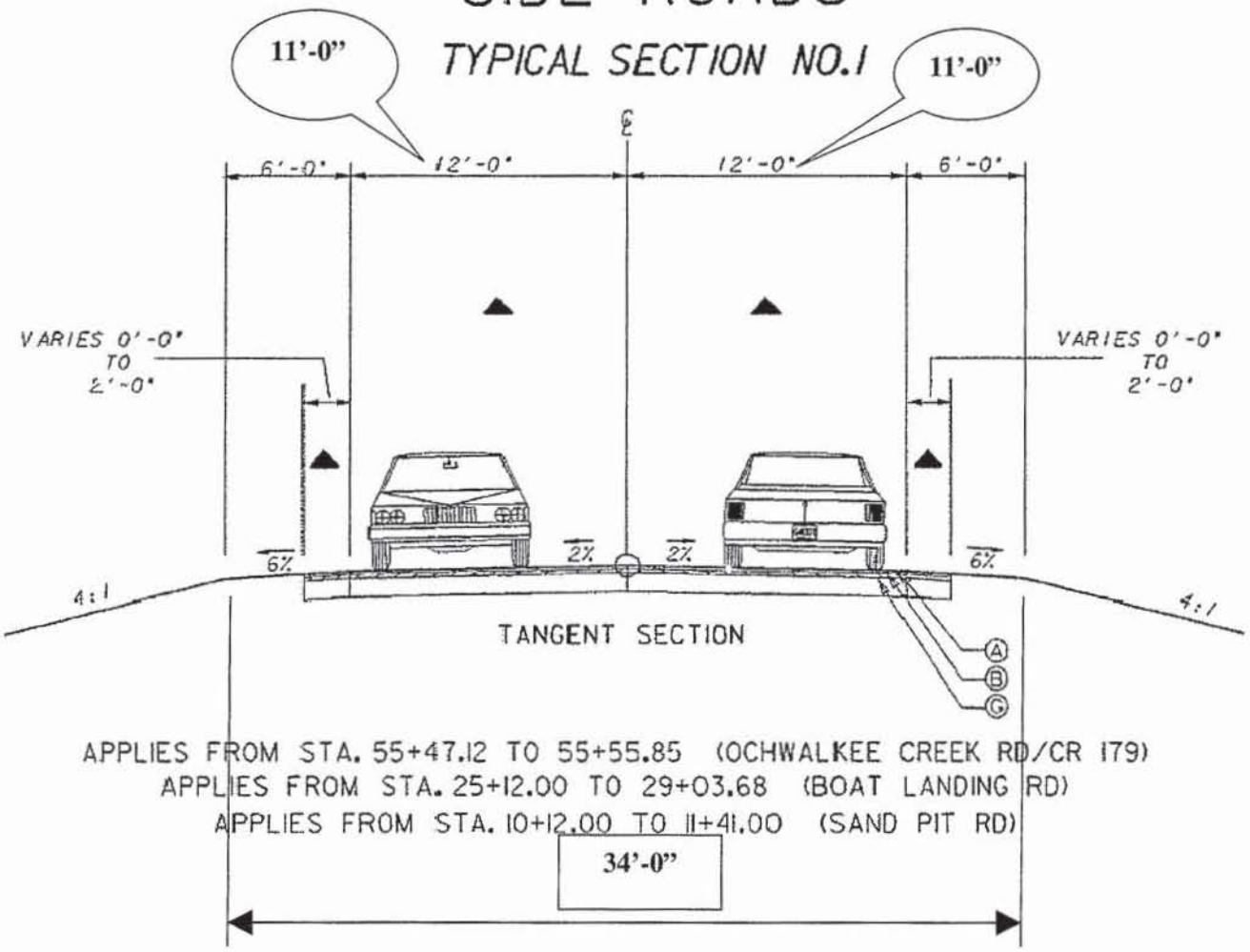
Currently, only 11-ft.-wide lanes exist on CR 179 and the boat ramp. With minimal traffic on these roads, keeping the travel lanes 11-ft.-wide in both directions appears reasonable. The collision rate will not be compromised, especially considering that up to 2 ft. of paved shoulders will be constructed on both sides of these roads.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,000	—	$ 6,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 6,000	—	$ 6,000

SKETCH

PROJECT:	**SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS** ***BR000-0001-00(366), P.I. No. 0001366*** ***Wheeler & Montgomery Counties, GA – Preliminary Engineering***	ALTERNATIVE NO.: **S-4**
ORIGINAL DESIGN ☐	ALTERNATIVE DESIGN ☐ BOTH ☒	SHEET NO.: **2 of 4**

TYPICAL SECTION
SIDE ROADS



APPLIES FROM STA. 55+47.12 TO 55+55.85 (OCHWALKEE CREEK RD/CR 179)
APPLIES FROM STA. 25+12.00 TO 29+03.68 (BOAT LANDING RD)
APPLIES FROM STA. 10+12.00 TO 11+41.00 (SAND PIT RD)

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **S-4**

SHEET NO.: **3 of 4**

Full Depth Side Road Pavement Unit Cost ($/SY):

9.5mm:	135#/SY x Ton/2,000# x $81.41/Ton	= $5.50/SY
19.0mm:	220#/SY x Ton/2,000# x $76.22/Ton	= $8.38/SY
8 in. GAB:		= $14.76/SY

Total Pavement Unit Cost = $28.64/SY

Lane Length:

CR 179: STA. 55+47 – STA. 50+00 – 12 ft. (for SR 30) = 535 ft.
Boat Ramp: STA. 29+04 – STA. 25+00 – 12 ft. (for SR 30) = 392 ft.
Total One-way Length: 535 + 392 = 927 ft.
Both ways: 927 x 2 = 1,854 ft.
Lane Width Reduction: 12 ft. – 11 ft. = 1.0 ft.

Area: 1,854 x 1/9 = 206 sy

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **S-4**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement - Side Roads	SY	206	28.64	5,900			
Subtotal				5,900			
Markup (%) at 9.00%				531			
TOTAL				6,431			
TOTAL ROUNDED				6,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS** ***BR000-0001-00(366), P.I. No. 0001366*** ***Wheeler & Montgomery Counties, GA – Preliminary Engineering***	ALTERNATIVE NO.: **S-5**
DESCRIPTION:	**USE 2:1 SLOPES IN LIEU OF 4:1 SLOPES WHERE FEASIBLE**	SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

Construct a 4:1 slope on the south side of the road from STA. 143+00 to STA. 155+00. Construct 4:1 slopes on the north side of the road from STA. 149+00 to STA. 154+00, from STA. 158+50 to STA. 162+50, and from STA. 192+00 to STA. 194+00.

ALTERNATIVE:

Construct a 2:1 slope on the south side of the road from STA. 143+00 to STA. 155+00. Construct 2:1 slopes on the north side of the road from STA. 149+00 to STA. 154+00, from STA. 158+50 to STA. 162+50, and from STA. 192+00 to STA. 194+00.

ADVANTAGES:

- Reduces earthwork quantities

DISADVANTAGES:

- Steeper slopes

DISCUSSION:

Per AASHTO Road Design Guidebook Figure 5.1b, guardrail is not necessary for a 2:1 slope as long as the embankment is six feet or less in height. At the locations listed above, the embankment height is six feet or less. Savings in earthwork can be realized by constructing a 2:1 slope instead of a 4:1 slope. Due to the reduced surface area, there will also be slight reduction in the cost of permanent grassing. Since the reduction will be very small, permanent grassing savings are not included.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 11,000	—	$ 11,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 11,000	—	$ 11,000

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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ALTERNATIVE NO.: **S-5**

SHEET NO.: **2 of 3**

Difference in earthwork volume (cf) – only between the triangles formed by 4:1 slope and 2:1 slope:

STA. (Rt.)	AREA	VOLUME
143+00	0	
		100
143+50	4	
		250
144+00	6	
		350
144+50	8	
		450
145+00	10	
		550
145+50	12	
		650
146+00	14	
		750
146+50	16	
		800
147+00	16	
		750
147+50	14	
		700
148+00	14	
		700
148+50	14	
		650
149+00	12	
		550
149+50	10	
		450
150+00	8	
		400
150+50	8	
		350
151+00	6	
		300
151+50	6	
		350
152+ 00	8	
		400
152+50	8	
		450
153+00	10	

STA. (Rt.)	AREA	VOLUME
		600
153+50	14	
		700
154+00	14	
		800
154+50	18	
		1050
155+00	24	
	TOTAL:	***13,100cf***

STA. (Lt.)	AREA	VOLUME
149+00	4	
		300
149+50	8	
		500
150+00	12	
		700
150+50	16	
		900
151+00	20	
		1100
151+50	24	
		1300
152+ 00	28	
		1500
152+50	32	
		1450
153+00	26	
		1200
153+50	22	
		1000
154+00	18	
	TOTAL:	***9,950cf***

STA. (Lt.)	AREA	VOLUME
158+50	16	
		800
159+00	16	
		1000
159+50	24	
		1200
160+00	24	
		1200
160+50	24	
		1350
161+00	30	
		1400
161+50	26	
		1200
162+00	22	
		1000
162+50	18	
	TOTAL:	***10,350cf***

STA. (Lt.)	AREA	VOLUME
192+00	28	
		1150
192+50	18	
		750
193+00	12	
		750
193+50	18	
		1000
194+00	22	
	TOTAL:	***3,650cf***

Total earthwork saved: (13,100+10,350+9,950+3,650)/27 = 1,327 cy

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **S-5**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Earthwork	CY	1,327	7.50	9,953			
Subtotal				9,953			
Markup (%) at 9.00%				896			
TOTAL				10,849			
TOTAL ROUNDED				11,000			

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Prelim. Engineering

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
BRIDGE (B)						
B-3	Use longer spans on the east end of Bridge No. 1 (Main Span)	$1,780,000	$1,540,000	$240,000	$0	$240,000
B-12	Abandon the old bridges in place and defer demolition until the future 4-lane expansion project (2028)	$1,732,000	$16,000	$1,716,000	$0	$1,716,000
B-12.1	Demolish only the portion of Bridge No. 1 (Main Span) which is located directly over the river (STA 166+00 to STA 173+00) and abandon the remainder in place until the future 4-lane expansion project (2028)	$1,732,000	$442,000	$1,290,000	$0	$1,290,000
B-13	Replace the concrete piers on the 70 ft. spans with a pile bent substructure on Bridge No. 1 (Main Span)	$889,000	$746,000	$143,000	$0	$143,000
CONSTRUCTION MANAGEMENT (CM)						
CM-3	Revise the earthwork quantities for borrow material to reduce the risk during the bidding phase	$282,000	$0	$282,000	$0	$282,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-3**

DESCRIPTION: **USE LONGER SPANS ON THE EAST END OF BRIDGE NO. 1 (MAIN SPAN)**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN:

The current design for Bridge No. 1 has 19 spans of 70 ft., 4 spans of 125 ft., and 4 spans of 120 ft.

