Georgia Department of Transportation

Georgia Department of Transportation

WIDENING AND RECONSTRUCTION OF NORTH FORREST STREET/CR 138 FROM PARK AVE/SR 31 TO BEMISS RD/SR 125

Project No. STP00-4921-00(001)

P.I. No. 450200

Lowndes County, Georgia

Value Engineering Study Report

Preliminary Design Submittal

December 2008

Designer:

Georgia Department of Transportation

District 4

Value Engineering Consultant

Lewis & Zimmerman Associates, Inc.

Lewis & Zimmerman Associates, Inc.

Lewis & Zimmerman Associates, Inc.
Taking the Chance out of Change
1000 Town Center, Suite 180-27
Tacoma, Washington 98422
253/925-8741 • Fax: 253/925-8791 • Cell: 253/229-7703
dahamilton@lza.com • www.lza.com

December 24, 2008

Ms. Lisa Myers, Design Review Engineering Manager
State of Georgia
Department of Transportation
600 West Peachtree Street, 5th Floor
Atlanta, Georgia 30308

re: Widening and Reconstruction of North Forrest St./CR 138 from Park Ave. to Bemiss Rd.
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to present this value engineering study report on the referenced project. We appreciate your assistance in the conduct of this study and hope that these VE recommendations will provide a variety of improvements that will enhance the true value and constructability of the Widening of North Forrest Street Project in Lowndes County, Georgia. Some of the more interesting alternatives deal with optimizing the drainage system along the road and reducing the amount of right-of-way along North Forrest Street.

We appreciate the excellent participation of the GDOT District 4 design team throughout the study. Please feel free to contact David Hamilton if you have any questions as you review this report. On behalf of Lewis & Zimmerman Associates Inc., and the entire VE team, we hope our services have been informative and useful to the goal of value improvement on this project.

Sincerely,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

David A. Hamilton, P.E., CVS, CCE, LEED® AP
Vice President/VE Team Leader
Certified Value Specialist No. 910506 - Life

Enclosures

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) report summarizes the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc., for the Georgia Department of Transportation (GDOT). The subject of the study was the Preliminary Engineering Submittal on the Widening and Reconstruction of North Forrest Street/CR 138 from Park Avenue/SR 31 to Bemiss Road/SR 125 (STP00-4921-00(001) P.I. No. 450200), located in Valdosta, Georgia, and being designed by GDOT District 4. The project will greatly improve the Level of Service (LOS) along this busy corridor in Valdosta and aid in reducing accidents.

The VE study was conducted December 8 – 11, 2008 at the GDOT Central Office, located in Atlanta, Georgia and was conducted under the value engineering guidelines of GDOT, FHWA, AND SAVE International. VE team members consisted of a Certified Value Specialist from LZA, design and construction professionals from local highway engineering consultants.

Value engineering studies by their nature identify alternate design schemes, construction methods, and project delivery options, which can impact the final scope, design documents, budget, schedule, functionality, and appearance of the North Forrest Street Project. The task of the VE team is to identify possible solutions, whereas the task of GDOT and the inhouse design team is to choose the most favorable of the VE alternatives for incorporation into the project.

PROJECT DESCRIPTION

This project is the widening and reconstruction of North Forrest Street/CR 138 from Park Avenue/SR 31 to Bemiss Road/SR 125 in Lowndes County, Valdosta, Georgia. The proposed project length is 3.22 miles. The existing road consists of a two lane rural roadway on 60 – 80 feet of right-of-way. North Forrest Street/CR 138 currently functions at an acceptable Level of Service; however, traffic is projected to reach unacceptable levels within the next 10 years. There were 91 accidents, 54 injuries and one fatality along this corridor between 1995 and 1997, with the vast majority of the accidents attributed to following too close. Widening North Forrest Street will improve safety along this route and provide needed facilities for pedestrians and bikes. The base year traffic (2006) along this section of CR 138 is 13,300 VPD and future volumes are projected to be 22,500 VPD in 2026.

Traffic along North Forrest Street/CR 138 peaks near Park Avenue and decreases as traffic approaches SR 125. Land use along North Forrest is mostly residential. There are three schools located with the project limits. Near Park Avenue, there is some commercial property and a school. Land use at the north section of the project turns agricultural and the traffic volumes decrease to 10,800 ADT. The proposed construction will widen North Forrest Street / CR 138 to provide four, 12-ft-wide lanes with a 20-ft-wide center turn lane, curb and gutter, and sidewalks on 110-ft of minimum right of way. The proposed typical section consists of a 5-lane urban with two 12-ft-wide lanes in each direction and a 20-ft-wide flush turn lane with curb, gutter and sidewalks. The five existing traffic signals along this route will be reused. The additional lanes will reduce the number of

cars per lane thus increasing the distance between vehicles and will allow traffic to go around vehicles that are completing a turning movement. Design speed on the roadway is 45 mph with approximately 3% truck traffic. Total construction cost is estimated at $18.9M with an additional $6.9M needed for right of way. Construction is expected to take between 18 and 24 months.

RESULTS

The VE team explored over 25 ideas that could enhance the value of the project and address the concerns of GDOT. Evaluation and research of the ideas yielded 11 technically feasible alternatives with definable cost implications and two design suggestions that will improve the project in areas other than cost such as operations, safety, constructability, reliability, etc., or produce non-quantifiable cost reductions. Each of the alternatives and design suggestions are summarized on the table entitled Summary of Potential Cost Savings. Note that the alternatives were developed independent of each other and thus the total potential cost savings achievable is dependent on the combination of alternatives selected for implementation.

The VE team searched for ways to optimize the design from a traffic perspective and looked for schemes to reduce the $6.9M currently estimated for project right of way. The right of way issue was addressed by using slightly steeper side slopes on the crossection and exploring various combinations of lane widths, median combinations, and shoulder/sidewalk options. Reductions in section width assisted in achieving reductions in the amount of right of way required for the project.

The other major project cost component is the drainage facilities. This was addressed by considering more open drainage, the addition of potential storm detention basins, and the use of larger elliptical drain pipes with shallower inverts. The Study Results section of the report provides additional backup support describing each alternative.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
DRAINAGE (D)						
D-5	Modify yard drain piping concept to reduce the amount of piping required	$15,117	0	$15,117		$15,117
D-6	Reduce the amount of drain pipe by running only one main trunk down Forrest Street in lieu of two	$1,839,390	$1,464,476	$374,914		$374,914
D-7	Use a paved ditch along West Lakeland Avenue in lieu of three 24-inch pipes	$225,640	$136,731	$88,909		$88,909
D-8	Modify the drainage system by adding several storm detention basins. This will reduce the time of concentration and reduce the pipe sizes. Conduct additional hydraulic modeling.	DESIGN SUGGESTION				

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SECTION (S)						
S-1	Use 2:1 shoulder slopes from STA 316+00 to STA 325+00 to reduce right of way and save relocation cost.	$163,000		$163,000		$163,000
S-2	Use four 11 ft wide lanes in lieu of four 12 ft wide lanes.	$6,141,318	$5,629,570	$511,748		$511,748
S-3	Use a section with two 11 ft wide lanes on the inside and two 12 ft wide lanes on the outside.	$6,141,318	$5,885,444	$255,874		$255,874
S-5	Modify the section to use one urban shoulder on the East side and one rural shoulder on the West side.	$1,456,946	$436,880	$1,020,066		$1,020,066
S-8	Use 18 ft wide shoulders with 2:1 front slope ditches in lieu of 4:1 front slopes. Shorten the culverts and reduce the total section width.	$39,960		$39,960		$39,960
S-9	Construct the project in two major phases. First phase to include 3-lanes with rural shoulders on 4-lanes of right of way.	$8,661,651	$1,127,658	$7,533,993		$7,533,993
S-10	Reduce the grass strip in the shoulder from 6 ft wide to 2 ft wide.	$123,216	$6,773	$116,443		$116,443
S-11	Use Geogrid fabric in the pavement section and reduce the depth of base material from 5-inches to 2.5-inches.	$6,580,502	$5,629,504	$950,998		$950,998
ALIGNMENT (A)						
A-1	Replace all five of the existing traffic signals and increase the project estimate; assume that all signals will be integrated.	DESIGN SUGGESTION				

STUDY RESULTS

GENERAL

The results of this value engineering study conducted on Widening and Reconstruction of North Forrest Street/CR 138 from Park Avenue/SR 31 to Bemiss Road/SR 125 project since the benefits that can be realized by GDOT and the patrons that use North Forrest Street.

During the study, many ideas for potential value enhancement 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 are 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 or its subconsultant, whenever possible. If unit quantities were not available, published databases, such as the one produced by the RS Means Company, or team member or owner databases were consulted. A composite markup of 14%, as described in the Value Analysis and Conclusions section of the report, was used to generate an all-inclusive project cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is usually included. The design suggestions are presented as a series of narratives following the alternatives. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons include improved facility operation, ease of maintenance, ease of construction, safer working conditions, reduction in project risk, etc. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) to track through the value analysis process and thus facilitate referencing among the *Creative Idea*

Listing and Evaluation worksheets, the alternatives, and the *Summary of Value Engineering Alternatives* table. The Alt. No. includes a prefix that refers to a major project element listed below:

PROJECT ELEMENT	PREFIX
Alignment	A
Section	S
Drainage	D

Summaries of the alternatives and design suggestions are provided on the *Summary of Value Engineering Alternatives* tables. The tables are also organized by project element and are used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows each of the *Summary of Value Engineering Alternative* tables.

KEY ISSUES

During the design presentation several key issues arose in the project design, including the need for $6.9M in new right of way, shallow drainage conduits and outfalls, the sizable investment required for stormwater along the corridor, and the need to upgrade the five existing traffic signals along the corridor. The use of 4:1 outside side slopes also appears to be driving the width of the section and affects the amount of right of way required for the project.

PROJECT OBJECTIVES AND CONCERNS

The key objectives of the project as described by the design team is to improve the Level of Service, reduce the number of accidents in the corridor, and control the amount of right of way required. The planned five-lane facility with paved median will provide needed turning capability for adjacent home owners and businesses while allowing vehicles to move into a protected turn lane.

The other key objective is to improve the drainage in the corridor through the installation of curbs, gutters, and storm drains. However, concerns arise from the flat nature of the corridor, which complicates drainage and requires that catch basins be located fairly close together with drain pipes laid at minimum slopes. The drainage outfalls are very shallow and require multiple parallel pipes. Maintenance on these pipes could be problematic in the future due to low slopes and the potential for sediment buildup in the pipes. Right of way is also a concern since more than $6.9M of new property is required for the new widened section.

PROJECT CONSTRAINTS

Discussions held during the VE study evolved around several key constraints that must be incorporated in the design:

- The proposed alignment along North Forrest Street is generally fixed due to the large amount of residential and retail development in the area. The frequency of existing driveways

improves access to local businesses, but increases the potential for rear-end accidents from through traffic.

- There are a number of side streets which tend to limit the roadway profile in a number of locations.
- Traffic projections along North Forrest Street reinforce the decision for four lanes with a median through the corridor.
- The grades in the area are quite flat and minimum pipe slopes for culverts and corridor storm drains will be needed. Pipe crowns in the area will also be at minimum depth due to the shallow outfalls.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 11 alternatives and two design suggestions for consideration by the owner and designer. These alternatives and design suggestions address the key issues described above, specifically the amount of project right of way and the extent of storm drains.

Alignment

- The project does not include upgrade of the five existing traffic signals at this time. The new five lane section will require an additional investment in new signals to control the traffic at the main intersections. Funds for this should be included in the project budget.

Section

- Several options exist to optimize the road section, control right of way cost, and improve the operability of the corridor. A phased expansion program could be considered to more closely pace the traffic projections with the facilities. Purchasing all of the right of way initially but only constructing a 3-lane roadway could defer more than $7.5M. This would provide facilities which match the traffic projections more closely and enable State funds to be used on other priorities.
- The section could also be optimized by using an urban shoulder on the east side of the road and a rural shoulder on the west side. Deleting the formal sidewalk, curb and gutter from one side could save an estimated $1M.
- Right of way could be minimized through the use of 18-ft-wide shoulders with 2:1 front slope ditches in lieu of the 4:1 slopes as currently designed. This will reduce the needed right of way and shorten many of the culverts on the project.
- Since the percentage of trucks traveling in the corridor is lower than normal, 11-ft-wide lanes could be considered. If all four traffic lanes were reduced from 12-ft-wide to 11-ft-wide, a savings of nearly $500,000 in right of way could be captured. Another option would be to use 12-ft-wide lanes on the outside of the section and 11-ft-wide lanes on the inside. This would provide some of the benefits in right of way savings while maintaining at least one 12-ft wide lane in each direction.
- Major savings is also possible in the roadway through the use of a geogrid fabric in the pavement section. Analysis assumed a clayey sand material for the project and resulted in a reduction of 2.5 inches in base material with a potential savings to the project in the range of $1M.