ALTERNATIVE:

Increase the span lengths for the bridge east of the river and reduce the number of intermediate piers. The bridge spans would include: 2 spans of 70 ft., 4 spans of 125 ft., 4 spans of 120 ft., 7 spans of 110 ft., and 5 spans of 84 ft.

ADVANTAGES:

- Reduces the number of intermediate piers to construct
- Faster construction time
- Fewer members to assemble
- Reduces the number of structures in the flood plain

DISADVANTAGES:

- None apparent

DISCUSSION:

Increasing the span lengths will remove six intermediate piers. The elimination of these piers will decrease the construction time by not having to construct the piers or install as many piles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,780,000	—	$ 1,780,000
ALTERNATIVE	$ 1,540,000	—	$ 1,540,000
SAVINGS (Original minus Alternative)	$ 240,000	—	$ 240,000

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-3**

SHEET NO.: **2 of 6**

70 ft Span Intermediate Pier Cost

16 – 2 Column Piers

Bridge Width = 43.25 ft.

70 ft.-0 in. Type III PSC Beam. Say (7 Beams) 6 sp @ 6.2083 ft. = 37.25 ft.

Overhang = 3ft

Say Pier Cap Length is 37.25 ft.+1.5 ft.+1.5 ft. = 40.25 ft.

Pier Cap Volume = 3 ft. x 3 ft. x 40.25 ft. = **362.35 CF**

Column Length, Say EL 136.0
-3.75 ft. (Beam)
- 0.625 ft. (7.5 in. Deck)
-0.25 ft. (3 in. coping)
-0.4 (Super El. 20 x 0.02)
-0.083 (1 in. Bearing Pad)
Beam Seat EL 130.89
-3.0 (cap depth)
EL 127.89
-Existing Ground -EL 119.0
+ 4 ft. (Embedment)
12.89 ft. Say 13 ft.

Column Volume = 3 ft. x 3 ft. x 13 ft. = 117 CF x 2 columns = **234 CF**

Footing Volume = 6 ft. x 6 ft.x 3 ft. = 108 CF x 2 footings = **216 CF**

Use HP 14 x 89 Steel Piles

Say EL 115.0 – EL 40.0 = 75 ft. long Piles x 8 piles (4 per footing) = **600 ft. per Int Pier**

Total Pile Length = 600 ft. x 16 Piers = **9,600 ft.**

Total Bent Cap Volume = 362.35 CF + 234 CF + 216 CF = 812.35 CF = 30.08 CY x 16 bents = **481.28 CY**

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-3**

SHEET NO.: **3 of 6**

84 ft Span Intermediate Bent Cost

4 – 2 Column Piers

Bridge Width = 43.25 ft.

84 ft.-0 in. Type III PSC Beam. Say (7 Beams) 6 sp @ 6.2083 ft. = 37.25 ft.

Overhang = 3 ft.

Say Pier Cap Length is 37.25 ft.+1.5 ft.+1.5 ft. = 40.25 ft.

Pier Cap Volume = 3 ft. x 3 ft. x 40.25 ft. = **362.35 CF**

Column Length, Say EL 136.0
-3.75 ft. (Beam)
- 0.625 ft. (7.5 in. Deck)
-0.25 ft. (3 in. coping)
-0.4 (Super El. 20 x 0.02)
-0.083 (1 in. Bearing Pad)
Beam Seat EL 130.89
-3.0 (cap depth)
EL 127.89
-Existing Ground -EL 119.0
+ 4 ft. (Embedment)
12.89 ft. Say 13 ft.

Column Volume = 3 ft. x 3 ft. x 13 ft. = 117 CF x 2 columns = **234 CF**

Footing Volume = 6 ft. x 6 ft.x 3 ft. = 108 CF x 2 footings = **216 CF**

Use HP 14 x 89 Steel Piles

Say EL 115.0 – EL 40.0 = 75 ft. long Piles x 8 piles (4 per footing) = **600 ft. per Int Pier**

Total Pile Length = 600 ft. x 4 Piers = **2,400 ft.**

Total Bent Cap Volume = 362.35 CF + 234 CF + 216 CF = 812.35 CF = 30.08 CY x 4 bents = **120.32 CY**

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-3**

SHEET NO.: **4 of 6**

110 ft Span Intermediate Bent Cost

6 – 2 Column Piers

Bridge Width = 43.25 ft.

84 ft.-0 in. Type III PSC Beam. Say (7 Beams) 6 sp @ 6.2083 ft. = 37.25 ft.

Overhang = 3 ft.

Say Pier Cap Length is 37.25 ft.+1.5 ft.+1.5 ft. = 40.25 ft.

Pier Cap Volume = 3 ft. x 3 ft. x 40.25 ft. = **362.35 CF**

Column Length, Say EL 136.0
-3.75 ft. (Beam)
- 0.625 ft. (7.5 in. Deck)
-0.25 ft. (3 in. coping)
-0.4 (Super El. 20 x 0.02)
-0.083 (1 in. Bearing Pad)
Beam Seat EL 130.89
-3.0 (cap depth)
EL 127.89
-Existing Ground -EL 119.0
+ 4 ft. (Embedment)
12.89 ft. Say 13 ft.

Column Volume = 3 ft. x 3 ft. x 13 ft. = 117 CF x 2 columns = **234 CF**

Footing Volume = 6 ft. x 6 ft.x 3 ft. = 108 CF x 2 footings = **216 CF**

Use HP 14 x 102 Steel Piles

Say EL 115.0 – EL 40.0 = 75 ft. long Piles x 8 piles (4 per footing) = **600 ft. per Int Pier**

Total Pile Length = 600 ft. x 6 Piers = **3,600 ft.**

Total Bent Cap Volume = 362.35 CF + 234 CF + 216 CF = 812.35 CF = 30.08 CY x 6 bents = **180.48 CY**

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-3**

SHEET NO.: **5 of 6**

Beam Cost

70 ft Spans

70 ft.-0 in. Type III PSC Beam. Say 7 Beams 6 sp @ 6.2083 ft. = 37.25 ft.

Total Beam Length = 7 beams x 17 spans x 70 ft. long = **8,330 ft.**

84 ft Spans

84 ft.-0 in. Type III PSC Beam. Say 7 Beams 6 sp @ 6.2083 ft. = 37.25 ft.

Total Beam Length = 7 beams x 5 spans x 84 ft. long = **2,940 ft.**

110 ft Spans

110 ft.-0 in., 54 in. Bulb Tee Beam. Say 7 Beams 6 sp @ 6.2083 ft. = 37.25 ft.

Total Beam Length = 7 beams x 7 spans x 110 ft. long = **5,390 ft.**

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **B-3**

SHEET NO.: **6 of 6**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
70 ft Spans							
AASHTO Type III PSC Beams	LF	8,330	103.85	865,071			
Class A Concrete w/ Rebar	CY	481	498.70	239,875			
HP 14 x 89 Steel Piles	LF	9,600	55.00	528,000			
84 ft Spans							
AASHTO Type III PSC Beams	LF				2,940	103.85	305,319
Class A Concrete w/ Rebar	CY				120	498.70	60,004
HP 14 x 89 Steel Piles	LF				2,400	55.00	132,000
110 ft Spans							
54 IN Bulb Tee PSC Beams	LF				5,390	114.77	618,610
Class A Concrete w/ Rebar	CY				181	498.70	90,015
HP 14 x 102 Steel Piles	LF				3,600	57.44	206,784
Subtotal				1,632,946			1,412,732
Markup (%) at 9.00%				146,965			127,146
TOTAL				1,779,911			1,539,878
TOTAL ROUNDED				1,780,000			1,540,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-12**

DESCRIPTION: **ABANDON THE OLD BRIDGES IN PLACE AND DEFER DEMOLITION UNTIL THE FUTURE 4-LANE EXPANSION PROJECT (2028)**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

The design includes the replacement and demolition of the Main Span Bridge, Overflow No. 1, and Overflow No. 2 bridges. In the future, these structures will be replaced when the 4-lane facility is built. Projections show that the expansion to 4-lanes will be required in the year 2028, when traffic flows reach 10,000 vehicles per day.

ALTERNATIVE: (sketch attached)

Defer the demolition of all three existing bridges until the year 2028. To minimize risk, it is recommended that the bridges be closed and secured to prohibit access by the public.

ADVANTAGES:

- Defers this expenditure until the future
- Funds can be used elsewhere for a higher purpose

DISADVANTAGES:

- Old bridges can be a source of risk

DISCUSSION:

The demolition of the old bridges adds no value to the project other than removing an old asset. This expenditure can be deferred to the future and does not limit traffic operations.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,732,000	—	$ 1,732,000
ALTERNATIVE	$ 16,000	—	$ 16,000
SAVINGS (Original minus Alternative)	$ 1,716,000	—	$ 1,716,000

SKETCH

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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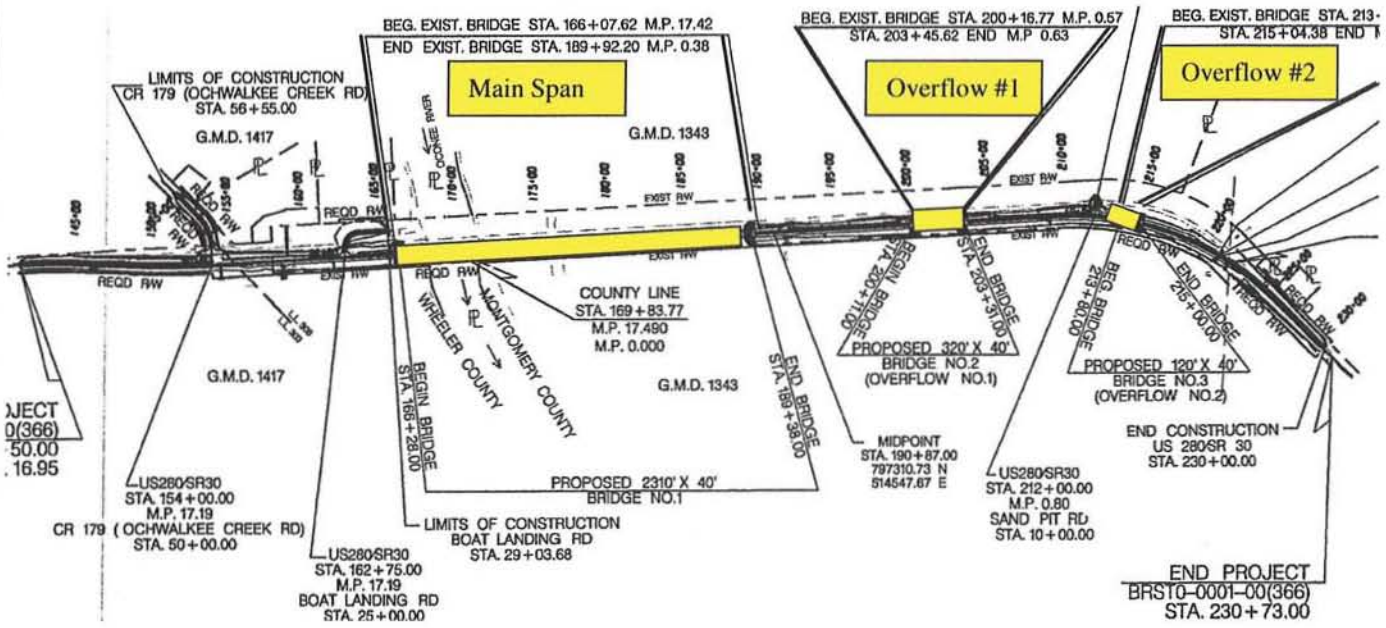
ALTERNATIVE NO.: **B-12**

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: **2 of 3**



COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
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ALTERNATIVE NO.:

B-12

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Demolition @ $20/SF							
Mainspan Bridge	LS	1	1,331,680.00	1,331,680			
Overflow #1	LS	1	181,440.00	181,440			
Overflow #2	LS	1	75,600.00	75,600			
Fencing	LF				600	25.00	15,000
Subtotal				1,588,720			15,000
Markup (%) at 9.00%				142,985			1,350
TOTAL				1,731,705			16,350
TOTAL ROUNDED				1,732,000			16,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-12.1**

DESCRIPTION: **DEMOLISH ONLY THAT PORTION OF BRIDGE NO. 1 (MAIN SPAN) WHICH IS DIRECTLY OVER THE RIVER (STA 166+00 TO STA 173+00) AND ABANDON THE REMAINDER IN PLACE UNTIL THE FUTURE 4-LANE EXPANSION PROJECT (2028)**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

The design includes the replacement and demolition of the Main Span Bridge, Overflow No. 1, and Overflow No. 2 bridges. In the future, these structures will be replaced when the 4-lane facility is built. Projections show that the expansion to 4-lanes will be required in the year 2028, when traffic flows reach 10,000 vehicles per day.

ALTERNATIVE: (sketch attached)

Defer the demolition of all three existing bridges until the year 2028 except that portion of the Main Span Bridge which is directly above the river. To minimize risk, it is recommended that the bridges be closed and secured to prohibit access by the public.

ADVANTAGES:

- Defers this expenditure until the future
- Funds can be used elsewhere for a higher purpose
- Removes a portion of the Main Span Bridge

DISADVANTAGES:

- Old bridges can be a source of risk

DISCUSSION:

The demolition of the old bridges adds no value to the project other than removing an old asset. This expenditure can be deferred to the future and does not limit traffic operations.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,732,000	—	$ 1,732,000
ALTERNATIVE	$ 442,000	—	$ 442,000
SAVINGS (Original minus Alternative)	$ 1,290,000	—	$ 1,290,000

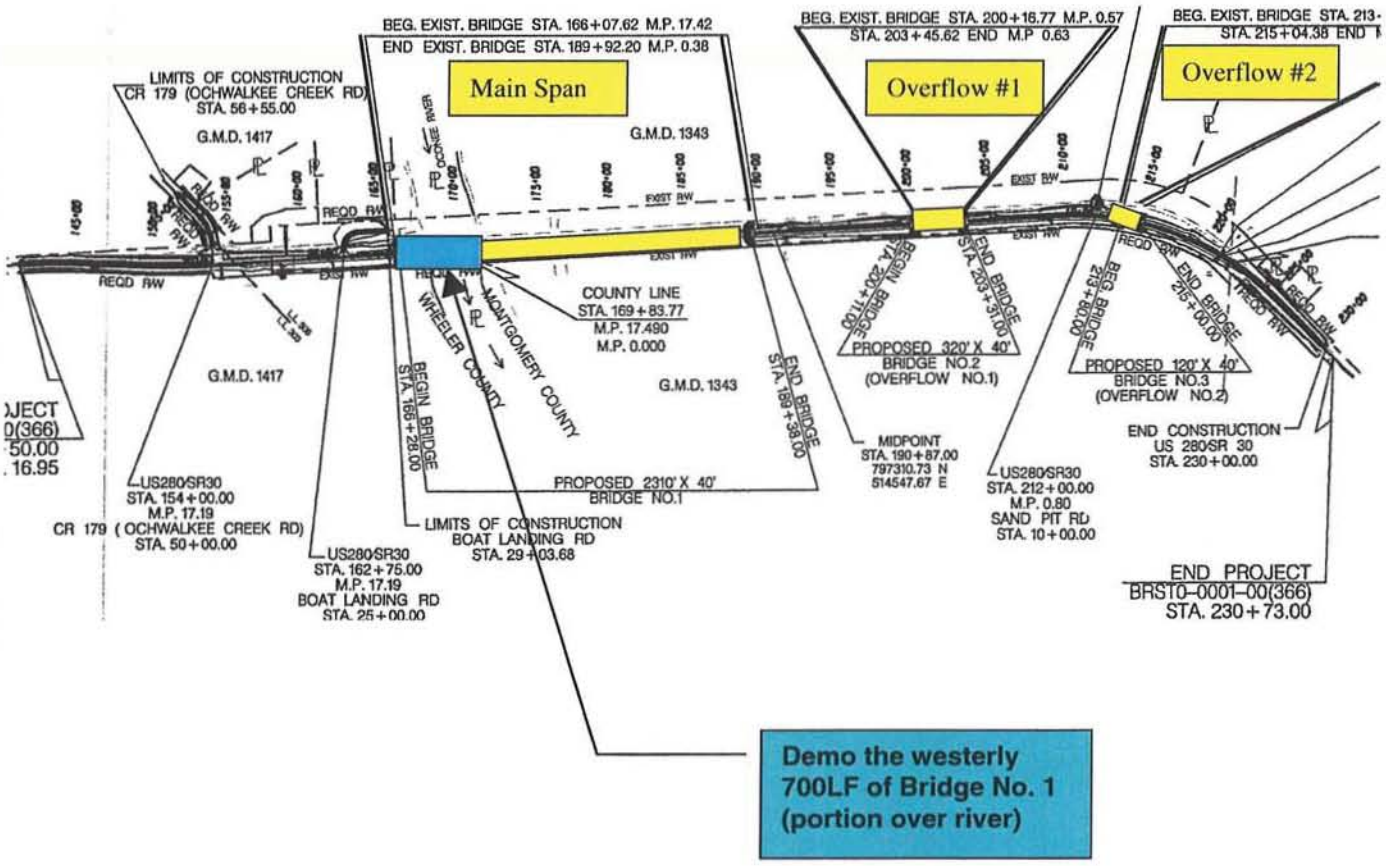
SKETCH

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-12.1**

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: **2 of 3**



COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.:

B-12.1

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Demolition @ $20/SF							
Mainspan Bridge (2,385LF)	LS	1	1,331,680.00	1,331,680	1	390,848.08	390,848
Overflow #1	LS	1	181,440.00	181,440			
Overflow #2	LS	1	75,600.00	75,600			
Fencing	LF				600	25.00	15,000
Subtotal				1,588,720			405,848
Markup (%) at 9.00%				142,985			36,526
TOTAL				1,731,705			442,374
TOTAL ROUNDED				1,732,000			442,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-13**

DESCRIPTION: **REPLACE THE CONCRETE PIERS ON THE 70 FT. SPANS WITH A PILE BENT SUBSTRUCTURE ON BRIDGE NO. 1 (MAIN SPAN)**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The design for Bridge No. 1 has 17 intermediate concrete piers for the 70 ft. span substructures.

ALTERNATIVE:

Replace the 17 intermediate concrete piers with intermediate pile bents for the 70 ft. span substructures.

ADVANTAGES:

- Reduces construction efforts
- Simplifies substructure system

DISADVANTAGES:

- None apparent

DISCUSSION:

Replacing the 17 concrete intermediate piers with pile bents using prestressed concrete piles will reduce the project's cost. Replacing these intermediate piers with pile bents will decrease the construction time by not having to drive as many piles and not constructing the piers with all the formwork. Per the GDOT Bridge Design Manual Section 2.9.3, spans up to 70 ft. have been constructed on prestressed concrete pile bents.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 889,000	—	$ 889,000
ALTERNATIVE	$ 746,000	—	$ 746,000
SAVINGS (Original minus Alternative)	$ 143,000	—	$ 143,000

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **B-13**

SHEET NO.: **2 of 4**

70 ft Span Intermediate Pier Cost

17 – 2 Column Piers

Bridge Width = 43.25 ft.

70 ft.-0 in. Type III PSC Beam. Say (7 Beams) 6 sp @ 6.2083 ft. = 37.25 ft.

Overhang = 3 ft.

Say Pier Cap Length is 37.25 ft.+1.5 ft.+1.5 ft. = 40.25 ft.

Pier Cap Volume = 3 ft. x 3 ft. x 40.25 ft. = **362.35 CF**

Column Length, Say EL 136.0
-3.75 ft. (Beam)
- 0.625 ft. (7.5 in. Deck)
-0.25 ft. (3 in. coping)
-0.4 (Super El. 20 x 0.02)
-0.083 (1 in. Bearing Pad)
Beam Seat EL 130.89
-3.0 (cap depth)
EL 127.89
-Existing Ground -EL 119.0
+ 4 ft. (Embedment)
12.89 ft. Say 13 ft.

Column Volume = 3 ft. x 3 ft. x 13 ft. = 117 CF x 2 columns = **234 CF**

Footing Volume = 6 ft. x 6 ft.x 3 ft. = 108 CF x 2 footings = **216 CF**

Use HP 14 x 89 Steel Piles

Say EL 115.0 – EL 40.0 = 75 ft. long Piles x 8 piles (4 per footing) = **600 ft. per Int Pier**

Total Pile Length = 600 ft. x 17 Piers = **10,200 ft.**

Total Pier Concrete Volume = 362.35 CF + 234 CF + 216 CF = 812.35 CF = 30.08 CY x 17 bents = **511.36CY**

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
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ALTERNATIVE NO.: **B-13**

SHEET NO.: **3 of 4**

70 ft Span Intermediate Pile Bent Cost

17 Bents

Bridge Width = 43.25 ft.