Drainage

- Since the drainage component is a sizable component to the project cost, the team offers several alternatives. Converting the drainage system from a dual trunk system with drains on both sides of the road to a system with a single trunk could save an estimated $370,000.
- Other drainage options would include the conversion of the three 24-inch-diameter pipes along Lakeland Avenue to an open paved ditch saving an estimated $90,000. Other options for the triple pipe system would include the use of elliptical or parabolic pipe to meet the tight dimensions from gutter to drainage outfall elevations.
- Another unique approach to reduce the size and amount of drain pipe would be to install several storm detention ponds along the corridor to reduce the time of concentration of the storm flows. Small ponds could shave the peaks off of the hydrographs and reduce the active flow requirements in the piping system. To adequately investigate this option, however, a hydraulic model would need to be prepared and actual flows and pipe sizes determined. The ponds would also require additional right of way, but the savings in pipe size may offset the additional cost of land.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

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

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

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.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
DRAINAGE (D)						
D-5	Modify yard drain piping concept to reduce the amount of piping required	$15,117	0	$15,117		$15,117
D-6	Reduce the amount of drain pipe by running only one main trunk down Forrest Street in lieu of two	$1,839,390	$1,464,476	$374,914		$374,914
D-7	Use a paved ditch along West Lakeland Avenue in lieu of three 24-inch pipes	$225,640	$136,731	$88,909		$88,909
D-8	Modify the drainage system by adding several storm detention basins. This will reduce the time of concentration and reduce the pipe sizes. Conduct additional hydraulic modeling.	DESIGN SUGGESTION				

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET** ALTERNATIVE NO.:
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal **D-5**

DESCRIPTION: **MODIFY "YARD DRAIN" PIPING TO REDUCE LENGTH OF PIPE** SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The current design has numerous yard drains in fill sections. The piping from the yard drains runs to the closest catch basin.

ALTERNATIVE: (sketch attached)

Modify the location of certain catch basins so the length of 18-in. pipes to the yard drains would be shorter.

ADVANTAGES:

- Reduces construction cost
- Eliminates pipes under driveway pavement

DISADVANTAGES:

- Requires some re-design

DISCUSSION:

The current drainage design has numerous long lengths of 18-in. pipes from yard drains to the closest catch basin. It appears the catch basins could be spaced to shorten the lengths of pipes from yard drains. See attached sketch for examples. There are also other locations where this same idea could be implemented to save 18-in. storm drain pipe.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 15,116	—	$ 15,116
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 15,116	—	$ 15,116

Sketch A4.D-5 2/4

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

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		

BRICK RES. PI 0+00.00

Curve Data
N = SVAI
Δ = 0°13'00" (RT)
D = 0°05'00"
T = 130.00
L = 260.00
E = 0.12
R = 68754.94

L.L. 80 0+00

JULIAN R. & NORMA B. CLOUD (14)

GERALD E. HALTIWANGER (15)

MARIA F. KEEFEE (16)

ALTON O. & ABBIE W. ANDERSON (17)

JEAN RIGSBY (12)

MACARONI BRICK RES.

ALFRED & WILLA E. GOOSBY (13)

BRICK RES.

FENCE, CHAIN LINK

EXIST. R/W

LEONE AVE.

N 87°56'52"E

225+00

PI 225+54.77

R 30

224+94.09 80.00'
224+21.77 65.00'
225+44.09 70.00'
226+00.00 65.00'
226+74.19 65.00'
227+64.23 65.00'
228+54.23 65.00'
229+44.23 65.00'

REQ'D R/W

CONSTR. LIMITS

EXIST. R/W FENCE, WOOD

5' SIDEWALK

14'

20'

C-57 C-56 C-55 C-54 C-53

224+21.77 40.00' C-26
224+94.27 40.00'
225+44.24 40.00' C-27
226+74.36 40.00' C-28
227+64.36 40.00'
228+54.36 40.00' C-29
229+44.36 40.00' C-30

CONC. DWAY
EX. SIDEWALK
ASPH DWAY

STA 225+19.44 CONSTR. C/L
STA 1+64.89 LEONE AVE.

FORREST ST.

N 1°38'47"W

89°23'43"

STA. 224+00

MATCH LINE

STA. 230+00

224+21.77 40.00' C-13
224+74.61 40.00'
225+64.66 40.00' C-12
226+70.42 40.00'
226+81.77 40.00'
227+60.57 40.00' C-10
228+50.57 40.00'
229+40.57 40.00' C-9

18' 16' 14' 18'

EXIST. R/W C-11

226+70.44 65.00'
226+81.77 65.00'

C-68 C-67 C-66 C-65

224+21.77 70.00'
224+94.75 70.00'
225+44.75 50.00'
224+94.70 50.00'
225+44.80 70.00'
226+00.00 65.00'
227+60.57 65.00'
228+50.57 65.00'
229+40.57 65.00'

REQ'D R/W

PC 224+21.77

PT 226+81.77

BRICK BUILDING

BRICK RES.

N 87°56'52"E

EXIST. R/W

99 L.L. 105 JEROME & DEBORAH MCNAIR

100 WILLIE R. & JOANNA R. JONES
L.L.* 80, 105
11TH LAND DISTRICT
G.M.D. *663

ARTIE BLAND (101)

CYNTHIA D. JONES (102)

PATRICIA C. EASON (103)

CAREY M. & DOROTHY M. CAMERON (104)

This sheet shows examples of modifications to spacing C.B.s to save Pipe.

If need be other C.B.s could be relocated for gutterspend.

D-5

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

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET 0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
MAINLINE PLAN

DRAWING NO. 13-5

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: D-5

SHEET NO.: 3 of 4

Original storm pipe saved:
Shorten pipe lines to catch basins
After reviewing plans, save 390 L.F. of
18" storm DRAIN pipe

COST WORKSHEET

PROJECT: **WIDENING OF N. FORREST STREET**

Project No. STP00-04921-00(001) Lowndes County, Georgia

ALTERNATIVE NO.: **D-5**

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
Save pipe							
18-in storm drain pipe	LF	390	34.00	13,260			
Subtotal				13,260			
Markup (%) at 14%				1,856			
TOTAL				15,116			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **D-6**

DESCRIPTION: **REDUCE THE AMOUNT OF DRAIN PIPE BY RUNNING A SINGLE TRUNK LIKE WITH TRANSVERSE COLLECTORS IN LIEU OF TWO TRUNK LINES ON FORREST STREET**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The drainage design includes 18", 24", 30" and 36-in. pipes on either side of the roadway for the entire project length. This creates a dual trunk drainage system.

ALTERNATIVE: (sketch attached)

The amount of pipe on each longitudinal system can be reduced by using a single trunk system on one side of the street with laterals running transverse to the other side of the street. Use a single large trunk on one side of the street and reduce the pipe size to many of the catch basins.

ADVANTAGES:

- Reduces amount of pipe used and therefore reduces cost
- Lateral pipes will be smaller

DISADVANTAGES:

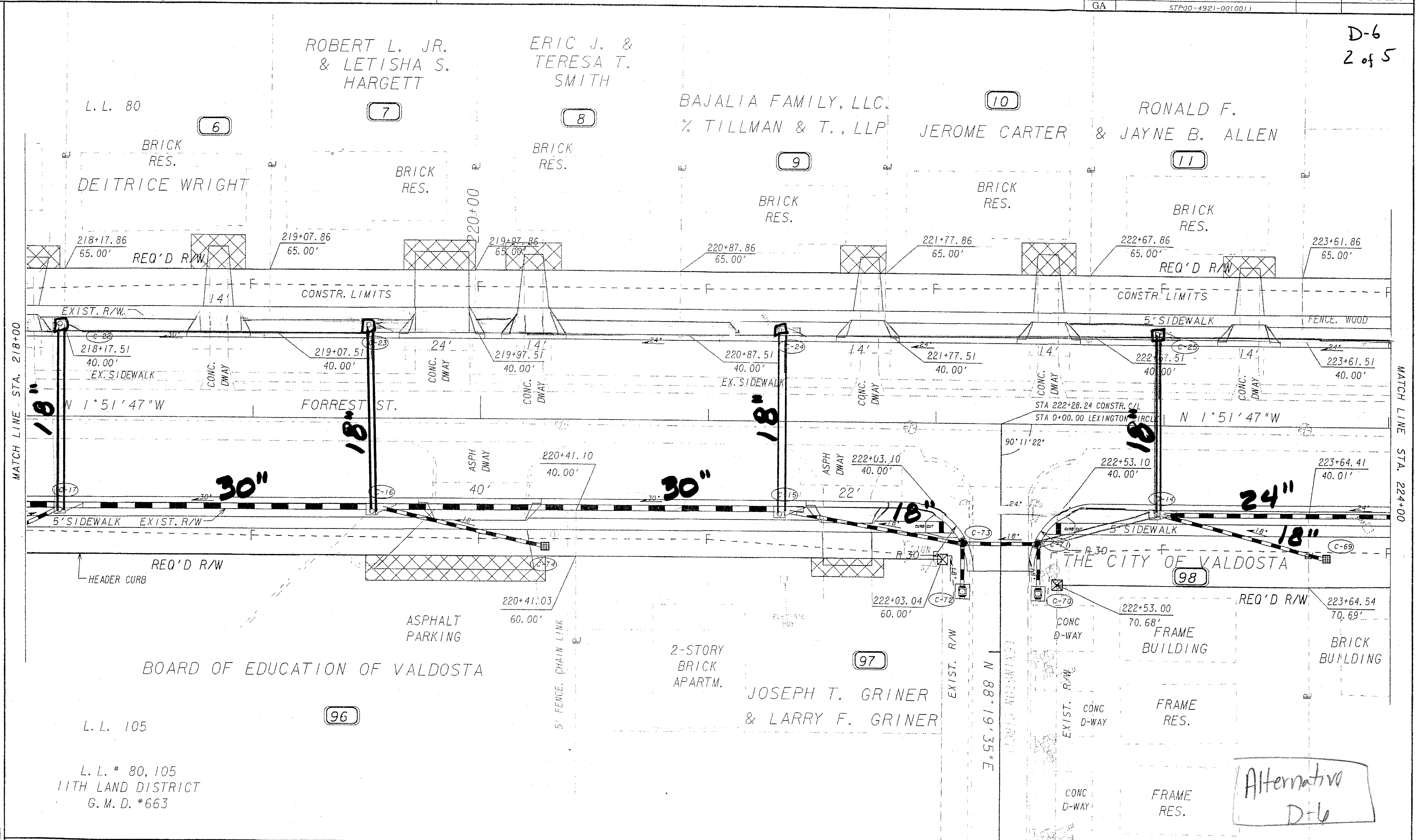
- Flow may not be as steady/constant
- The trunk line will be larger and the invert could be deeper than the double trunk concept, however other solutions such as elliptical pipe could be explored to minimize the depth of bury.

DISCUSSION:

In looking over the layout/plans, there is an extensive amount of pipe throughout this project. Rerouting the system will reduce the quantity of pipe used while still allowing proper flow through the drainage system.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,839,390	—	$ 1,839,390
ALTERNATIVE	$ 1,464,476	—	$ 1,464,476
SAVINGS (Original minus Alternative)	$ 374,914	—	$ 374,914

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		



D-6
2 of 5
ROBERT L. JR. & LETISHA S. HARGETT
ERIC J. & TERESA T. SMITH
BAJALIA FAMILY, LLC. % TILLMAN & T., LLP
JEROME CARTER
RONALD F. & JAYNE B. ALLEN
DEITRICE WRIGHT
L. L. 80
6
7
8
9
10
11
BRICK RES.
218+17.86 65.00'
219+07.86 65.00'
219+97.86 65.00'
220+87.86 65.00'
221+77.86 65.00'
222+67.86 65.00'
223+61.86 65.00'
REQ'D R/W
CONSTR. LIMITS
EXIST. R/W
5' SIDEWALK
FENCE, WOOD
218+17.51 40.00'
219+07.51 40.00'
219+97.51 40.00'
220+87.51 40.00'
221+77.51 40.00'
222+67.51 40.00'
223+61.51 40.00'
EX. SIDEWALK
CONC. DWAY
N 1°51'47"W
FORREST ST.
STA 222+28.24 CONSTR. C/L
STA 0+00.00 LEXINGTON CIRCLE
90°11'22"
MATCH LINE STA. 218+00
MATCH LINE STA. 224+00
18"
30"
24"
ASPH DWAY
220+41.10 40.00'
222+03.10 40.00'
222+53.10 40.00'
223+64.41 40.01'
HEADER CURB
220+41.03 60.00'
222+03.04 60.00'
222+53.00 70.68'
223+64.54 70.69'
THE CITY OF VALDOSTA
98
ASPHALT PARKING
BOARD OF EDUCATION OF VALDOSTA
96
2-STORY BRICK APARTM.
97
JOSEPH T. GRINER & LARRY F. GRINER
5' FENCE, CHAIN LINK
EXIST. R/W
N 88°19'35"E
CONC D-WAY
FRAME BUILDING
BRICK BUILDING
FRAME RES.
L. L. 105
L. L. # 80, 105
11TH LAND DISTRICT
G. M. D. #663
Alternative D-6

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

BEGIN LIMIT OF ACCESS	BLA
END LIMIT OF ACCESS	ELA
LIMIT OF ACCESS	
REQ'D R/W & LIMIT OF ACCESS	

Typical case.... use cross drains when feasible

SCALE IN FEET 0 20 40 80

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

MAINLINE PLAN

DRAWING No. 13-4

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		

D-6
3 of 5

Curve Data
N = SVA2
Δ = 0°05'00" (RT)
D = 0°03'00"
T = 83.33
L = 166.67
E = 0.03
R = 114591.56

PI 1+56.67

PI 0+00.00

0+00

PI 244+47.87

245+00

ASPH. DWAY

CONC. DWAY

FIRST FREEWILL BAPTIST CHURCH OF VALDOSTA

28

L.L. 80

EXIST. R/W

S 88°20'33" W

BRICK RES.

29

NICHOLS, INC.

30

NICHOLS, INC.

N 88°22'51" E

HASTIE D. BIBBS

31

242+85.00
65.00'
R 30

243+35.00
60.00'

243+64.54
60.00'

244+69.38
60.00'

245+31.21
60.00'

246+03.01
60.00'

246+53.01
60.00'

247+87.01
60.00'

REQ'D R/W

CONSTR. LIMITS

EXIST. R/W

5' SIDEWALK

4" FENCE, CHAIN LINK

242+85.00
40.00'

243+35.00
40.00'

243+64.54
40.00'

244+69.39
40.00'

245+31.21
40.00'

246+03.03
40.00'

246+53.03
40.00'

247+87.03
40.00'

STA 243+10.01 CONSTR. C/L
STA 0+00.00 PAGE DR.

N 1°38'47" W

90°00'38"

FORREST ST.

N 1°33'47" W

90°03'20"

STA 246+28.06 CONSTR. C/L
STA 1+35.00 EUCLID CIRCLE/ST.

MATCH LINE STA. 242+00

MATCH LINE STA. 248+00

18"

242+41.78
40.00'

243+31.78
40.00'

243+64.54
40.00'

244+35.33
40.00'

245+31.21
40.00'

245+83.10
40.00'

246+73.10
40.00'

247+43.10
40.00'

14'

18'

FENCE, WOOD

5' SIDEWALK

242+41.78
65.00'

243+31.78
65.00'

243+64.54
65.00'

244+35.30
65.00'

245+31.21
65.00'

246+03.13
65.00'

246+03.12
60.00'

246+53.12
60.00'

246+53.13
65.00'

247+43.10
65.00'

PC 243+64.54

PT 245+31.21

JOE S. & TRILBY A. STEVENS

BRICK RES.

ANTHONY C. SANFORD

117

116

L.L. 105

L.L. # 80, 105
11TH LAND DISTRICT
G.M.D. #663

WALLACE E. WALSH, JR.

118

119

MARK D. TIDROW

CONC. DWAY

FRAME RES.

ATLEE E. & LOIS P. CAIN

120

KATHERINE A. NESBITT

121

Alternative
D-6

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

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET
0 20 40 80

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

MAINLINE PLAN

DRAWING NO. 13-8

3/1/2007 GPLN

CALCULATIONS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: D-6
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

SHEET NO.: 4 of 5

Pipe Removal

18" - 6280' ($33.56) = $210,757
24" - 4744' ($51.92) = $246,309
30" - 580' ($62.32) = $36,146
36" - 180' ($81.28) = $14,630

Alternate Cost

18" → (15454')($33.56) = $518,636
24" → (11843')($51.92) = $614,889
30" → (1616')($62.32) = $100,709
36" → (420')($81.28) = $50,394

Pipe Addition

18" - 2616' ($33.56) = $87,793
24" - 1480' ($51.92) = $76,842
30" - 230' ($62.32) = $14,334

Differences

	Original		Addition	
18" →	19118'	- 6280' →	12838' + 2616'	= 15454'
24" →	15107'	- 4744' →	10,363' + 1480'	= 11843'
30" →	1966'	- 580' →	1386 + 230'	= 1616'
36" →	800'	- 180' →	620'	

COST WORKSHEET

PROJECT: **WIDENING OF N. FORREST STREET**

Project No. STP00-04921-00(001) Lowndes County, Georgia

ALTERNATIVE NO.: **D-6**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Storm drain pipe, 18-in	LF	19,118	33.56	641,600			
					15,454	33.56	518,636
Storm drain pipe, 24-in	LF	15,107	51.92	784,355			
					11,843	51.92	614,889
Storm drain pipe, 30-in	LF	1,966	62.32	122,521			
					1,616	62.32	100,709
Storm drain pipe, 36-in	LF	800	81.28	65,024			
					620	81.28	50,394
Subtotal				1,613,500			1,284,628
Markup (%) at 14%				225,890			179,848
TOTAL				1,839,390			1,464,476

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **D-7**

DESCRIPTION: **USE A PAVED DITCH ALONG WEST LAKELAND AVENUE IN LIEU OF THREE 24-IN. PIPES**

SHEET NO.: **1 of 9**

ORIGINAL DESIGN: (sketch attached)

The original/current design uses three 24-in. drain pipes, along an existing ditch, to outfall flows from N. Forrest Street/CR 138. It is assumed that the triple pipe concept was selected due to the limited dimension from the outfall invert to the crown of the pipes. The total length of 24-in. pipe required is 3,870 LF for the three lines 1,290 ft long runs along the south side of West Lakeland Avenue.

ALTERNATIVE: (sketch attached)

Retain and update the existing ditch geometrics into formal paved invert to handle flows from North Forrest Street.

ADVANTAGES:

- Reduces construction cost
- Uses existing ditch

DISADVANTAGES:

- Results in an open drainage system

DISCUSSION:

If an open drainage system is acceptable, this approach saves about $90,000.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 225,640	—	$ 225,640
ALTERNATIVE	$ 136,731	—	$ 136,731
SAVINGS (Original minus Alternative)	$ 88,909	—	$ 88,909

2/9

Sketch A14.D-7

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STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		

L. L. 80

N

HAZEL G. EDGECOMB

FRAME RES. 157

NANCY F. HORN

FRAME RES. 158

RENEE FLANDERS & VERNON BROWN

FRAME RES. 159

BARBARA A. CURL

FRAME RES. 160

STEPHANIE R. SLOCOMB

FRAME RES. 161

EXIST. R/W

PIN OAK CIRCLE, N 1°17'34.6" W

PI 1+24.33

PI 1+95.49

PI 4+89.76

5+00

1+48.46 50.00'

1+95.49 50.00'

2+82.16 50.00'

3+32.16 50.00'

4+41.62 50.00'

4+70 55'

4+94 55'

4+89.76 50.00'

5+21.71 50.00'

5+69 55'

5+95 55'

6+01.71 50.00'

6+08 55'

6+34 55'

6+74.38 50.00'

6+82.14 50.00'

6+86 55'

REQ'D R/W

EXIST R/W

2+82.13 42.47'

3+32.13 46.66'

4+41.50 23.09'

4+70 50'

4+94 50'

5+21.64 23.43'

5+69 50'

5+95 50'

6+08 50'

6+34 50'

6+86 50'

24'

1+48.36 21.94'

2+62.06 22.39'

90°21'06"

3+52.07 22.74'

14' CONC. DWAY

16' CONC. DWAY

DOUBLE 4'X6' CULVERT

N 88°30'45" E

N 88°30'57" E

PI 0+00.00

STA 3+06.99 LAKELAND AVE. C/L

STA 0+00.00 PIN OAK CIRCLE

N 88°33'36" E

6+82.35 24.18'

6+01.64

23.81'

WEST LAKELAND AVE.

MATCH LINE STA. 7+00

GUARDRAIL

CONCRETE DITCH

1+34.71

25.07' EXIST R/W

32'

3-24"

C-81

C-82

C-83

C-84

ASPH DWAY

3+07.23 24.89'

EX. SIDEWALK

3-24" EXIST. R/W

3-24"ϕ

REMOVE PIPE AND MANHOLE

22'

TIE EXISTING PIPE TO JUNCTION BOX

REMOVE PIPE

REMOVE PIPE

ASPH DWAY

JUNCTION BOX

REQ'D R/W

2+25 60.00'

3+07.73 40.00'

1+31.94 70.00'

6+64.20 60.00'

ADJUST TOP OF EXISTING DROP INLET TO PROPOSED DRIVEWAY GRADE.

ASPHALT PARKING

BRICK BUILDING

END CONSTRUCTION

1+32

PI 6+74.46

L. L. 79

167

CITY OF VALDOSTA

L. L. *79, 80
11TH LAND DISTRICT
G. M. D. *663

168

LOWNDES COUNTY

D-7

PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS.....BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS.....ELA
CONSTRUCTION LIMITS — C — F —	LIMIT OF ACCESS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	REQ'D R/W & LIMIT OF ACCESS
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

SCALE IN FEET
0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSSROAD PLAN

DRAWING NO. 14-1

3/9

Sketch Alt. D-7

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GA | STP00-4921-00(001)

JOHN H. CRISWELL
&
MARCIA L. CRISWELL
BRICK RES.
162

JESSE L. BROWN
&
MARIETTA BROWN
163
FRAME RES.

SAMUEL ROBINSON
&
YOLANDA ROBINSON
164
BRICK RES.

MONICA WILLIAMS
165
BRICK RES.

FRANCENA M. HOLSENDOLPH
166

L.L. 80

DEBORAH DR. N 2°11'44.2" W

BRICK RES.

7+12 55'
8+07.05 50.00'
8+24 55'
8+44 55'
8+44.85 50.00'
9+07.02 50.00'
10+00 55'
10+00 50'
10+24.44 50.00'
10+19 55'
10+47.01 50.00'
11+77.02 50.00'
12+27.30 50.00'

REQ'D R/W
EXIST R/W
EXIST. R/W
EXIST. R/W
EXIST. R/W

7+12 50'
8+24 50'
8+44 50'
10+19 50'

24'
14' CONC. DWAY
24'
14' CONC. DWAY
24'

8+07.35 24.57'
9+07.33 24.93'
10+47.30 25.45'
11+77.31 25.87'
12+27.45 25.90'

N 88°28'18" E
N 88°30'40" E
N 88°28'32" E
STA 12+02.61 LAKELAND AVE. C/L
STA 0+00.00 DEBORAH DR.
90°21'06"
WEST LAKELAND AVE.
N 88°09'21" E

MATCH LINE STA. 7+00

MATCH LINE STA. 13+00

3-24"ϕ

12+02.55 24.05'

C-79
C-78
EXIST. R/W
EXIST. R/W
28'
22'
3-24'
ASPH DWAY
6' WOOD FENCE
ASPH DWAY
6' WOOD FENCE

REQ'D R/W
REQ'D R/W

8+44.85 60.00'
12+02.45 60.00'

ASPHALT PARKING
ASPHALT PARKING

L.L. 79

169

LOWNDES COUNTY

L.L. #79, 80
11TH LAND DISTRICT
G.M.D. #663

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

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET
0 20 40 80

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSSROAD PLAN

DRAWING NO. 14-2

D-7

4/9

Sketch Alt. D-7

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STP00-4921-00(001)

FRANCENA M. HOLSENDOLPH

MARVIN F. & EDNA E. MOORE

2

BRICK RES.

Curve Data
N = KC310
Δ = 1°55'00.0" (LT)
D = 0°28'45.0"
T = 200.02
L = 400.00
E = 1.67
R = 11957.38
C = 399.98
CB = N 0°54'17.1" W

L.L. 80

2

15+00

MARVIN F. & EDNA E. MOORE BRICK RES.

215+00.00 65.00'

215+47.70 65.00'

4' FENCE, CHAIN LINK

EXIST. R/W

215+47.42 39.97' CONC. DWAY

40'

SIDEWALK

215+00.00 60.00'

HEADER CURB

BOARD OF EDUCATION OF VALDOSTA

MOBILE HOME

MOBILE HOME

L.L. 105

REQ'D R/W

214+25.15 75.00'

214+00.61 38.72' EX. SIDEWALK

214+01.56 41.28'

214+01.90 70.00'

STA 213+78.31 CONSTR. C/L
STA 16+12.67 LAKELAND AVE.

R 30

5' FENCE, CHAIN LINK

EXIST. R/W

13+34 55'
13+08 55'
13+56.71 50.00'
13+08 50'
13+34 50'
24'
16' CONC. DWAY
13+56.74 25.59'

14+14 55'
14+34 55'
14+33.26 50.00'
14+14 50'
14+34 50'
24'
14' CONC. DWAY
14+43.01 25.39'

N 88°09'21" E

WEST LAKELAND AVE.

LAND LOT LINE N 88°08'45" E

PI 213+76.11

90°46'31"

EAST LAKELAND AVE. LAND LOT LINE

N 88°20'39" E

MATCH LINE STA. 13+00

13+73.50 24.45'

EXIST. R/W

EXISTING DITCH

3-24"ϕ

3-24'

ASPHALT PARKING

REQ'D R/W

13+72.32 60.00'

LOWNDES COUNTY

169

L.L. 79

BLOCK BUILDING

VALLORBE INC.

1

213+14.45 73.00'

213+00.00 70.00'

HEADER CURB

REQ'D R/W

CONSTR. LIMITS

ASPHALT PARKING

20' ASPH DWAY

213+50.60 28.73'

FORREST ST.

STA 213+76.11 CONSTR. C/L
STA 16+12.67 LAKELAND AVE.

213+51.57 31.29'

EXIST. R/W

5' SIDEWALK

CONSTR. LIMITS

212+34.87 30.14'

DIRT DWAY

212+38.13 70.00'

REQ'D R/W

16'

213+52.19 70.00'

EXIST. R/W

ROBERT B. DINKINS, JR. & CAROLYN T. DINKINS

95

FRAME RES.