110 ft.-0 in., 54 in. Bulb Tee Beam. Say (7 Beams) 6 sp @ 6.2083 ft. = 37.25 ft.

Overhang = 3 ft.

Say Bent Length is 37.25 ft.+1.5 ft.+1.5 ft. = 40.25 ft.

Assume a pile is under each beam, 7 piles.

Use 24 in. PSC Piles.

Bent Cap Volume = 3 ft. x 3 ft. x 40.25 ft. = 362.35 CF

pile embedment = 2.0 ft. x 2.0 ft. x 1.0 ft. x 7 piles = 28.0 CF

Total Bent Cap Volume = 362.35 CF – 28.0 CF = 334.35 CF = 12.38 CY x 17 bents = **210.46 CY**

Pile Length, Say EL 136.0
-3.75 ft. (Type III Beam)
- 0.625 ft. (7.5 in. Deck)
-0.25 ft. (3 in. coping)
-0.4 (Super El. 20 x 0.02)
EL 131.0

EL 131.0 – EL 88.0 = 43.0 ft. long 24 in. PSC Piles

Total Pile Length = 43.0 ft. x 7 piles x 17 bents = **5,117.0ft**

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **B-13**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
70 ft Spans - Concrete Piers							
Class A Concrete w/ Rebar	CY	511	498.70	255,015			
HP 14 x 89 Steel Piles	LF	10,200	55.00	561,000			
70 ft Spans - Pile Bents							
Class A Concrete w/ Rebar	CY				210	498.70	104,956
24 IN PSC Piles	LF				5,117	113.17	579,091
Subtotal				816,015			684,047
Markup (%) at 9.00%				73,441			61,564
TOTAL				889,456			745,611
TOTAL ROUNDED				889,000			746,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

ALTERNATIVE NO.: **CM-3**

DESCRIPTION: **REVISE THE EARTHWORK QUANTITIES FOR BORROW MATERIAL TO REDUCE THE RISK DURING THE BIDDING PHASE**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The current cost estimate dated May 17, 2010 shows a total earthwork cost of $5,438,234. The earthwork quantity takeoff spreadsheet shows a net borrow quantity of 355,682 CY for Stage 1 construction.

ALTERNATIVE:

The earthwork quantities should be reviewed and recalculated to reduce project risk during the bidding and award phase.

ADVANTAGES:

- Reduces the anticipated embankment quantity by nearly two-thirds
- Project estimate can be reduced by nearly $2M

DISADVANTAGES:

- Additional analysis is needed

DISCUSSION:

It appears that the existing calculations may not have removed the bridge sections from the total earthwork quantities, but subtracted the future road profile from the existing ground profile over the total project length of 8,923 ft. Recalculating the earthwork quantity and removing the length of the three bridges (2,400 ft. + 324 ft. + 135 ft.) from the total project length of 8,923 ft. yields an embankment length of approximately 6,064 ft. Assuming an average embankment width of 85 ft. and an average fill depth of approximately 9 ft. yields a total embankment quantity in the range of 175,000 CY, which is considerably less than the 347,000 CY shown on the quantity take-off sheet.

If the project goes out to bid with the higher earthwork quantity, there would be substantial risk to GDOT in the form of potential change orders or higher unit prices with an unbalanced bid. Although the magnitude of this amount is difficult to assess, it is estimated that the exposure may be as high as 20% of the net overage in quantity.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 282,000	—	$ 282,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 282,000	—	$ 282,000

BR000-0001-00(366); PI: 0001366; Wheeler/Montgomery County Earthwork Summary

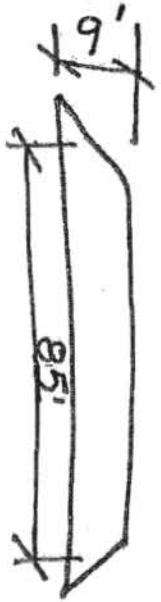
Road	Excavation (cy)				Adj. Excavation* (cy)				Embankment (cy)				Net/(1-0.3) Barrow or Waste (cy)		
	Stage 1	Stage 2	Stage 3	Total	Stage 1	Stage 2	Stage 3	Total	Stage 1	Stage 2	Stage 3	Total	Stage 1	Stage 2	Stage 3
US 280/SR 30	5328.33	4207.57	7345.94	16881.84	3729.83	2945.30	5142.16	11817.29	246823.98	3504.99	2555.26	252884.23	347277.36B	799.56 B	3695.57 W
Ochwalkee Rd (CR179)	684.34	---	577.12	1261.45	479.04	---	403.98	883.02	218.29	---	102.50	320.79	372.50 W	---	430.69 W
Boat Landing Rd	847.69	---	---	847.69	593.38	---	---	593.38	6738.04	---	1244.36	7982.40	8778.09 B	---	1777.66 B
Sandpit Rd	---	---	217.61	217.61	---	---	152.33	152.33	---	---	631.85	631.85	---	---	685.03 B
Total													355682.95 B	766.56 B	1663.57 W

*(30% Shrinkage from soil survey report)

(net balance assumes that excavation from later stages cannot be used for embankment during previous stages)

EMBANKMENT CY.

FILL QUANTITIES



TYP. SECTION

6,064FT x 85' x 9'/27 = 172,000 CY

SAY 175,000CY

CM - 3
2 OF 3

COST WORKSHEET

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler/Montgomery Counties, GA – Prelim. Engineering

ALTERNATIVE NO.: **CM-3**

SHEET NO.: **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow Material	CY	347,277	7.50	2,604,578	175,000	7.50	1,312,500
Mark-up @ 9%				234,412			118,125
Total				**2,838,990**			**1,430,625**
Net Reduction in Project Estimate				**1,408,365**			
Estimated Risk Exposure @ 20%				**281,673**			
Subtotal				281,673			
Markup (%) at				Incl.			
TOTAL				281,673			
TOTAL ROUNDED				282,000			

PROJECT DESCRIPTION

The SR 30/US 280 @ Oconee River & Overflows project as shown in Figure 1 includes the replacement of three (3) narrow and structurally deficient bridges on SR 30/US 280 over the Oconee River and two (2) overflows, 2.0 miles east of Glenwood, Georgia. The existing Oconee River Bridge (2,378 ft. x 28 ft.) was built in 1956 and consists of concrete bents with concrete caps, concrete T-beam superstructure, and a concrete deck with a sufficiency rating of 18.

Figure 1 – Aerial Site Plan

The existing Oconee River overflow bridges (324 ft. x 28 ft. and 135 ft. x 28 ft.) were built in 1956 and both have a sufficiency rating of 69. The existing approaches consist of two, 12-ft.-wide lanes with 8-ft.-wide rural shoulders (2 ft. paved) on 300 ft. of existing right-of-way. State Route 30/US 280 is part of the Governors Road Improvement Program (GRIP). The SR 30/US 280 corridor was identified and approved for implementation by the governor and the state legislature. In the future, State Route 30/US 280 will be widened to four lanes with a 44 ft. median under GRIP project MSL-0004-00(774), P.I. No.0004774. The construction of the GRIP project is scheduled in the Long Range plan. The base year traffic (2008) on this section of SR 30/US 280 is 6,500 VPD and the 20-year traffic (2028) or design year projected volume is 10,000 VPD. The posted speed and the design speed are 55 MPH.

The construction proposes to replace the existing bridges over the Oconee River and the two overflows with new 2,400 ft. x 44 ft., 350 ft. x 44 ft., and 200 ft. x 44 ft. concrete bridges, respectively, constructed on new location south of the existing bridges. Foundations will be pile-supported bents. The relocated SR 30/US 280 will consist of two, 12-ft.-wide lanes with 10-ft.-wide rural shoulders (6.5 ft. paved) on 350 ft. of proposed right-of-way. Traffic will be maintained on the existing bridges while the proposed bridges are constructed on the new parallel alignment to the

south of the existing road. Environmental concerns include requiring a COE 404 Permit for the project and some wetland mitigation will be required. Projected traffic data is presented in Table 1.

Table 1
TRAFFIC DATA

Traffic	ADT	6500	2008
	ADT	10000	2028
	DHV	600	2028
Directional Distribution			60%
% Trucks			8%
% 24hr Trucks			10%
Speed Design			65 mph

Existing design features

- Typical Section: Two paved 12-ft.-wide lanes, 8-ft.-wide shoulders (2-ft.-wide paved), with V-ditch left and right
- Posted speed 55 mph
- Maximum grade: 2% mainline
- Width of right-of-way: 300 ft.
- Major structures: 2378-ft.-long x 28-ft.-wide bridge with sufficiency rating of 18.79
- Mile Point Reference: Begin-17.52, End 0.386
- Major structures: 324-ft.-long x 28-ft.-wide bridge with sufficiency rating of 68.82
- Mile Point Reference: Begin 0.58, End 0.64
- Major structures: 135-ft.-long x 28 ft.-wide bridge with sufficiency rating of 68.82
- Mile Point Reference: Begin 0.84, End 0.86
- Major interchanges or intersections along the project: None
- Maximum degree of curvature: 5° 00'
- Maximum grade driveways: 10.5%

Proposed Design Features

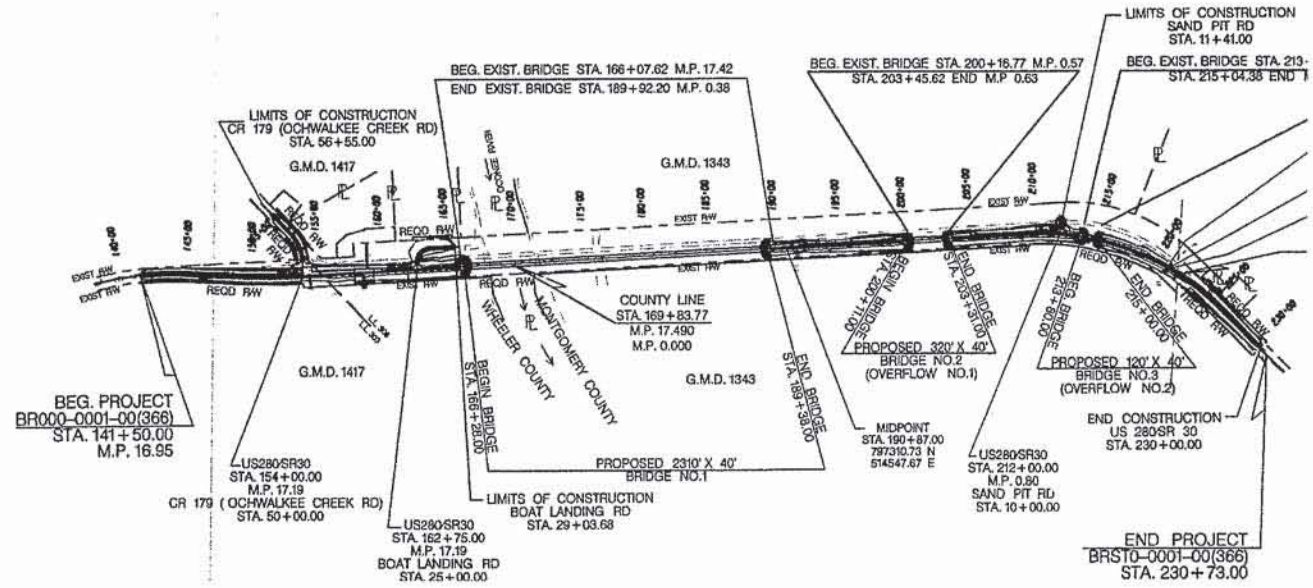
- Proposed typical section(s): Two paved 12-ft.-wide lanes, with 10-ft-wide shoulders (6.5-ft.-wide paved) left and right, and 4-ft.-wide ditches
- Proposed Design Speed: Mainline-55 mph
- Proposed Maximum grade Mainline: 2.0%, Maximum grade allowable 3.5%
- Proposed Maximum grade driveway: 10.5%
- Proposed Maximum degree of curve: 3° 00', Maximum allowable 6° @ 55 mph;
- Right of Way - Width – 350 ft.
- Bridge: The proposed bridge will be 2,400-ft.-wide x 44-ft.-wide (main span);
- Bridge: The proposed bridge will be 350-ft.-wide x 44-ft.-wide (Overflow #1);
- Bridge: The proposed bridge will be 200-ft.-wide x 44-ft.-wide (Overflow #2);
- Retaining walls: None
- Traffic control during construction: Two-way traffic will be maintained on the existing roadway while the proposed bridges are being constructed.

Project Cost and Schedule

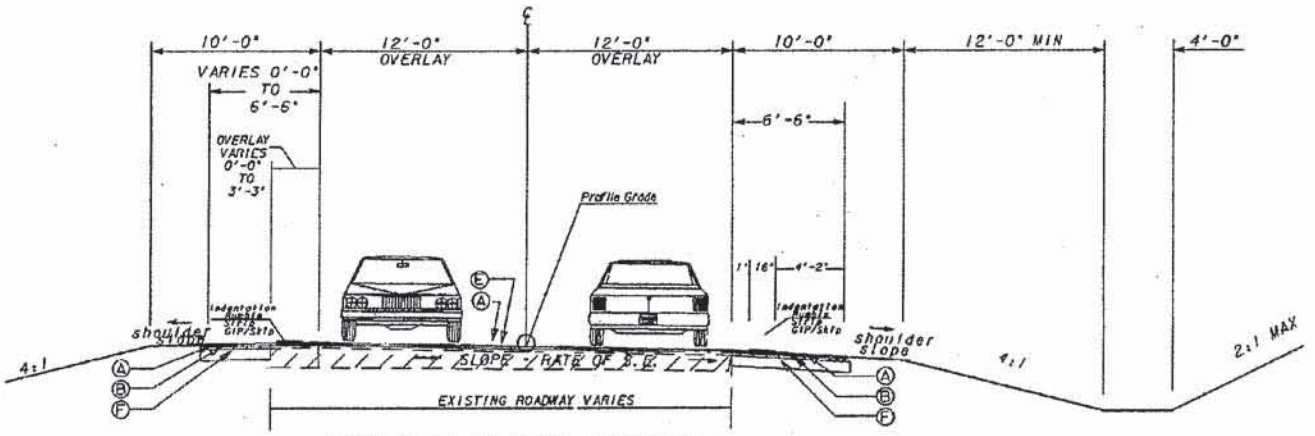
The total project cost is estimated at $19,839,000 including 5% engineering and inspection, and 4% construction contingency. Approximately 350,000CY of fill material will be required for the new roadway.

Project Exhibits

The following exhibits present the project plan, profile, section, and supporting data.



PROJECT ALIGNMENT

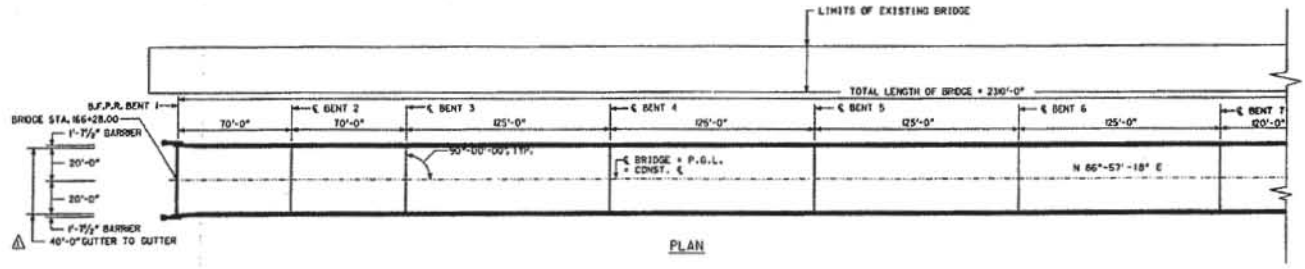


SUPER ELEVATED SECTION

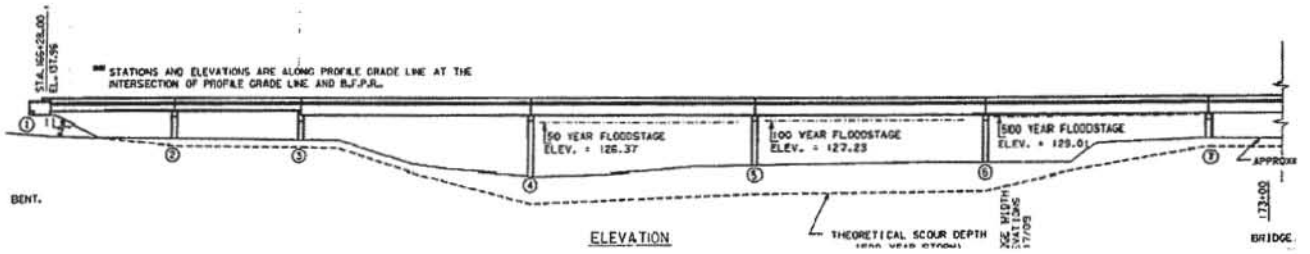
SEE ROADWAY PLANS FOR SUPERELEVATION RATES AND TRANSITIONS

APPLIES FROM STA. 141+50.00 TO 143+86.87

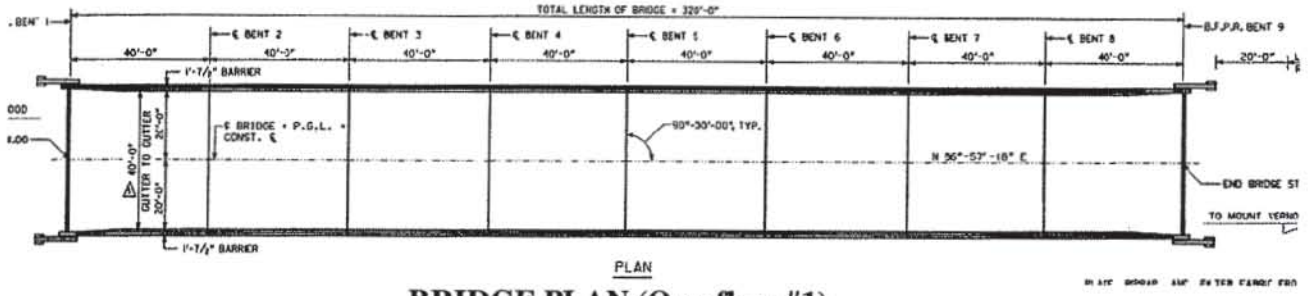
TYPICAL SECTION



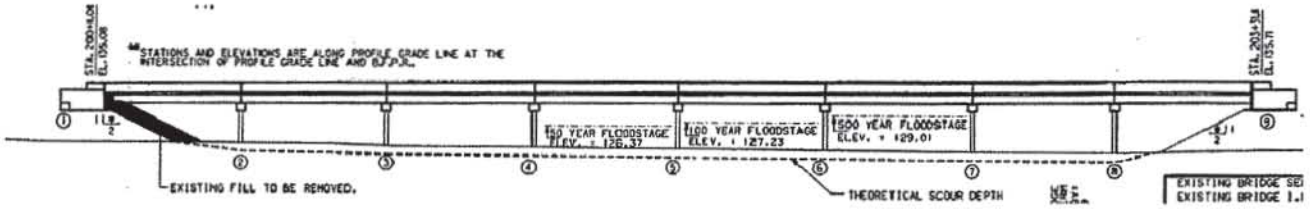
BRIDGE PLAN (Main Bridge - West End)



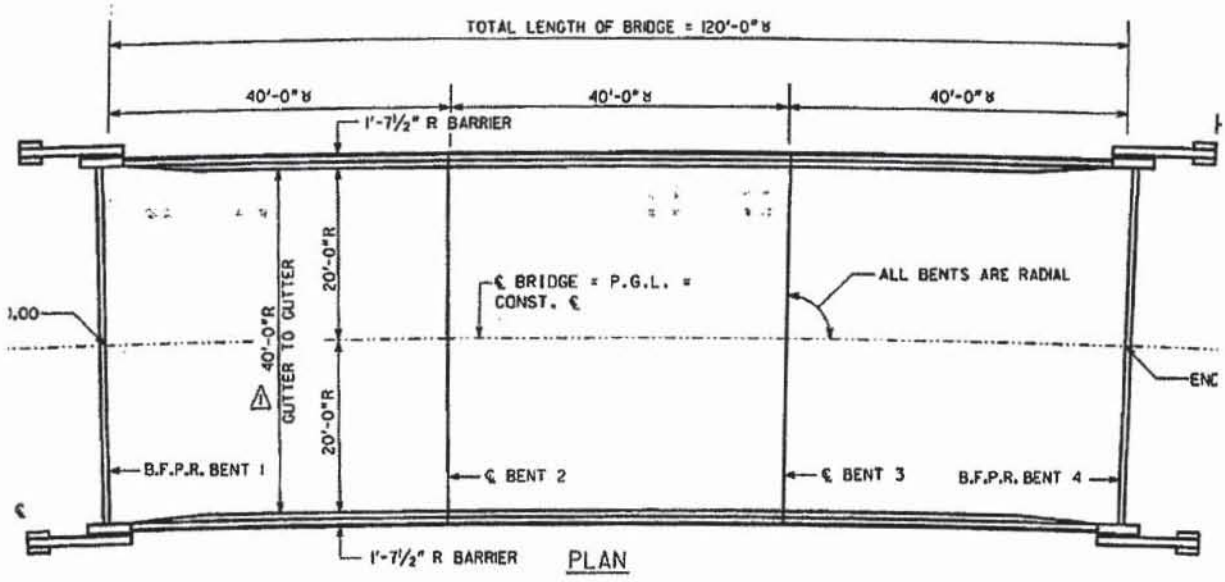
BRIDGE ELEVATION (Main Bridge - West End)