STEPHEN C. COLEMAN

L.L. 106

STEPHEN C. COLEMAN

L.L. #79, 106, 80, 105
11TH LAND DISTRICT
G.M.D. #663

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

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET
0 20 40 80

REVISION DATES

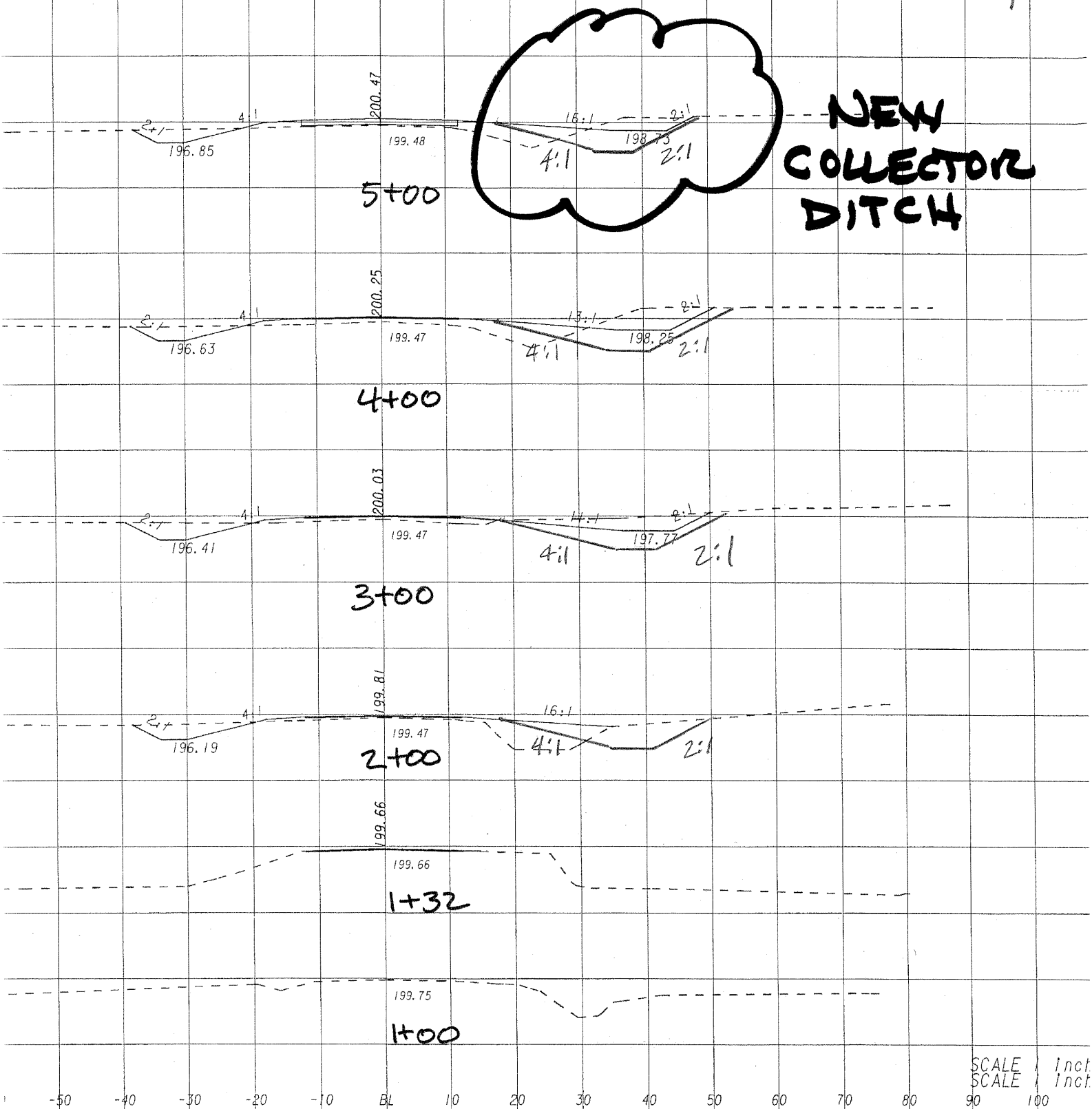
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSSROAD PLAN

DRAWING No. 14-3

D-7

WEST LAKELAND AVE.

5/9

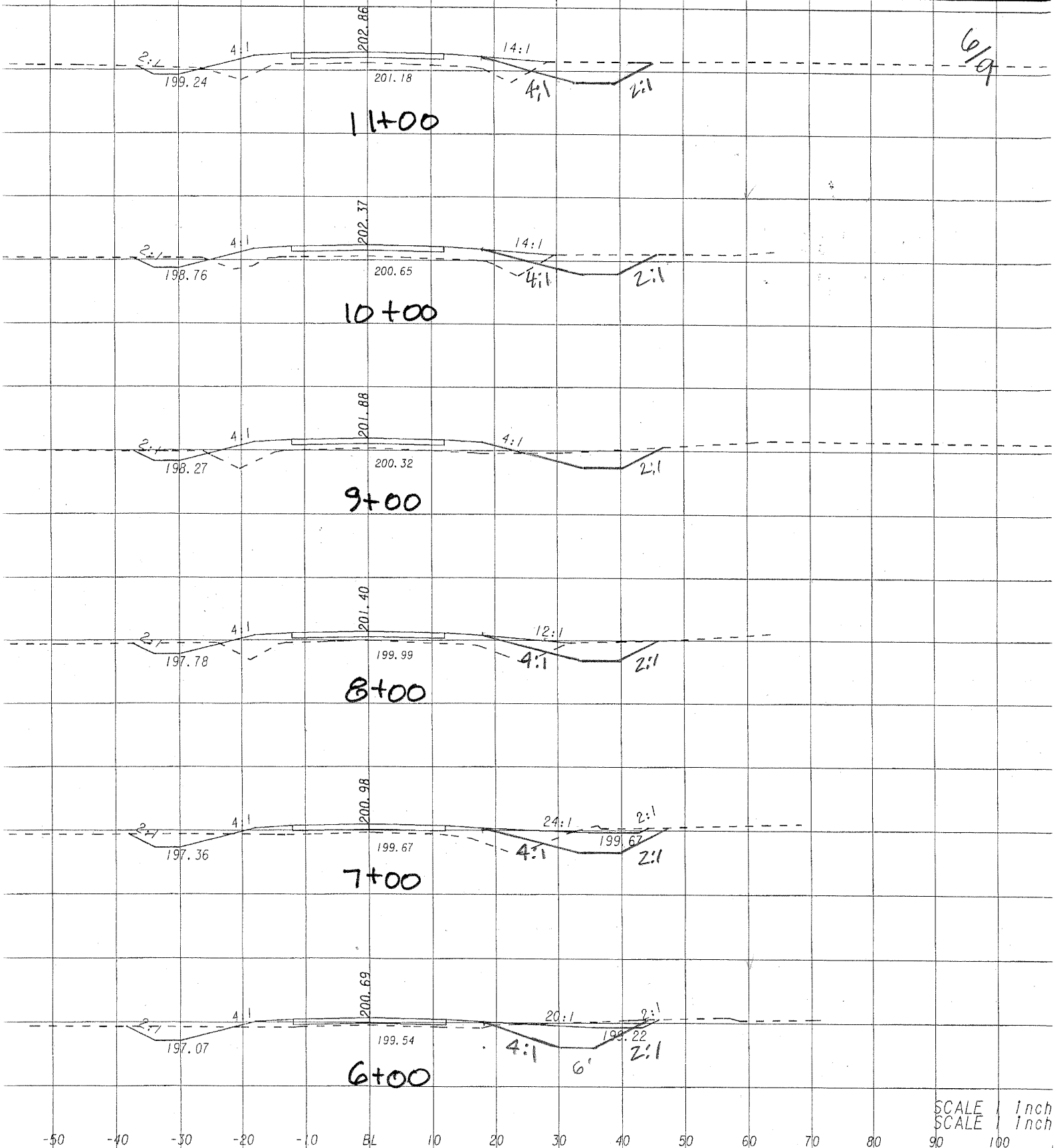


Sketch
Alt. D-7
5/9

REVISION DATES

DEPAR
OFFICE:
LAKELAND

6/9

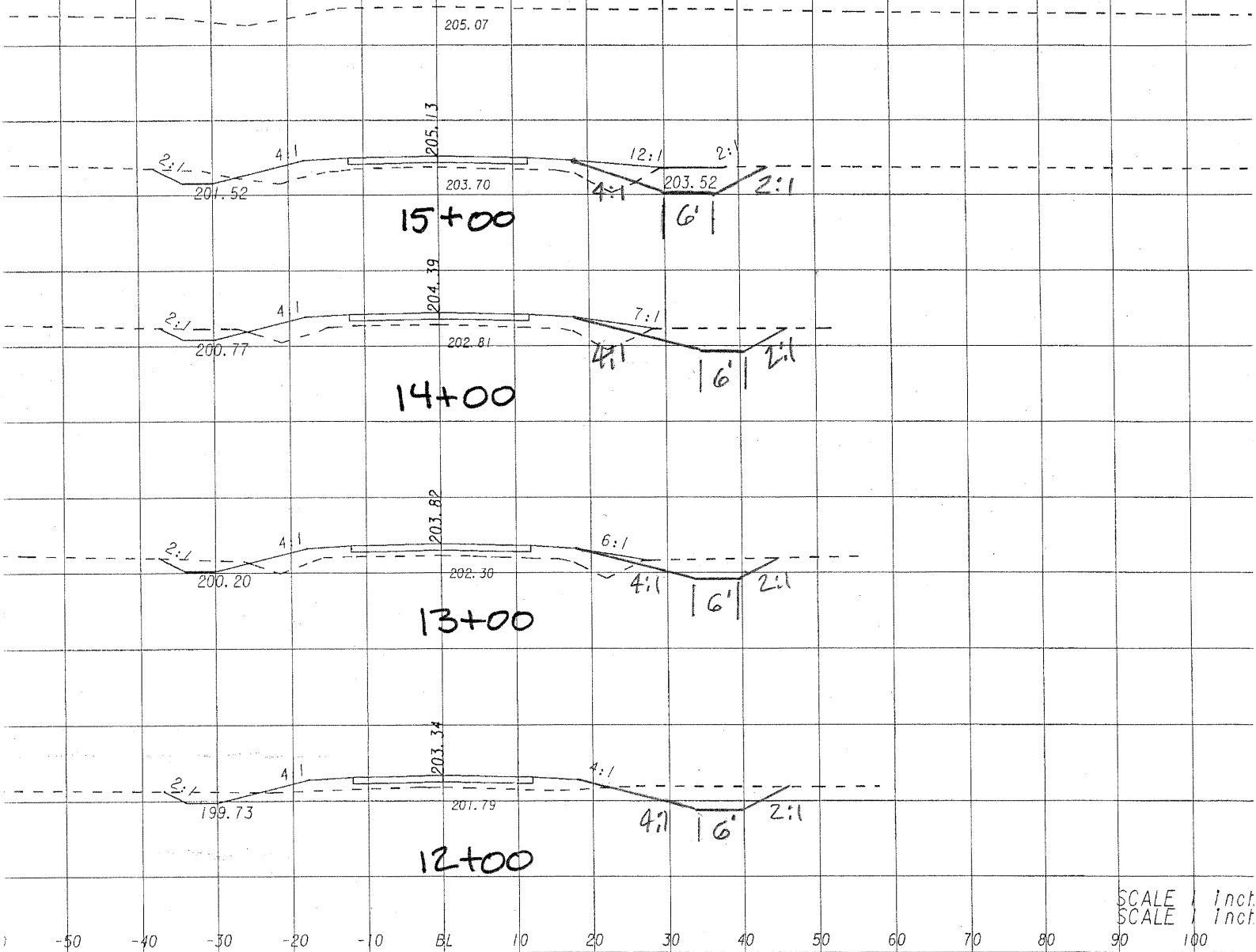


Sketch Alt.
D-7
6/9

REVISION DATES

DEPART
OFFICE:
LAKELAND

7/9



Sketch
Alt. D-7
7/9

REVISION DATES

DEPAR
OFFICE:
LAKELAND

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: D-7

SHEET NO.: 8 of 9

Original Costs Saved:

24" Storm Drain Pipe (Current Design)

1,290 L.F. × 3 Lines = 3,870 L.F.

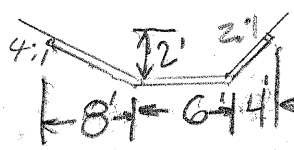
3,870 L.F. − (223 L.F. × 3 Lines) = 3,200 L.F. (24" Saved)

↑ pipe still needed to flow under drives

- Large Drop Inlets eliminated: 7 EA.
- Flared End Sections Saved: 3 EA (24")

Additional Alternate Costs

Plain Conc. Ditch paving: 8' + 6' + 4' = 18'



Ditch paving in S.Y.: $\frac{18' \times (1290' - 240')}{9 sf/sy} = 2,100$

Rip Rap 24": 100 S.Y. (At end of Ditch)

Flared end Sections: 3 EA × 2 × 4 sides = 24 EA

24 EA (24") F.E.S.

Additional Grading for ditch ≈ 2,400 C.Y.

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET**
Project No. STP00-04921-00(001) - Lowndes County,

ALTERNATIVE NO.:

DESCRIPTION:

SHEET NO.: D-9 7 of 9

PROJECT ITEM		ORIGINAL ESTIMATE			Alt. PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original Costs Saved w/ ditch							
24" Storm Dr. Pipe	L.F.	3200	$52.25	$167,200			
Large Drop Inlets	EA	7	$4,000	$28,000			
Flared End Sect 24"	EA	3	$910	$2,730			
Alt. Add'l Costs							
Plain Conc Ditch	SY				2100	$36	$75,600
Rip Rap 24"	SY				30	$60	$1,800
Grading	CY				2300	$9	20,700
Flared End Sect 24"	EA				24	$910	21,840
Subtotal				$197,930			$119,940
Markup (%) at				$27,710			
TOTAL				$225,640			136,731

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **D-8**

DESCRIPTION: **MODIFY THE DRAINAGE SYSTEM BY ADDING SEVERAL STORM DETENTION BASINS AND REDUCING PIPE SIZES**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The current design includes major improvements to the corridor in the way of catch basins, trunk lines, and outfalls. Several of the lines are double or even triple barrels to assist in minimizing the impact upon receiving inverts.

ALTERNATIVE:

Consider adding several storm detention basins in the system to assist in reducing the total instantaneous storm flow in the system. The detention basins will have the net effect of increasing the rainfall – intensity – curve time of concentration, thus reducing the total storm flow at the outfall points. This will reduce the pipe size as the flow moves from upstream to downstream along North Forrest Street.

ADVANTAGES:

- Reduces the pipe size
- Reduces the peak flow requirement

DISADVANTAGES:

- Requires further hydraulic analysis
- Requires two or three additional parcels for the detention basins

DISCUSSION:

To achieve the reduction in pipe size, a hydraulic model of the basin would need to be prepared. It is projected that many of the pipes could be reduced by at least one pipe size through the addition of storm detention basins.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SECTION (S)						
S-1	Use 2:1 shoulder slopes from STA 316+00 to STA 325+00 to reduce right of way and save relocation cost	$163,342	0	$163,342		$163,342
S-2	Use four 11 ft wide lanes in lieu of four 12 ft wide lanes	$6,141,318	$5,629,570	$511,748		$511,748
S-3	Use a section with two 11 ft wide lanes on the inside and two 12 ft wide lanes on the outside	$6,141,318	$5,885,444	$255,874		$255,874
S-5	Modify the section to use one urban shoulder on the East side and one rural shoulder on the West side	$1,506,946	$436,880	$1,070,066		$1,070,066
S-8	Use 2:1 front slope ditches from STA 266+82 to STA 283+85 in lieu of 4:1 front slopes. Shorten the culverts and reduce the total section width.	$39,960	0	$39,960		$39,960
S-9	Construct the project in two major phases. First phase to include 3-lanes with rural shoulders on 4-lanes of right of way.	$8,661,651	$1,127,658	$7,533,993		$7,533,993
S-10	Reduce the grass strip in the shoulder from 6 ft wide to 2 ft wide	$123,216	$6,773	$116,443		$116,443
S-11	Use Geogrid fabric in the pavement section and reduce the depth of base material from 5-inches to 2.5-inches	$6,580,502	$5,629,504	$950,998		$950,998
ALIGNMENT (A)						
A-1	Replace all five of the existing traffic signals and increase the project estimate; assume that all signals will be integrated (not developed)	DESIGN SUGGESTION				

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-1**

DESCRIPTION: **USE 2:1 SIDE SLOPES FROM STA. 316+00 TO STA. 325+00 TO REDUCE RIGHT-OF-WAY AND SAVE RELOCATION COSTS**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (sketch attached)

The current design uses 4:1 fill slopes from STA. 316+00 to STA. 325+00 and requires additional right-of-way for construction limits.

ALTERNATIVE: (sketch attached)

Use 2:1 fill slopes STA. 316+00 RT. to STA.325+00 to reduce the required width of the crossection and reduce the impact on the right-of-way.

ADVANTAGES:

- Less right-of-way cost and impacts
- Reduces required borrow material

DISADVANTAGES:

- Steeper slopes, although they are outside of the clear zone.

DISCUSSION:

The current design provides for 19.5-ft. of clear-zone, which includes the 4-ft wide bicycle lane and a 15.5-ft. shoulder. The 19.5-ft. dimension is sufficient clear-zone distance for 45 mph with traffic over 6,000 vpd. The required clear-zone is 18-20 ft. Therefore, this alternate recommends to use 2:1 slopes from STA.316+00 to STA.325+00 LFT and right to reduce right-of-way costs. Alternate right-of-way could be "pulled" in an additional 10-ft to miss the building at STA.322+50 RT.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN (savings)	$ 163,342	—	$ 163,342
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 163,342	—	$ 163,342

Sketch Alt. S-1

2/6

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STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		

Curve Data
N = SVA5
Δ = 0°51'00" (RT)
D = 0°15'00"
T = 170.00
L = 340.00
E = 0.63
R = 22918.31

77 FRAME RES. BILLY JOE & LINDA JEANNE CRIBB

78 FRAME RES. 315+00 GEORGE J. MASCIARELLI, JR. PI 315+34.02

79 FRAME RES. L. J. MYERS FAMILY, LLLP

80 SOLOMON & NAN HUI GLOSTER FRAME RES. FENCE, WOOD

81 RICHARD W. HILL FRAME RES.

82 PATRICK E. & SUNI MCDONALD FRAME RES. L. L. 82

MATCH LINE STA. 314+00

CONSTR. LIMITS — 5' SIDEWALK — EXIST. R/W — REQ'D R/W — Original REQ'D R/W — Alt. R/W — Alt. Constr Limits

314+58.09 60.00' | 314+57.76 40.00' | 315+57.84 60.00' | 315+57.60 40.00' | 316+57.59 60.00' | 316+57.63 65.00' | 316+57.43 40.00' | 317+04.02 65.00' | 317+04.02 40.00' | 317+57.54 70.00' | 317+57.36 40.00' | 318+57.57 75.00' | 318+57.37 40.00'

ASPH DWAY | CONC. DWAY | 14' | 18" | 24"

STA 315+62.99 CONSTR. C/L
STA 0+00.00 FORREST RUN DR.
FORREST ST. N 0°46'47"W

315+18.09 40.00' | 315+38.20 60.00' | 315+88.33 60.00' | 315+88.44 80.00' | 316+08.25 40.00' | 316+10.00 65.00' | 317+04.02 40.00' | 317+04.02 70.00' | 318+51.82 40.00' | 318+52.42 100.00'

CURB CUT | R 30 | 90°00' 15" | N 88°39'22" E | PI 1+35.18 | PI 317+04.02 | 105' | 80'

BLOCK AND MATL BUILDING 145

WEAVER CLASSIC HOMES BY, INC.
C/O GARY WEAVER

L. L. 103

146

WEAVER CLASSIC HOMES BY, INC.
C/O GARY WEAVER
L. L. # 82, 103
11TH LAND DISTRICT
G. M. D. #663

147 GAINES CARTER, ESTAL

R/W SAVED

TOP OF BANK

FENCE, FIELD WIRE

MATCH LINE STA. 320+00

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

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

MAINLINE PLAN

DRAWING No.

Sketch Alt. S-1

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STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-4921-00(001)		

3/6

METAL BUILDING

JON S. LINDA W. BURCH

83

84

82

L.L. 82

R/W SAVED

SETSER PROPERTIES, LLC.

PATRICIA & SUNI MCDONALD

320+57.47
90.00'

Original R/W

ALT. S-1 R/W

CONSTR. LIMITS

FRAME RES.

323+68.49
80.00'

REQ'D R/W

ALT. R/W

323+68.49
70.00'

FRAME RES.

CHURCH OF GOD

85

324+86.96
65.00'

325+00

REQ'D R/W

ALT. Constr. Limits

CONSTR. LIMITS

EXIST. R/W

5' SIDEWALK

320+56.80
40.00'

18'

14' CONC. DWAY

14' CONC. DWAY

H-4

323+67.83
40.00'

14' CONC. DWAY

14' CONC. DWAY

324+87.83
40.00'

CURB CUT

CURB CUT

H-3

MATCH LINE STA. 320+00

FORREST ST.

N 0°46'47"W

STA 324+62.71 CONSTR. C/L
STA 0+00.00 MT. ZION CHURCH RD.

92°55' 00"

DIRT DWAY

MATCH LINE STA. 326+00

I-5

24'

EXIST. R/W

FENCE, FIELD WIRE

I-4

323+70.62
40.00'

I-27

5' SIDEWALK

24'

ALT. Constr. Limits

80'

80'

CONSTR. LIMITS

60'

18'

CURB CUT

R 50'

I-15

I-14

18'

CURB CUT

I-13

R 50'

325+50.72
40.00'

1.8' L

I-3

I-12

325+29.67
60.00'

4' FENCE, CHAIN LINK

TELEPHONE JUNCTION BOX

ALT. S-1 R/W

"Original" REQ'D R/W

"Original" R/W

FRAME BUILDING

GAINES CARTER, ESTAL

FRAME BUILDING

FRAME BUILDING

R/W would be "pulled" in 10' to save Relocation.

324+18.07
89.94'

147

148

EXIST. R/W

S 87°51'46"E

EXIST. R/W

LOWNDES CO. BOARD OF EDUCATION

L.L.# 82, 103
11TH LAND DISTRICT
G.M.D. #663

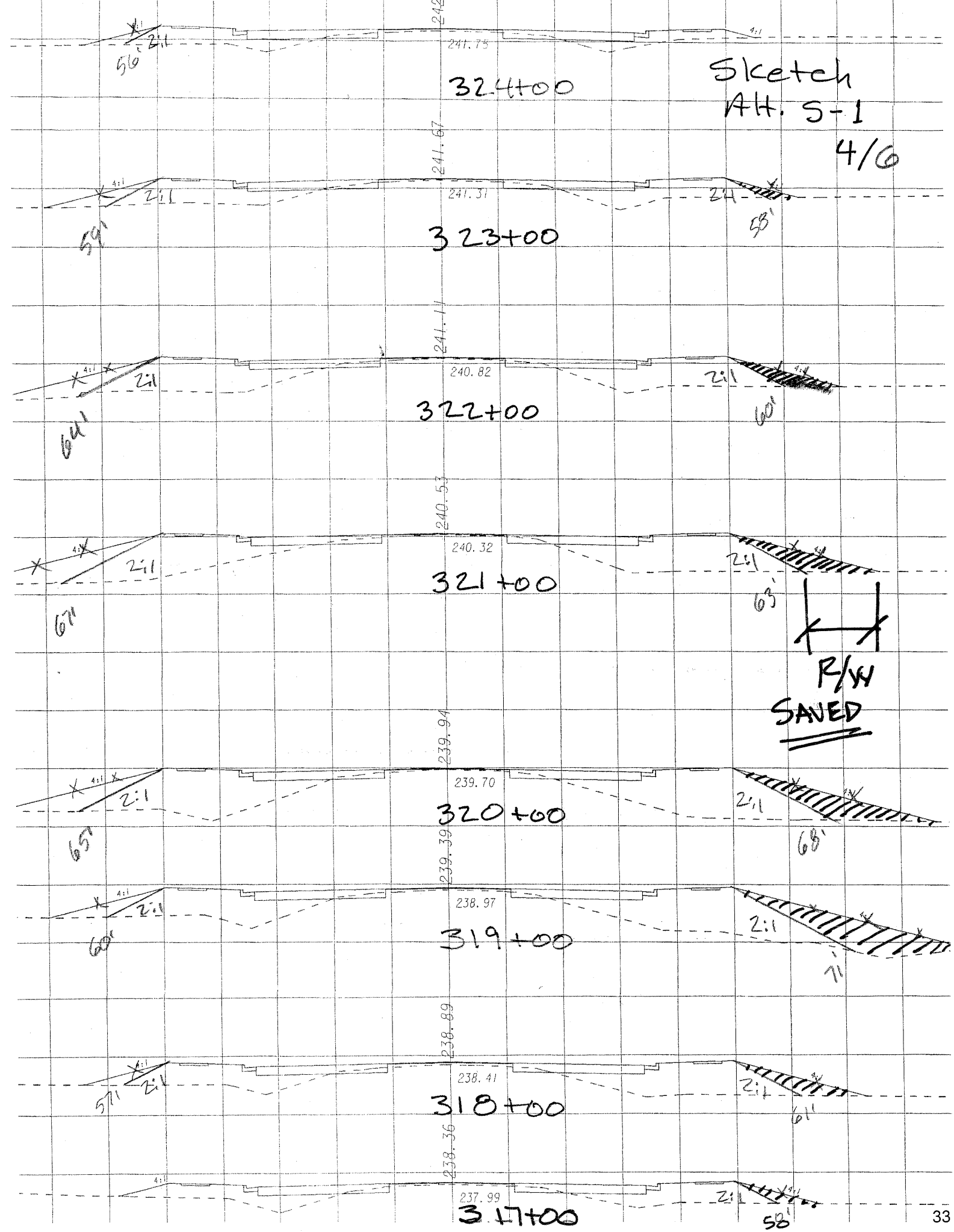
L.L. 103

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

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
MAINLINE PLAN


Sketch
Alt. 5-1
4/6
241.75
324+00
241.67
241.31
323+00
241.11
240.82
322+00
240.53
240.32
321+00
R/W
SAVED
239.94
239.70
320+00
239.39
238.97
319+00
238.89
238.41
318+00
238.36
237.99
317+00
2:1
4:1
56'
54'
64'
67'
63'
65'
68'
60'
71'
61'
58'

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-1

SHEET NO.: 5 of 6

Original Design R/W Saved with 2:1 slopes: Sta 316+00 to Sta. 325+00

R/W Saved Lt. Side: $\frac{6,140 \text{ SF}}{43,560 \text{ SF/AC}} = 0.141 \text{ AC}$

R/W Saved Rt. Side: $\frac{13,550 \text{ SF}}{43,560 \text{ SF/AC}} = 0.311 \text{ AC}$

Total R/W Saved: 0.452 AC

Relocation Saved: $40,000

Improvements Saved: $20,000
to buildings on Rt. Side

Grading: (Borrow Saved): 2,400 c.y. (Lt. & Rt.)
estimated from x-sections

COST WORKSHEET

PROJECT: **WIDENING OF N. FORREST STREET**

Project No. STP00-04921-00(001) Lowndes County, Georgia

ALTERNATIVE NO.: **S-1**

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
Original Right-of-Way							
Saved with 2:1 slopes	AC	0.452	10,000.00	4,520			
Relocation	EA	1	40,000.00	40,000			
Improvements	EA	1	20,000.00	20,000			
Save Grading	CY	2,400	9.00	21,600			
Construction Subtotal				21,600			
Markup (%) at 14%				3,024			
TOTAL				24,624			
Right-of-Way Subtotal				64,520			
Markup (%) at 115%				74,198			
TOTAL				163,342			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-2**

DESCRIPTION: **USE FOUR 11-FT WIDE LANES IN LIEU OF FOUR 12-FT WIDE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The proposed typical section includes four 12-ft-wide lanes within a 14-ft-wide flush median and urban shoulders.

ALTERNATIVE: (sketch attached)

Instead of the 12-ft-wide lanes, use 11-ft-wide lanes on North Forrest Street.