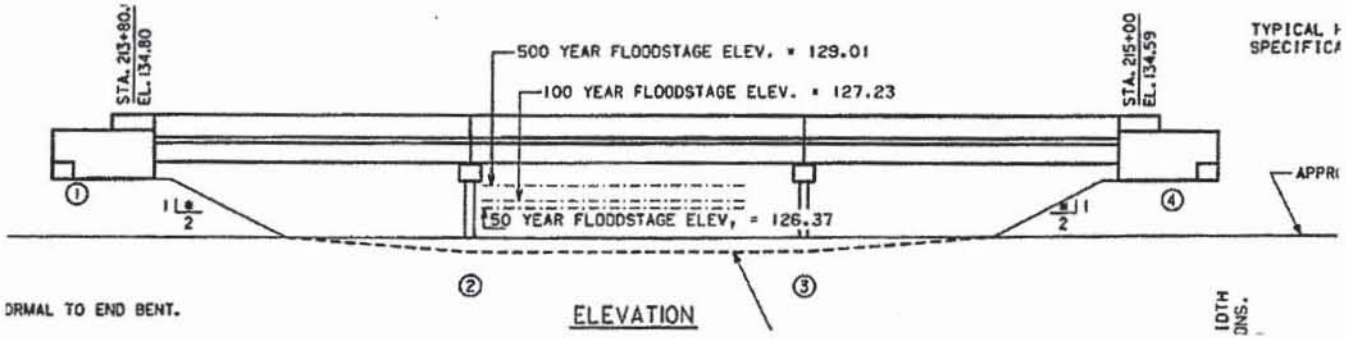
BRIDGE PLAN (Overflow #1)



BRIDGE ELEVATION (Overflow #1)



BRIDGE PLAN (Overflow #2)



BRIDGE ELEVATION (Overflow #2)

VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis (VA) procedure used during the VE study conducted for GDOT by Lewis & Zimmerman Associates, Inc. on the SR 30/US 280 @ Oconee River & Overflows, located in Wheeler & Montgomery Counties, GA. The workshop was performed as the design neared the preliminary engineering stage as developed by GDOT District 5. GDOT has provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study, which was divided into three parts: (1) Preparation Effort, (2) Workshop Effort, and (3) Post-Workshop Effort. A task flow diagram outlining each of the procedures included in the VE study is attached for reference.

Following this description of the VA procedure, separate narratives and supporting documentation identify the following:

- VE workshop participants
- Economic data
- Cost model
- Function analysis
- Creative ideas and evaluations

PREPARATION EFFORT

Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. Documents such as those listed below were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, Preliminary Engineering Documents, prepared by GDOT District 5, dated April 5, 2010;
- Concept Report - SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, prepared by GDOT, dated February 9, 2005;
- Project Cost Estimate - SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, prepared by GDOT, dated June 4, 2010;
- Hydraulic and Hydrological Report, BR000-0001-00(366), P.I. No. 0001366 Montgomery County, SR 30/US 280 @ Oconee River & Overflows, prepared by GDOT, dated April 23, 2008;
- Revised Bridge Foundation Investigation Report, SR 30/US 280 Over the Oconee River, Bridge No. 1, 2, & 3, prepared by GDOT, dated January 13, 2010;
- Traffic Projection Memo, prepared by GDOT, dated April 15, 2002;
- Preliminary Right of Way Cost Estimate, prepared by GDOT, dated May 27, 2010;
- Preliminary Utility Cost Estimate, prepared by GDOT, dated May 19, 2010;

Value Engineering Study Task Flow Diagram

Preparation Effort

Coordination Project
- Verify Schedule
- Suggest Format for Designer Presentation
- Outline Project Responsibilities
- Outline Needed Background Data
- Define *Project Value Objectives*
- Identify Project Constraints

→

Prepare for Workshop
- Collect Project Data
- Distribute Data to Team Members
- Team Members Become Familiar with Project

→

Construct Cost Models
- Construct Cost Models
- Construct Graphic Function Analysis
- Outline High Cost Areas

→

LCC Model
- Roadway
- Bridges
- MOT
- Energy
- User Impact

Workshop Effort

Information Phase
- Introduction by VETL
- Project Description and Presentation by Designer
- Outline Owner Requirements
- Review Project Data
- Visit Project Site (Alt.)

→

Function Identification and Analysis Phase
- Analyze Project Costs and Energy Usage
- Perform Function Analysis and FAST Diagram
- Identify High Cost and Energy Areas
- Calculate Cost/Worth Ratios
- Identify Paradigms

List Ideas Generated During Function Analysis

→

Speculation Phase
- Introduction by VETL
- Creative Idea Listing:
  - Quantity of ideas
  - Association of Ideas
- Brainstorm
- Do Creative Thinking
  - Group Thinking
  - Individual Thinking
- Use Checklist for Ideas

→

Evaluation Phase
- Eliminate Impractical Ideas
- Rank Ideas with Advantages/ Disadvantages
- Evaluate Alternatives (Include Non-Economic considerations: Safety, Reliability, Environment, Aesthetics, O&M, etc.)
- Select Best Ideas for Implementation

→

Development Phase
- Develop Proposed Alternatives
- Prepare Alternative Design Sketches
- Estimate Costs
- Perform Life Cycle Comparison
  - Initial Cost
  - Redesign Cost
  - O&M Cost
  - LCC Cost

→

Presentation Phase
- Summarize Findings
- Present VE Ideas to Owner/ User/Designer
- Oral Presentation

Post-Workshop Effort

VE Study Report
- Develop Implementation VE Report
- Designer Prepares Responses to VE Report
- Owner Evaluates Recommendations

→

Implementation Phase
- Participate in Implementation Meeting with Owner/User/ Designer/ VE Team, as needed
- Prepare Final VE Report

→

Final Acceptance
- Redesign by Designer

- Accident Rate Calculations for Years 2006 – 2008, prepared by GDOT; and
- VE Study Constraints, prepared by GDOT District 5.

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs is very important as it provides the VE team with insight about how the project has progressed to its current state.

Project cost information provided by the designers is used by the team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the Project Cost Estimate - SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, prepared by GDOT, dated June 4, 2010, to develop a cost histogram for the project. The model was used to distribute the total project cost among the various elements of the project. The VE team used this model to identify the high-cost elements that drive the project and the element providing little or no value so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a 3½ day effort beginning with an orientation/kickoff meeting on Monday, August 30, 2010, and concluding with the final VE Presentation on Thursday, September 2, 2010. During the workshop, the VE Job Plan was followed in compliance with the U.S. Federal Highway Administration guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative/Speculation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods have to be reviewed and understood. For this reason, the workshop began with a presentation of the project by the GDOT design team to the VE team. The presentation highlighted the information provided in the documentation reviewed by the VE team before the workshop and expanded on it to include a history of the project's development and any underlying influences that caused the design to develop to its current state. During this presentation, VE team members were given the opportunity to ask questions and obtain clarification about the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to define the functions provided by the project, identifying the costs to provide these functions, and determining whether the value

provided by the functions has been optimized. Function analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project or if there are disproportionate amounts of money spent on support functions. Elements performing support functions add cost to the project but have a relatively low worth to the basic function.

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. To accomplish this, the team first looked at the project in its entirety and randomly listed its functions, which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) of the major components of the project depicted on the cost models were identified.

After identifying the functions, the team classified the functions according to the following:

Abbreviation	Type of Function	Definition
HO	Higher Order	The primary reason the project is being considered or project goal.
B	Basic	A function that must occur for the project to meet its higher order functions.
S	Secondary	A function that occurs because of the concept or process selected and may or may not be necessary.
R/S	Required Secondary	A secondary function that may not be necessary to perform the basic function but must be included to satisfy other requirements or the project cannot proceed.
G	Goal	Secondary goal of the project.
O	Objective	Criteria to be met
LO	Lower Order	A function that serves as a project input.

Higher order and basic functions provide value, while secondary functions tend to reduce value. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

To further clarify the impact of the various functions, the team assigned costs to provide the functions or group of functions indicated by a specific project element using the cost estimate and cost models. Where possible, they seek to find the lowest cost, or worth, to perform the function. This is accomplished using published data from other sources or team knowledge obtained from working on other similar projects to establish cost goals and then comparing them to the current costs. By identifying the cost and worth of a function or group of functions, cost/worth ratios were calculated. Cost/worth ratios greater than one indicated that less than optimum value was being provided. Those project functions or elements with high cost/worth ratios became prime targets for value improvement.

As well as looking at areas with high cost/worth ratios, the team used the cost models previously prepared to seek out the areas where most of the project funds are being applied. Because of the absolute magnitude of these high-cost elements or functions, they also became initial targets for value enhancement.

Overall, these exercises stimulated the VE team members to focus on apparently low value areas and initially channel their creative idea development in these places.

Creative/Speculation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the VE team began to generate as many ideas as possible to provide the necessary functions at a lower total life cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructability were also encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas and free association of ideas. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

GDOT may wish to review the Creative Idea Listing worksheet since the list may contain ideas that were not pursued by the VE team but can be further evaluated for potential use in the design.

Evaluation Phase

Since the goal of the Creative/Speculation Phase was to conceive as many ideas as possible without regard for technical merit or applicability to the project goals, the Evaluation Phase focused on identifying those ideas that do respond to the project value objectives and are worthy of additional research and development before being presented to the owner. The selection process consisted of the VE team evaluating the ideas originated during the Creative/Speculation Phase based on GDOT's value objectives identified through conversations during the opening presentation. Based on the team's understanding of the owner's value objectives, each idea was compared with the present design concept, and the advantages and disadvantages of each idea were discussed. How well an idea met the design criteria was also reviewed.