ADVANTAGES:

- Decreases quantity of asphalt used
- Reduces amount of right-of-way acquired

DISADVANTAGES:

- Decreases safety, particularly with heavy truck volumes

DISCUSSION:

The truck percentage along this corridor is 3% in a 24-hr time span. This percentage is well below the 6% average for trucks and alternate solutions could be quite acceptable.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,141,318	—	$ 6,141,318
ALTERNATIVE	$ 5,629,570	—	$ 5,629,570
SAVINGS (Original minus Alternative)	$ 511,748	—	$ 511,748

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: 8-2
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

SHEET NO.: 2 of 4

project length = 17,002 ft (3.2 mi)

① 17,002 ft (48) = 816,096 sf ↓ 90,677 sy

② 17,002 ft (44) = 748,088 sf ↓ 83,121 sy

90,677 sy (59.41/sy) = $5,387,121 [12 ft lanes] Full depth paving

83,121 sy (59.41/sy) = $4,938,219 [11 ft lanes] full depth paving

$448,902

Pavement Full-Depth Cost: CM

Mix (12.5mm) $165\ \#/sy \times \frac{T}{2000\ \#} \times \$96/T = \$7.92/sy$

Mix (19mm) $220\ \#/sy \times \frac{T}{2000\ \#} \times \$87.67/T = \$9.64/sy$

mix (25mm) $550\ \#/sy \times \frac{T}{2000\ \#} \times 90.16/T = \$24.79/sy$

(10") GAB (from GDOT estimate) = $17.06/sy

Total Section Cost: $59.41/sy

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET**
Project No. STP00-04921-00(001) - Lowndes County,

ALTERNATIVE NO.: S-2

DESCRIPTION: Use 4 11-ft lanes in lieu of 12-ft lanes

SHEET NO.: 3 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Pavement (see attachment)	SY	90677	$59.41	$5,387,121	83,121	$59.41	$4,938,219
Subtotal				$5,387,121			$4,938,219
Markup (%) at 14%				754,197			691351
TOTAL				$6,141,318			$5,629,570

SKETCH

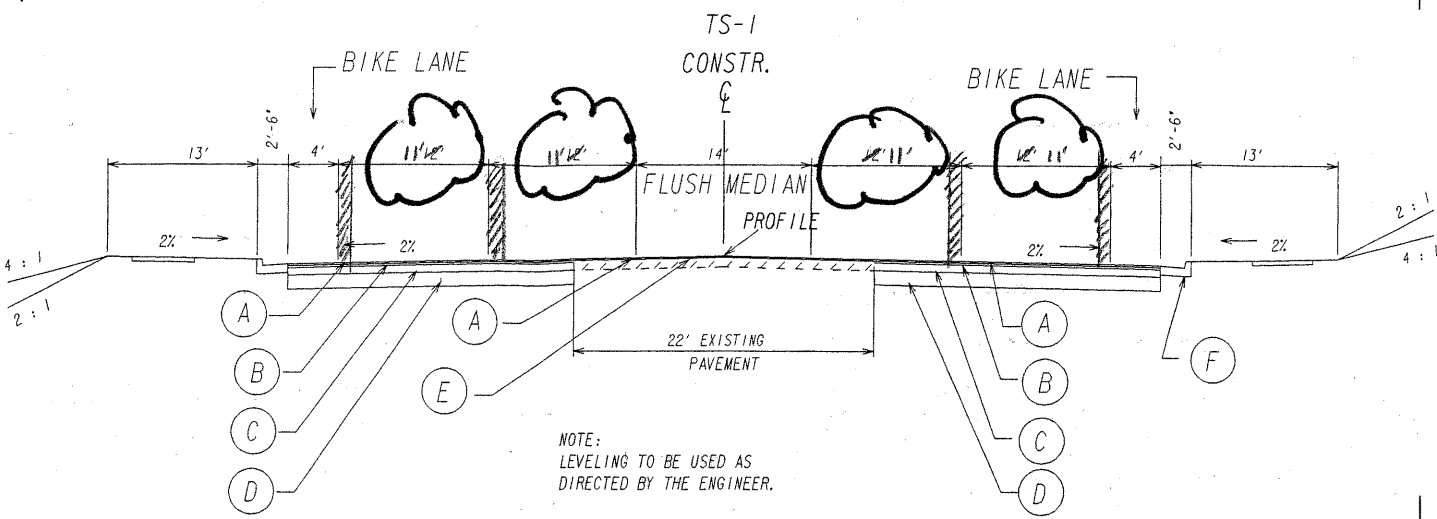
PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-2

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☑ BOTH ☐

SHEET NO.: 4 of 4

FOUR - 11FT. LANES



Alternative Typical depicts 11' lanes rather than 12' lanes.

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET** ALTERNATIVE NO.:
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal **S-3**

DESCRIPTION: **USE TWO 11-FT WIDE LANES AND TWO 12-FT WIDE LANES** SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The proposed typical section illustrates two 12-ft wide lanes on either side of the 14-ft wide flush median with urban shoulders.

ALTERNATIVE: (sketch attached)

Maintain two of the proposed 12-ft lanes on the outside of the section, but reduce the width of the two inside lanes from 12-ft-wide to 11-ft-wide. This will allow adequate lane width for trucks in the outside lanes, but economize on the width of the inside lanes.

ADVANTAGES:

- Saves on paving costs
- Saves on right-of-way expense

DISADVANTAGES:

- Reduces safety

DISCUSSION:

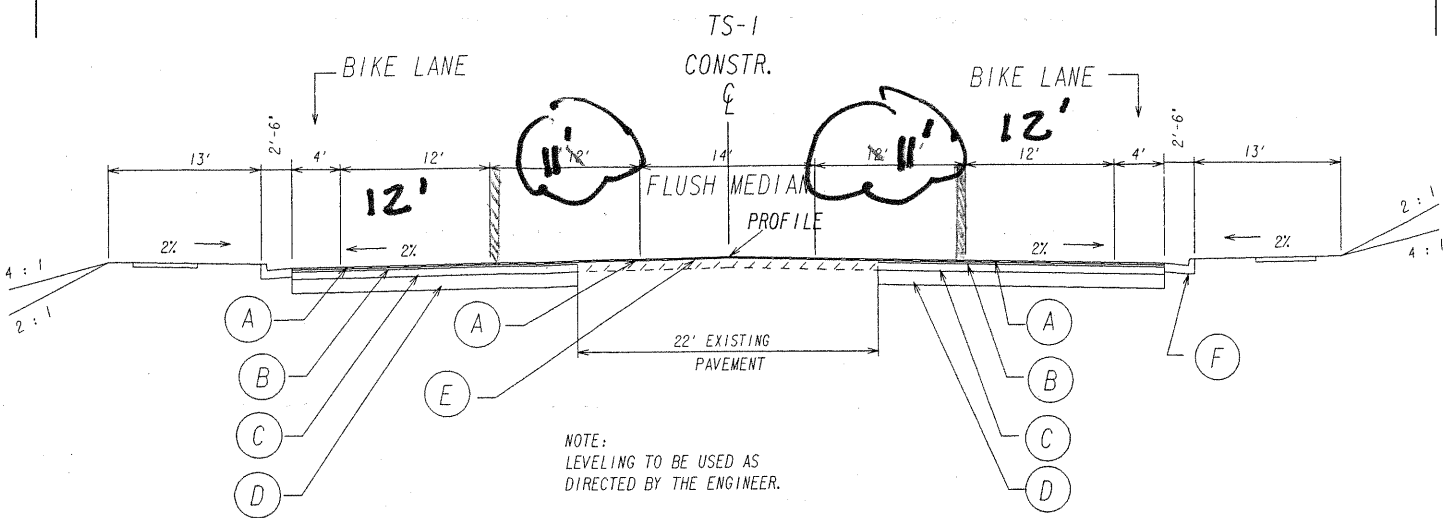
By reducing two of the lanes to 11 ft wide, the cost of paving is roadway is decreased. Retaining two 12-ft-wide lanes on the outside will accommodate any trucks traveling this route. The 11-ft-wide lanes in the inside are especially appropriate in situations with flush medians.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,141,318	–	$ 6,141,318
ALTERNATIVE	$ 5,885,444	–	$ 5,885,444
SAVINGS (Increase)	$ 255,874	–	$ 255,874

SKETCH

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: 5-3
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☐ SHEET NO.: 2 of 4



Changing the typical to have 2-11ft lanes and 2-12ft lanes in lieu of 4-12ft lanes.

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-3

SHEET NO.: 3 of 4

Project Length = 17,002 ft [4-12H lanes]

① 17,002 (48ft) = 816,096 sf → 90677 sy

Pavement Full-Depth Cost: (N)

Mix (12.5 mm) $\frac{165\#}{SY} \times \frac{T}{2000\#} \times \frac{\$96}{T} = \$7.92/SY$

Mix (19 mm) $\frac{220\#}{SY} \times \frac{T}{2000\#} \times \frac{\$87.67}{T} = \$9.64/SY$

mix (25 mm) $\frac{550\#}{SY} \times \frac{T}{2000\#} \times \frac{90.16}{T} = \$24.79/SY$

(10") GAB (from GDOT estimate) = $17.06/SY

Total Section Cost: $59.41/SY

② 17,002 (46') = 782,092 sf → 86899 sy [2-11ft + 2-12ft lanes]

Savings

Original (90,677 sy)($59.41) = $5,387,121

Alternative (86,899 sy)($59.41) = $5162,670

⇒ $224,451

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET** ALTERNATIVE NO.: S-3
Project No. STP00-04921-00(001) - Lowndes County,

DESCRIPTION: Use 2-11ft lanes and 2-12ft lanes 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
Pavement		90,677	$59.41	$5387,121			
					86,899	$59.41	$5,162,670
Subtotal				$5,387,121			$5,162,670
Markup (%) at 14				$754,197			$722,774
TOTAL				$6,141,318			$5,885,444

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET** ALTERNATIVE NO.:
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal **S-5**

DESCRIPTION: **USE ONE URBAN SHOULDER AND ONE RURAL SHOULDER IN THE SECTION** SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The proposed typical section displays urban shoulders on both sides.

ALTERNATIVE: (sketch attached)

Maintain the proposed typical section as-is, but change one urban shoulder to a rural shoulder. This will eliminate the sidewalk and curb and gutter on one side of the street. All right-of-way should be purchased now for the full 5-lane urban section.

ADVANTAGES:

- Reduces paving costs

DISADVANTAGES:

- Reduces pedestrian/bicyclist accommodations

DISCUSSION:

In an effort to reduce costs, the urban shoulder can be eliminated on one side because the pedestrian traffic is not substantial. With the one rural shoulder, a ditch can used rather than the longitudinal piping system.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,506,946	–	$ 1,506,946
ALTERNATIVE	$ 436,880	–	$ 436,880
SAVINGS (Original minus Alternative)	$ 1,070,066	–	$ 1,070,066

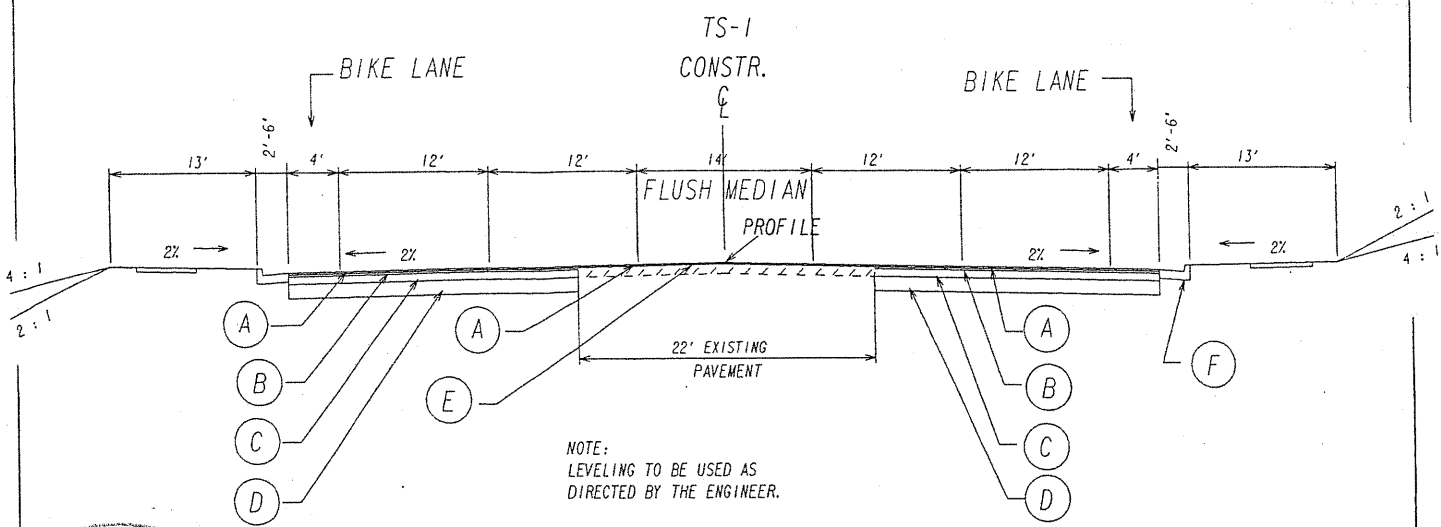
SKETCH

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: S-5

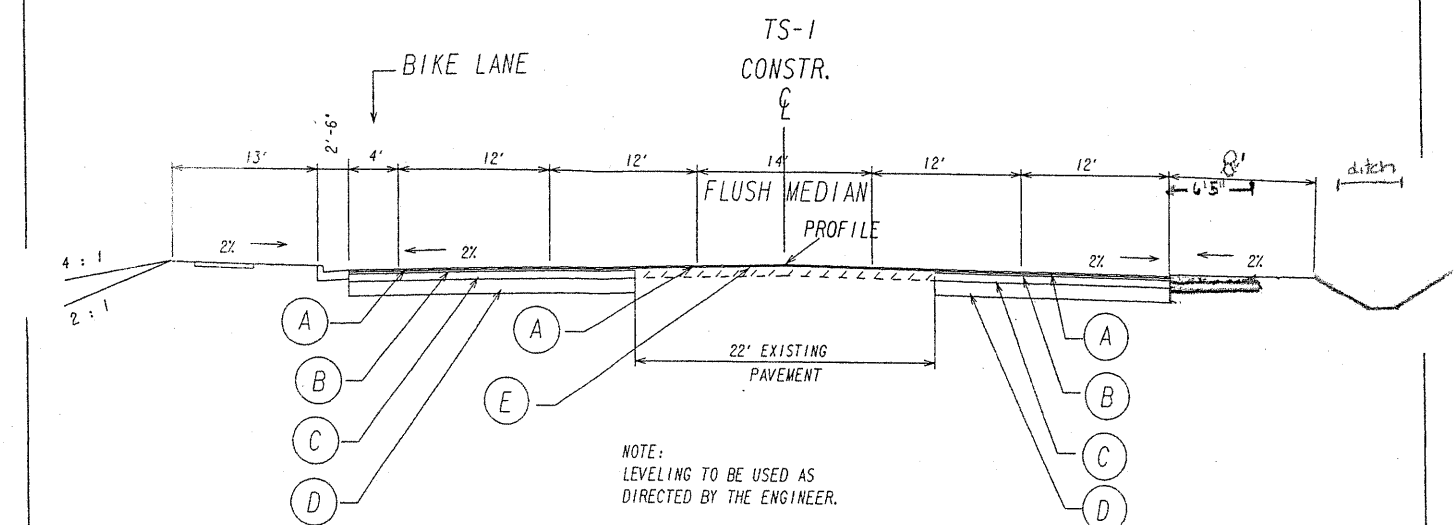
Project No. STP00-04921-00(001) - Lowndes County, Georgia

Preliminary Submittal

ORIGINAL DESIGN ☒ ALTERNATIVE DESIGN ☒ BOTH ☐ SHEET NO.: 2 of 5



Original



Alternative

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: S-5
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

SHEET NO.: 3 of 5

Project Length = 17,002 ft

① (17,002 ft)(4 ft bike lane) = 68008 sf ÷ 9 = 7556 sy

② (17,002 ft)(2.5 ft curb & gutter) = 42,500 sf ÷ 9 = 4722 sy

* Pavement Full-Depth Cost: (N)

Mix (12.5 mm) $\frac{165\#}{SY} \times \frac{T}{2000\#} \times \frac{\$96}{T} = \$7.92/SY$

Mix (19 mm) $\frac{220\#}{SY} \times \frac{T}{2000\#} \times \frac{\$87.67}{T} = \$9.64/SY$

mix (25 mm) $\frac{550\#}{SY} \times \frac{T}{2000\#} \times \frac{90.16}{T} = \$24.79/SY$

(10") GAB (from GDOT estimate) = $17.06/SY

Total Section Cost: $59.41/SY ←

③ (17,002 ft)(5 ft sidewalk) = 85010 sf ÷ 9 = 9445 sy

④ (17,002 ft)(8 ft grass strip) = 136,016 sf ÷ 9 = 15113 sy → 15113 sy × .000206611597 / 1 sy = 3 AC

① (7556 sy)($59.41) ⇒ $446,862

② (17002 ft)($17.34) ⇒ $294,815

③ (9445 sy)($45.35) ⇒ $428,331

④ (3 ac)($1904/ac) ⇒ $5712

$1,175,720 ← original urban shldr cost

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: S-5
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

SHEET NO.: 4 of 5

Project Length = 17,002 ft

Shoulder
(17002 ft)(6.5 ft) = 110,513 sf / 12,279 sy

Shoulder (6.5') Pavement:
(12.5mm) 1½" = $7.92/sy
(19mm) 2" = $9.64/sy
GAB 8" (.5 x $17.06/sy = $13.65/sy
6.5' shoulder = $31.21/sy

(12,279 sy)($31.21) = $383,228

→ R/W = (17,002 ft)(11 ft) = 187,022 sf ↓ (original assumption)
20780 sy × .000206611570 AC / 1 sy ↓
4.3 AC

est. 36 resid. ($10,000/ac) ⇒ $36,000
.4 comm ($100,000/ac) ⇒ $40,000
.3 agricult. ($5,000/ac) ⇒ $1500
$77,500

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET** ALTERNATIVE NO.: S-5
Project No. STP00-04921-00(001) - Lowndes County,

DESCRIPTION: Use an urban shoulder & rural shoulder SHEET NO.: 5 of 5

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Pavement (Full Depth Bikelane)	SY	7556	$59.41	$446,862			
Curb & Gutter	LF	17,002	$17.34	$294,815			
Sidewalk	SY	9445	$45.35	$428,331			
Grass Strip	AC	3	$1904.00	$5712			
Pavement (shldr)	SY				12,279	$31.21	$383,228
R/W							
R/W Save	$77,500 × 115% = $77,500 + 89125 = $166,625						
Subtotal				$1,175,720			$383,228
Markup (%) at 14				164,601			$53,652
TOTAL				$1340,321			$436,880

+ 166,625 R/W
1,506,946

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-8**

DESCRIPTION: **USE 2:1 FRONT SLOPE DITCHES FROM STA 266+82 TO STA 283+85 IN LIEU OF 4:1 FRONT SLOPE**

SHEET NO.: **1 of 10**

ORIGINAL DESIGN: (sketch attached)

The current design typical section uses a 4-ft wide bicycle lane and 15.5-ft-wide shoulder (which meets clear-zone) with a 4:1 front slope for ditches.

ALTERNATIVE: (sketch attached)

Use a 2:1 front slope for the ditches since the 19.5-ft (4-ft wide bicycle lane and 15.5-ft-wide shoulder) meets clear-zone requirements.

ADVANTAGES:

- Saves right-of-way cost
- Reduces construction limit impacts to adjacent properties

DISADVANTAGES:

- Requires a steeper slope, but it meets guidelines since it's outside of the clear-zone

DISCUSSION:

The original/current design proposes a 4-ft wide bicycle lane and 15.5-ft-wide urban shoulder. This typical section would provide for a 19.5-ft clear-zone. A 45 mph design speed with over 6,000 vpd would require a clear-zone of 18-20-ft. Since this typical section provides the required clear-zone dimension, a front slope on the ditch of 2:1 is acceptable. Presently, the plans have 4:1 ditch front slopes. The 2:1 slopes would reduce the right-of-way costs. See attached sketches for plan view sheets and cross-sections.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 39,960	–	$ 39,960
ALTERNATIVE	$ 0	–	$ 0
SAVINGS (Original minus Alternative)	$ 39,960	–	$ 39,960

Sketch Alt. S-8

2/10

Curve Data
N = SVA3
Δ = 0°26'00" (RT)
D = 0°05'00"
T = 260.00
L = 520.00
E = 0.49
R = 68754.94

GARY E. & BONNIE J. CARMAN

42

DOUGLAS R. & TONI L. SMITH

43

W. M. & VERONICA G. MOWLS

44

CATHERINE MAE LONG

45

41

6' FENCE, CHAIN LINK

267+16.95
80.00'

267+21.30
85.00'

Original Design R/W

Alt. S-8 R/W

269+51.59
85.00'

269+52.38
90.00'

270+00

269+98.92
90.00'

270+70.09
90.00'

271+71.02
90.00'

266+82.57
80.00'

REQ'D R/W

CONSTR. LIMITS

Alt. R/W

REQ'D R/W

PI 267+38.92

L.L. 81

D-28

4' SPEC. DITCH

24'

EXIST. R/W

5' SIDEWALK

D-11

266+82.13
40.00'

269+44.49
40.00'

269+98.92
40.00'

270+69.44
40.00'

271+70.88
40.00'

MATCH LINE STA. 266+00

FORREST ST.

N 1°07'47"W

MATCH LINE STA. 272+00

269+24.70
40.00'

F-11

ASPH DWAY

28'

269+98.92
40.00'

24'

EXIST. R/W

30'

5' SIDEWALK

CONSTR. LIMITS

HEADER CURB

REQ'D R/W

REQ'D R/W

269+24.55
70.00'

269+98.92
70.00'

272+00.00
70.00'

PT 269+98.92

L.L. 104

BETTE JEAN N. DAUGHARTY

135

ASPHALT PARKING

136

DONALD J. MIRATE, MD

OFFICE

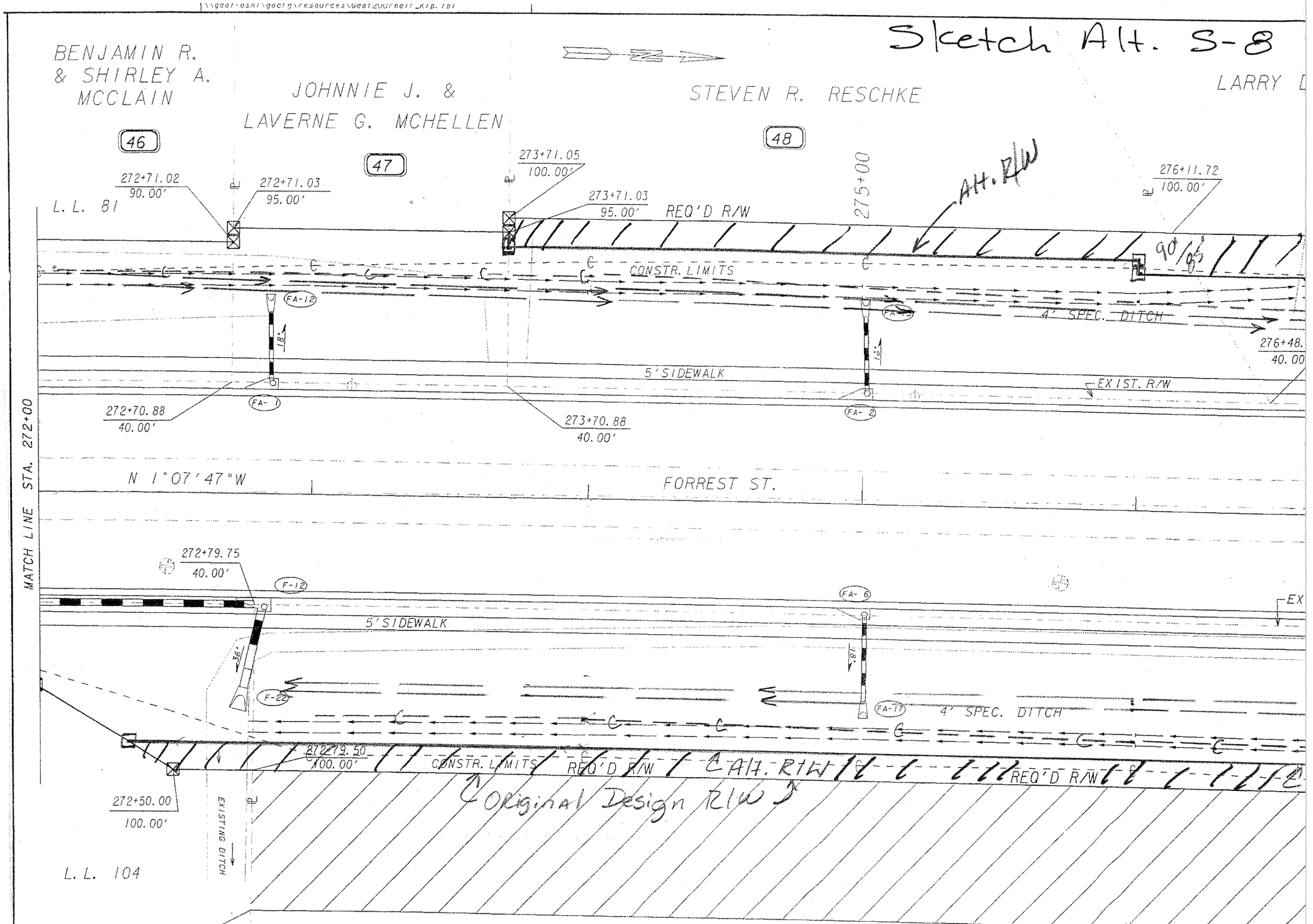
L.L. # 81, 104
11TH LAND DISTRICT
G.M.D. #663

PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS..... BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS..... ELA
CONSTRUCTION LIMITS	LIMIT OF ACCESS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	REQ'D R/W & LIMIT OF ACCESS
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

SCALE IN FEET
0 20 40 80

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
MAINLINE PLAN
DRAWING No. 13-12


Sketch Alt. S-8
BENJAMIN R. & SHIRLEY A. MCCLAIN
JOHNNIE J. & LAVERNE G. MCHELLEN
STEVEN R. RESCHKE
LARRY
46
47
48
L. L. 81
272+71.02
90.00'
272+71.03
95.00'
273+71.05
100.00'
273+71.03
95.00'
REQ'D R/W
275+00
Alt. R/W
276+11.72
100.00'
CONSTR. LIMITS
FA-12
FA-1
FA-2
4' SPEC. DITCH
276+48.
40.00
5' SIDEWALK
EXIST. R/W
272+70.88
40.00'
273+70.88
40.00'
MATCH LINE STA. 272+00
N 1°07'47"W
FORREST ST.
272+79.75
40.00'
F-12
F-22
FA-6
FA-17
EX
272+79.50
100.00'
CONSTR. LIMITS
REQ'D R/W
Alt. R/W
REQ'D R/W
Original Design R/W
272+50.00
100.00'
EXISTING DITCH
L. L. 104

GA | STP00-4921-00(001)

Sketch

Alt. S-8

4/10

THE J. N. BRAY CO.