Based on the results of these reviews, the VE team rated the idea by consensus using a scale of 1 to 5, with 5 or 4 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 3 indicating an idea that provides marginal value but could be used if the project was having budget problems, 2 indicating an idea with a major technical flaw, and 1 indicating an idea that does not respond to project requirements. Generally, ideas rated 4 and 5 are pursued in the next phase and presented to the owner during the Presentation Phase.

The team also used the designation "DS" to indicate a design suggestion, which is an idea that may not have specific quantifiable cost savings but may reduce project risk, improve constructability, help to minimize claims, enhance operability, ease maintenance, reduce schedule time, or enhance project value in other ways. Design suggestions could also increase a project's cost but provide value in areas not currently addressed.

Development Phase

In this phase, each highly rated idea was expanded into a workable solution designated as a VE alternative. The development consisted of describing the current design and the alternative solution, preparing a life cycle cost comparison where applicable, describing the advantages and disadvantages of the proposed alternative solution, and writing a brief narrative to compare the original design to the proposed change and provide a rationale for implementing the idea into the design. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in Section Two of this report.

Presentation Phase

The goals of the presentation phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Savings worksheets to hand out at the presentation, and to present the key VE alternatives to GDOT. The presentation was held on Thursday, September 2, 2010, at the GDOT Headquarters office in Atlanta, Georgia. The purpose of the meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed, and arrangements were made for the reviewers of the VE report to contact the VE team in order to obtain further clarifications, if necessary. Draft copies of the Summary of Potential Cost Savings worksheets were provided to the participants to facilitate a timely review and speedy implementation of the selected ideas.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from GDOT will analyze each alternative and prepare a response, recommending incorporation of the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. LZA is available at your convenience as you review the alternatives.

Upon completing their reviews, GDOT will decide which alternatives to implement.

VALUE ENGINEERING STUDY AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will facilitate a 28-hour value engineering (VE) study on the Preliminary Engineering Submittal for the **SR 30/US 280 @ Oconee River & Overflows, BR000-0001-00(366), P.I. No. 0001366, Wheeler & Montgomery Counties, Georgia**. This project is the replacement of three (3) narrow and structurally deficient bridges on SR 30/US 280 over Oconee River and two (2) overflows, 2.0 miles east of Glenwood, Georgia. The Georgia Department of Transportation (GDOT) project management and District 5 design team will be available to formally present the project at the beginning of the workshop; attend a presentation of the VE alternatives at the conclusion of the VE study; and be available to answer questions during the VE study effort.

The VE study will follow the outline described below and be conducted August 30 – September 2, 2010 at the offices of:

GDOT
600 West Peachtree Street, NW
5th Floor, Engineering Services Conference Room
Atlanta, Georgia 30308

The point-of-contact is Ms. Lisa Myers, GDOT Value Engineering Coordinator, who may be reached at 404-631-1770, or Matt Sanders, AVS, GDOT Value Engineering Specialist, 404-631-1752.

PROJECT DATA

Project #	P.I. No.	Description
BR000-0001-00(366)	0001366	SR 30/US 280 @ Oconee River & Overflows
Roadway Length:	1.169 miles	Wheeler & Montgomery Counties
Bridge Length:	0.521 miles	GDOT District 5
- Main Span	2400 ft. x 44 ft.	
- Overflow #1	350 ft. x 44 ft.	
- Overflow #2	200 ft. x 44 ft.	
Gross Length of Project	1.69 mi	
Estimated Construction Cost:	$19.8M	

VE STUDY AGENDA

Monday, August 30, 2010

8:00 am - 9:00 am	**VE Team Members Arrive and Review Documents**
9:00 am – 11:00 am	**Owner's/Designer's Presentation - *(5th Fl. Engr. Services Conf. Rm)***

The District #5 design team will present information concerning the project including, but not limited to: the Purpose and Need for the project, rationale for design; criteria for specific areas of study, project constraints and the reasons for design decisions.

11:00 am – 12:00 noon **VE Team Reviews Project Documents**

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 2:00 pm **Information Phase**

The VE team will continue their familiarization with the cost models and project data for each area of study. The cost models will be refined, as necessary. The VE team will define the function of each project element or system in the cost model, select the primary or basic functions, and determine the worth, or least cost, to provide the function. Cost/worth or value index ratios will be calculated, and high cost/low worth areas for study identified. In addition, the VE team will continue defining the function of each element/system to gain a thorough understanding of the projects' Purpose and Need.

2:00 pm – 3:00 pm **Function Analysis**

The team will identify all project functions required to meet the established purpose and need. Functions will be identified as to basic, required secondary, secondary, or project goals.

3:00 pm - 5:00 pm **Speculation Phase**

The VE 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.

Tuesday, August 31, 2010

8:00 am - 10:00 am **Speculation Phase (cont.)**

The VE team will continue the brainstorming exercise to capture ideas to improve the project in terms of initial and life cycle cost, technical aspects, schedule, and constructibility issues.

10:00 am – 12:00 noon **Analysis Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas for further development.

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 5:00 pm **Development Phase**

VE team will develop creative ideas into alternate design solutions. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives for change will be developed and supported with sketches, calculations and written substantiation.

Wednesday, September 1, 2010

8:00 am – 12:00 noon **Development Phase (cont.)**

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 5:00 pm **Development Phase (cont.)**

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the District #5 design team representatives. The team will review all documentation and prepare for the presentation.

Thursday, September 2, 2010

8:00 am - 9:00 am **Development Phase and Preparation for Presentation**

9:00 am – 12:00 noon **Presentation Phase – *(5th Fl. Engr. Services Conf. Rm)***

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the design team representatives. The team will review all documentation and prepare for the presentation.

Noon - Adjourn

POST-STUDY PHASE

Upon completion of the value engineering study, the VE team leader will prepare the Value Engineering Study Report and submit it to GDOT. The report will include the following material:

- Project description and design concept of project
- Cost models and graphic function analysis worksheets
- Value engineering alternatives: original design and proposed alternatives, including sketches, design calculations and initial and life cycle estimates
- Potential contract savings (capital construction and life cycle costs)

The GDOT design team will independently review the VE alternatives and classify them as accepted, accepted with modifications, needs further study, or rejected—accompanied by the reasons for rejection. A meeting with all stakeholders will then be convened to decide which VE alternatives to implement.

VE TEAM MEMBERS

David Hamilton, PE, CVS, CCE, LEED AP	VE Team Leader/Civil	Lewis & Zimmerman Assoc.
Joe Leoni, PE	Highway Design Engineer	ARCADIS
Mike Moilanen, PE	Structural Engineer	ARCADIS
Paresh Parikh, PE	Construction Engineer	Delon Hampton

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the unique project elements involved with the SR 30/US 280 @ Oconee River & Overflows project. The multidisciplinary team comprised professionals with highway design, bridge engineering, and construction experience and a working knowledge of VE procedures. The following lists the VE team members:

Participant	Specialization	Affiliation
Joe Leoni, PE	Highway Design	ARCADIS U.S., Inc.
Mike Moilanen, PE	Bridge Engineer	ARCADIS U.S., Inc
Paresh Parikh, PE	Civil/Constructability	Delon Hampton Associates
David Hamilton, PE, CVS, CCE	VE Team Leader/Civil	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, August 29, 2010, via video conferencing capabilities by representatives from the GDOT District 5 design team. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project specifics. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. An attendance list for the meeting is attached.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Thursday, September 2, 2010, at the GDOT Headquarters office in Atlanta, Georgia to review VE alternatives with representatives from GDOT. Copies of the Draft Summary of Potential Cost Savings worksheets were provided to the attendees. Attendees checked off their names on the attendance list from the opening presentation.

GDOT VE STUDY SIGN-IN SHEET

Meeting Days | **Project No.:** BR000-0001-00(366) PI No.: 0001366 | **County:** Wheeler & Montgomery | **Date:** Aug. 30 - Sept. 2, 2010

IN-BRIEF	OUT-BRIEF	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers		Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders		Engineering Services	404-631-1752	msanders@dot.ga.gov
✓	✓	Ron Wishon		Engineering Services	404-631-1753	rwishon@dot.ga.gov
✓		Ken Werho		Traffic Safety & Design	404-635-8144	kiwherho@dot.ga.gov
✓	✓	Mike Moilanen		ARCADIS-US	770-431-8666	mike.moilanen@arcadis-us.com
✓	✓	David Hamilton		Lewis & Zimmerman	253-229-7703	dahamilton@lza.com
✓	✓	Joe Leoni		ARCADIS-US	770-431-8666	joe.leoni@arcadis-us.com
✓	✓	Paresh Parikh		Delon Hampton	404-419-8439	pparikh@delonhampton.com
✓	✓	Bill DuVall		GDOT Bridge Design	404-631-1883	bduvall@dot.ga.gov
✓		Mike Murdock		OES	404-631-1178	mmurdock@dot.ga.gov
✓	✓	Travis Dent		Jesup Road Design	912-429-5718	tdent@dot.ga.gov
✓	✓	Dennis Odom		Jesup Road Design	912-427-5716	dodum@dot.ga.gov
✓		Ron Salter		Baxley Area	912-366-1090	rsalter@dot.ga.gov

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____ Check all that attended

__13__ Attended Project Overview (Day 1)

__10__ Attended Project Presentation (Day 4)

ECONOMIC DATA

The comparisons of life cycle costs between the VE alternatives and the current design solutions were performed on the basis of discounted present worth. To accomplish this, the VE team developed economic criteria to use in its calculations based on information gathered from GDOT and the District 5 design team. The following parameters were used when calculating discounted present worth, however, the schedule for the project is temporarily deferred and classified as long range.

Year of Analysis:	2010
Right of Way Purchase	2011
Planned Construction Let Date:	January 2012
Construction Completion Date:	Late 2013
Planning Period (n):	30
Discount Rate (i):	3%

When computing capital costs, direct material, labor and equipment costs are marked up using a composite markup of 9% that includes:

Engineering and Construction Inspection	5%
Construction Contingencies	4%

COST MODEL

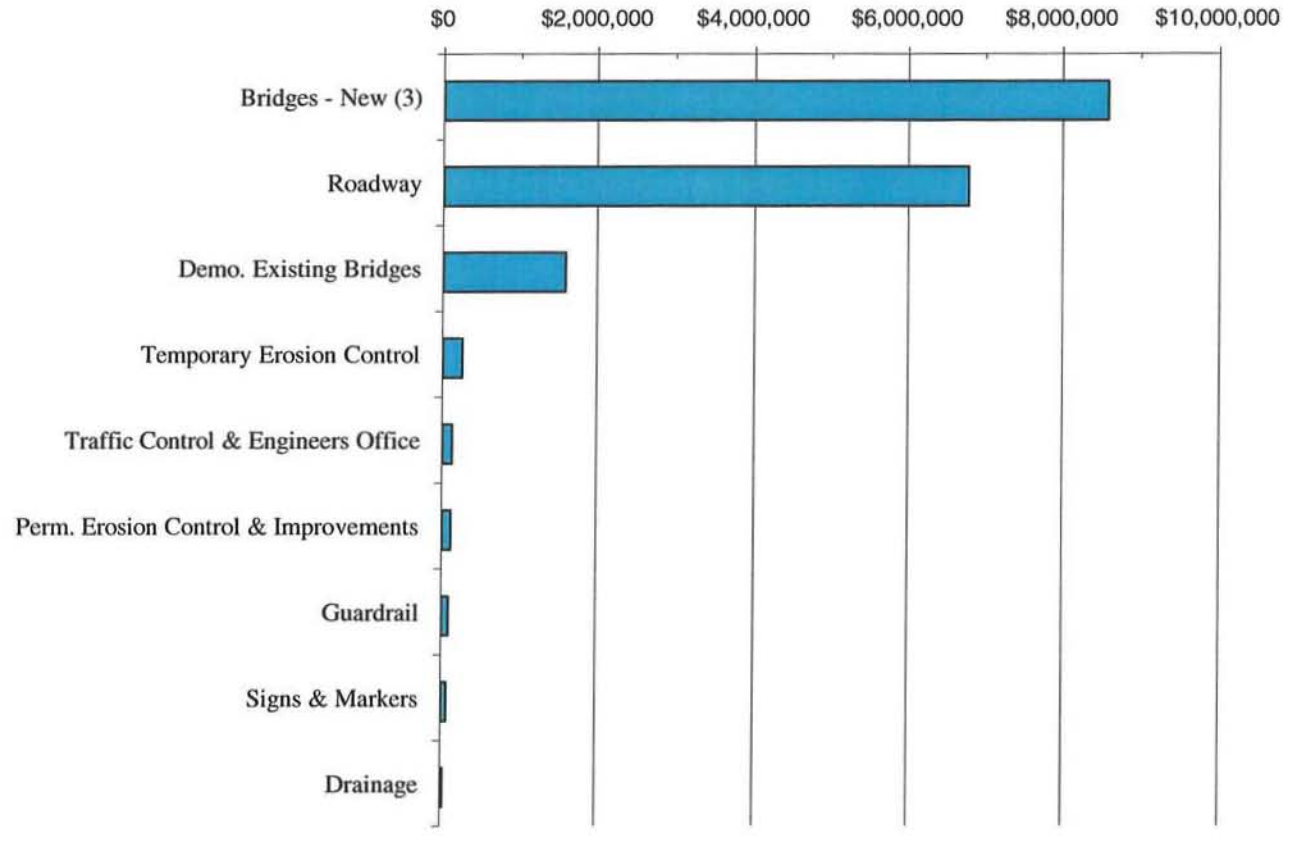
The VE team prepared a Pareto Chart, or Cost Histogram, for the project that follows this page. This Cost Histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project. The high cost elements provide the VE team with one focus for its work during the study.

The cost model quickly reveals that the bridge is the significant element in the project and the width and length of the structure are the key drivers of the project.

COST HISTOGRAM

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS**
BR000-0001-00(366), P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Preliminary Engineering

TOTAL PROJECT		COST	PERCENT	CUM. PERCENT
Bridges - New (3)		8,580,000	48.72%	48.72%
Roadway		6,779,557	38.49%	87.21%
Demo. Existing Bridges		1,588,720	9.02%	96.23%
Temporary Erosion Control		250,284	1.42%	97.65%
Traffic Control & Engineers Office		123,492	0.70%	98.35%
Perm. Erosion Control & Improvements		112,765	0.64%	98.99%
Guardrail		85,592	0.49%	99.48%
Signs & Markers		66,227	0.38%	99.85%
Drainage		25,701	0.15%	100.00%
Construction - Subtotal		***17,612,338***	100.00%	
Engineering and Inspection	5.00%	880,617		
Construction Contingency	4.00%	704,494		
Construction Total		***19,197,448***		
Fuel Adjustment		334,111		
Total Liquid AC Adjustment		307,903		
TOTAL PROJECT COST		**$ 19,839,462**	**Const. Markup:**	**9.00%**



FUNCTION ANALYSIS

A 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 function(s) needed to attain the given project purpose and need, (4) identify other public 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.

This project is quite well focused and is intended to "Eliminate Deficiencies" in the bridge cross section and structure. Re-investment in the bridge is needed due to its age and low sufficiency rating.

RANDOM FUNCTION ANALYSIS

PROJECT: **SR 30 / US 280 @ OCONEE RIVER & OVERFLOWS** SHEET NO.: **1 of 1**
BR000-0001-00(366) P.I. No. 0001366
Wheeler & Montgomery Counties, GA – Prelim. Engineering Submittal

DESCRIPTION		FUNCTION		
		VERB	NOUN	KIND
PROJECT	***(Magnitude of Function Cost $$)***	***Minimize***	***Accidents***	***HO***
Bridge	***$$$$***	***Span***	***Waterway***	***B***
	$$	***Upgrade***	***Infrastructure***	***B***
		Increase	Sufficiency	RS
Bridge Width & Geometrics		Improve	Functionality	RS
	$$$$	***Renew***	***Infrastructure***	***B***
Bridge Length	***$$***	Minimize	Backwater	RS
		Allow	Navigation	RS
		Increase	Life	G
		Increase	Capacity	S
		Reduce	Maintenance	G
		Improve	Durability	G
		Meet	Criteria	G
Shoulder width on bridge	***$$***	Improve	Geometrics	RS
		Access	Boat Ramp	RS
		Connect	***Population***	***HO***
		Allow	Commerce	G
Utilities	***$***	Relocate	Utilities	RS
		Minimize	Impacts	G
Environmental Constraints	***$***	Mitigate	Wetlands	RS
Bridge Elevation above flood levels	***$$***	Assure	Access	RS
		Satisfy	GRIP	RS
Parallel Roadway vs Detour	***$$$***	Maintain	Access	G
		Control	Budget	G
		Maintain	Schedule	G
Parallel Roadway vs Detour	***$$$***	Minimize	Disruption	RS

Function defined as: Action Verb, Measurable Noun

Kind: B = Basic; S = Secondary; RS = Required Secondary; HO = Higher Order; LO = Lower Order; G = Goal

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

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

PROJECT ELEMENT	PREFIX
Alignment	A
Profile	P
Section	S
Bridge	B
Construction Management	CM

The ideas were ranked on a qualitative scale of 1 to 5 on how well the VE team believed the idea met the project purpose and need criteria. To assist the team in evaluating the creative ideas, the advantages and disadvantages of each new idea compared to the existing design solution were discussed based on the owner's value objectives for the project. The following are the top value objectives for this project:

- Improve bridge sufficiency ratings
- Enhance functionality
- Maintain mainline access during construction
- Maintain boat ramp access
- Minimize wetland impacts
- Reduce user impacts

After discussing each idea, the team evaluated the ideas by consensus. Final analysis produced 12 ideas rated 4 or 5 to research and develop into formal VE alternatives to be included in the Study Results section of the report. Highly rated 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 reader 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 AND EVALUATION

PROJECT:	**SR 30 / US 280 OCONEE RIVER & OVERFLOWS** ***BR000-0001-00(366), P.I. No. 0001366*** ***Wheeler & Montgomery Counties, GA – Prelim. Engr. Submittal***	SHEET NO.:	**1 of 2**

NO.	IDEA DESCRIPTION	RATING
ALIGNMENT (A)		
A-1	Move new alignment closer to the existing road alignment	1
A-2	Shorten the project length; move the end points closer in	3
A-3	Shutdown the existing road and build the new facility on top of the old alignment	1
A-4	Reduce the size of the culvert (double box) at STA 220+72 to a single culvert	1
PROFILE (P)		
P-1	Raise the profile at Overflow #2 and use deeper single span beams	4
P-2	Lower the profile along the whole alignment	5
SECTION (S)		
S-1	Use 4-ft.-wide paved shoulders in lieu of 6.5-ft. paved shoulders	5
S-2	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes	2
S-3	Use 11.5-ft.-wide lanes in lieu of 12-ft.-wide lanes	4
S-4	Use 11-ft.-wide lanes on the side roads in lieu of the 12-ft.-wide lanes	5
S-5	Use 2:1 slopes in lieu of the 4:1 slopes	4
S-6	Use retaining walls on the side slopes to reduce the fill quantities and right of way	2
BRIDGE (B)		
B-1	Move Overflow #2 closer to Overflow #1	1
B-2	Combine Overflow #1 & #2	2
B-3	Use longer spans on the main bridge	4
B-4	Use Conspans on Overflow #1 & 2	2
B-5	Use longer bridge length and shorter embankment section	3
B-6	Use steel bridge in lieu of concrete	2
B-7	Use multiple culverts for Overflow #2	1
B-8	Use drilled caissons instead of driven piles	2
B-9	Clear span Overflow #3 in lieu of the two-span concept with shorter beams	2

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

CREATIVE IDEA LISTING AND EVALUATION

PROJECT:	**SR 30 / US 280 OCONEE RIVER & OVERFLOWS** ***BR000-0001-00(366), P.I. No. 0001366*** ***Wheeler & Montgomery Counties, GA – Prelim. Engr. Submittal***	SHEET NO.:	**2 of 2**

NO.	IDEA DESCRIPTION	RATING
BRIDGE (B) (cont.)		
B-10	Replace the main span bridge, but repair Overflow #1 & 2 instead of replacement	5
B-11	Re-use the old bridge structures in the future 4-lane expansion	3
B-12	Abandon the old bridges in place and demolish with the future road expansion	5
B-13	Use pile bents in lieu of concrete piers for the 70 ft. long bridge spans	5
CONSTRUCTION MANAGEMENT (CM)		
CM-1	Issue a Design/Build contract in lieu of conventional Design/Bid/Build	1
CM-2	Break the construction contract into two pieces, structures and earthwork	1
CM-3	Review the cost estimate quantities for earthwork to reduce project risk	5

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