50

51

DANIEL SHAW COLEMAN, ETAL

L. L. 81

REQ'D R/W

Alt. R/W

CONSTR. LIMITS

280+00

Alt. Design R/W

Original Design R/W

80'

283+78.71
80.00'

283+80.33
70.00'

REQ'D R/W

4' SPEC. DITCH

CONSTR. LIMITS

SAUCER

5' SIDEWALK

EXIST. R/W

FA-4

FA-5

FA-16

E-9

283+85.18
40.00'

PROPOSED DOUBLE 4'X4'X130'
CONCRETE BOX CULVERT

N. 1°07'47"W.

LAND LOT LINE

FORREST ST.

STA 284+01.94 CONSTR. C/L
STA 0+00.00 EASTWIND RD.

MATCH LINE STA. 278+00

MATCH LINE STA. 284+00

283+72.98
40.00'

FA-8

FA-9

5' SIDEWALK

EXIST. R/W

8' SAUCER

L. L. 104

FA-19

4' SPEC. DITCH

FA-20

R 50

18"

FA-10

FA-21

N 87°22'30"E

CONSTR. LIMITS

REQ'D R/W

NICHOLS INC.

137

Alt. S-8 R/W

Original R/W

283+74.85
100.00'

EXIST. R/W

283+75.85
150.00'

PERM. EASM'T FOR CONSTR. OF DAM

L. L. # 81, 104
11TH LAND DISTRICT
G. M. D. #663

PI 1+74.87

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

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

SCALE IN FEET
0 20 40 80

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

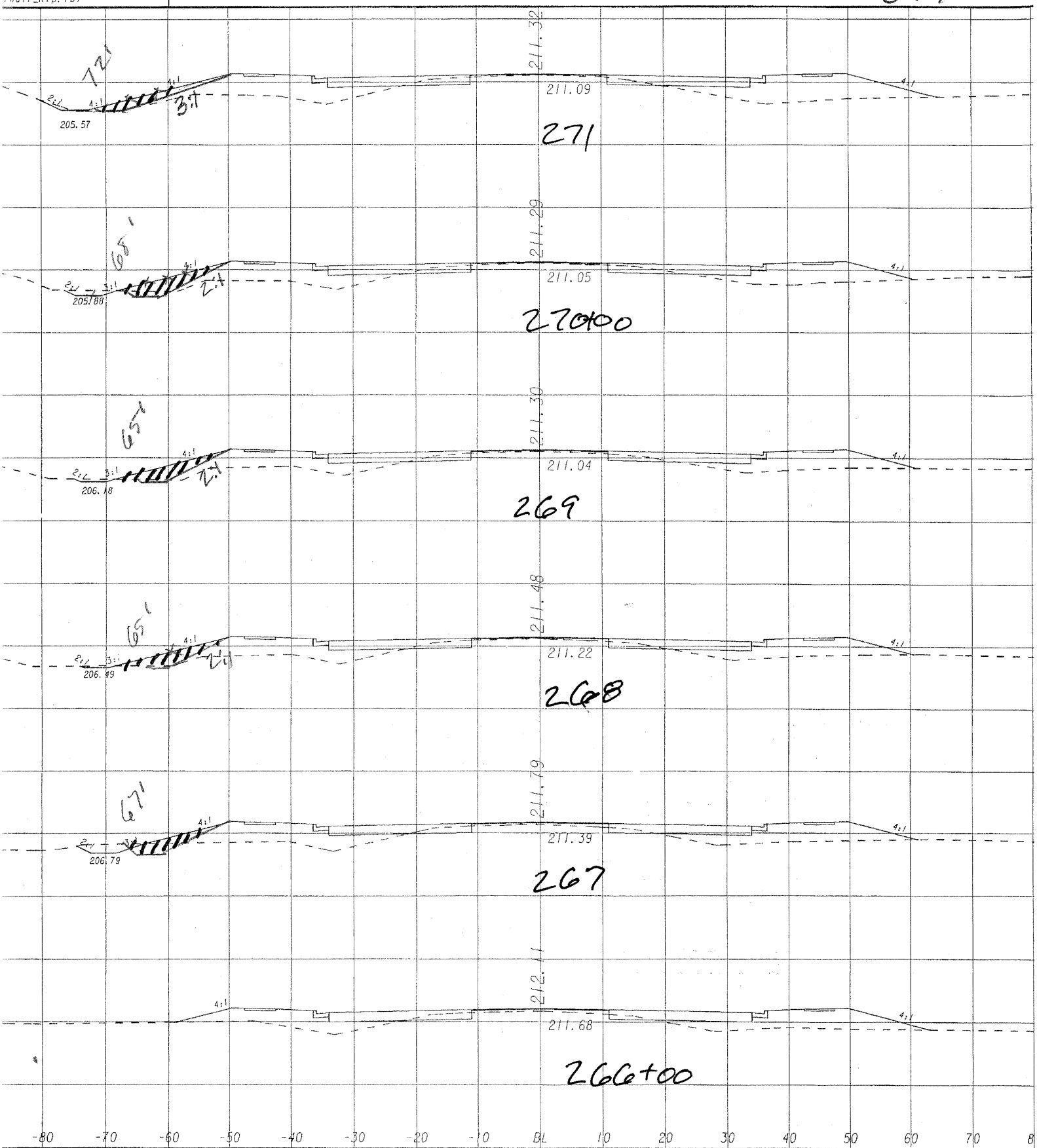
MAINLINE PLAN

Sketch

DRAWING NO. 13-14

Sketch Alt. S-8

5/10



REVISION D

23-10

Sketch Alt. S-8

6/10

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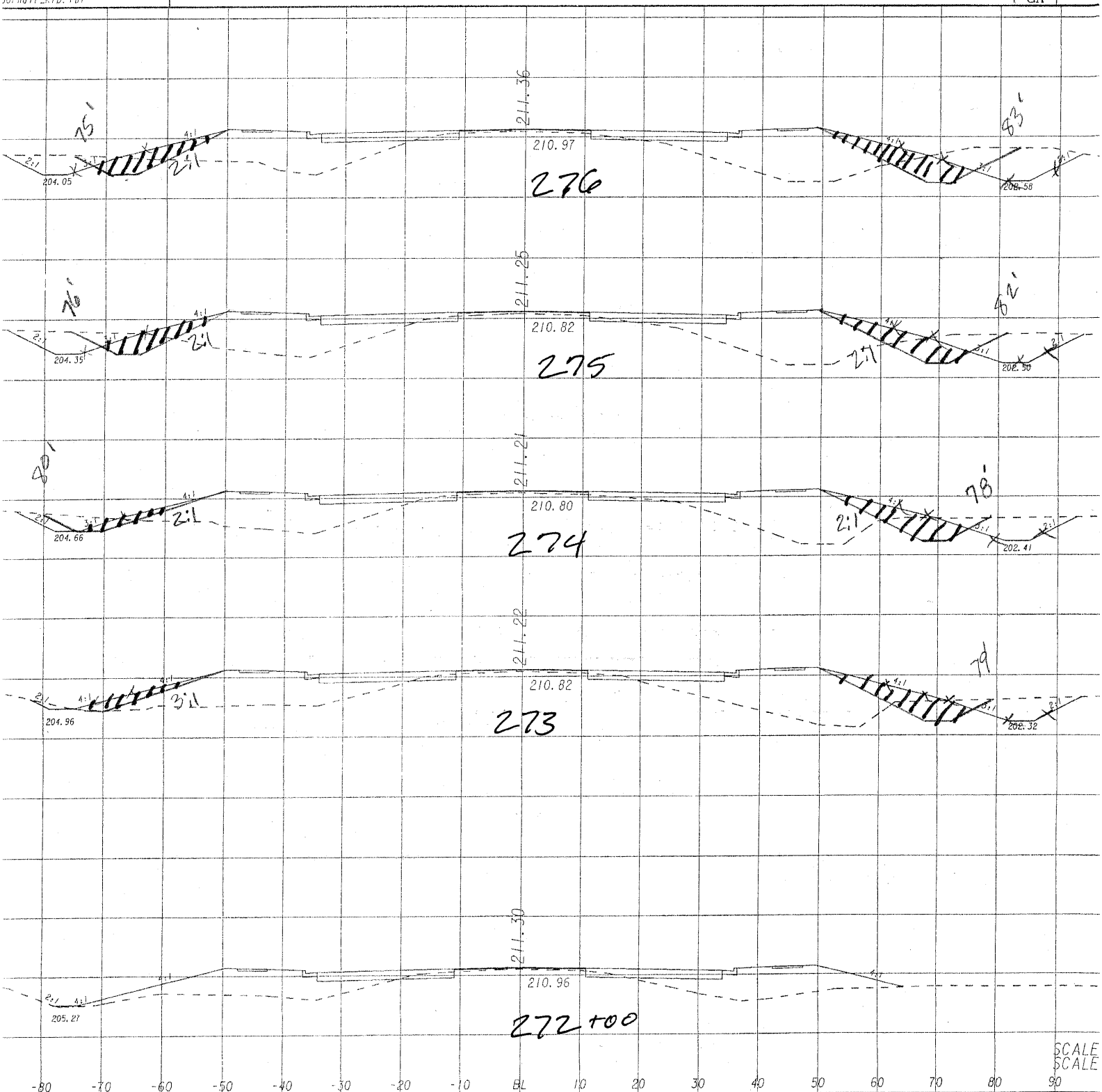
STATE GA



SCALE
SCALE

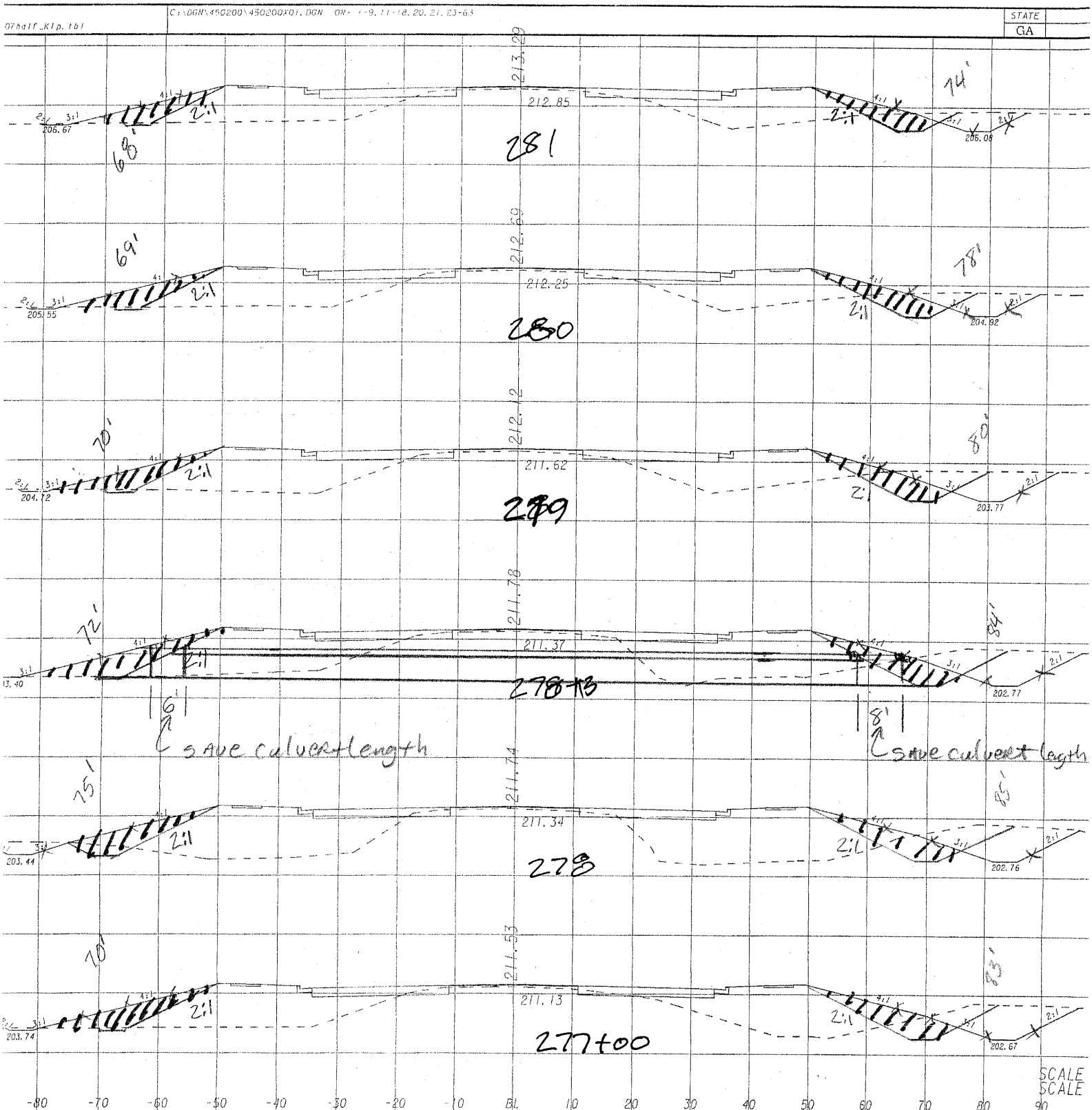
REVISION DATES

OFF

23-11

Sketch Alt. S-8

7/10



REVISION DATES

OFFI

23-12

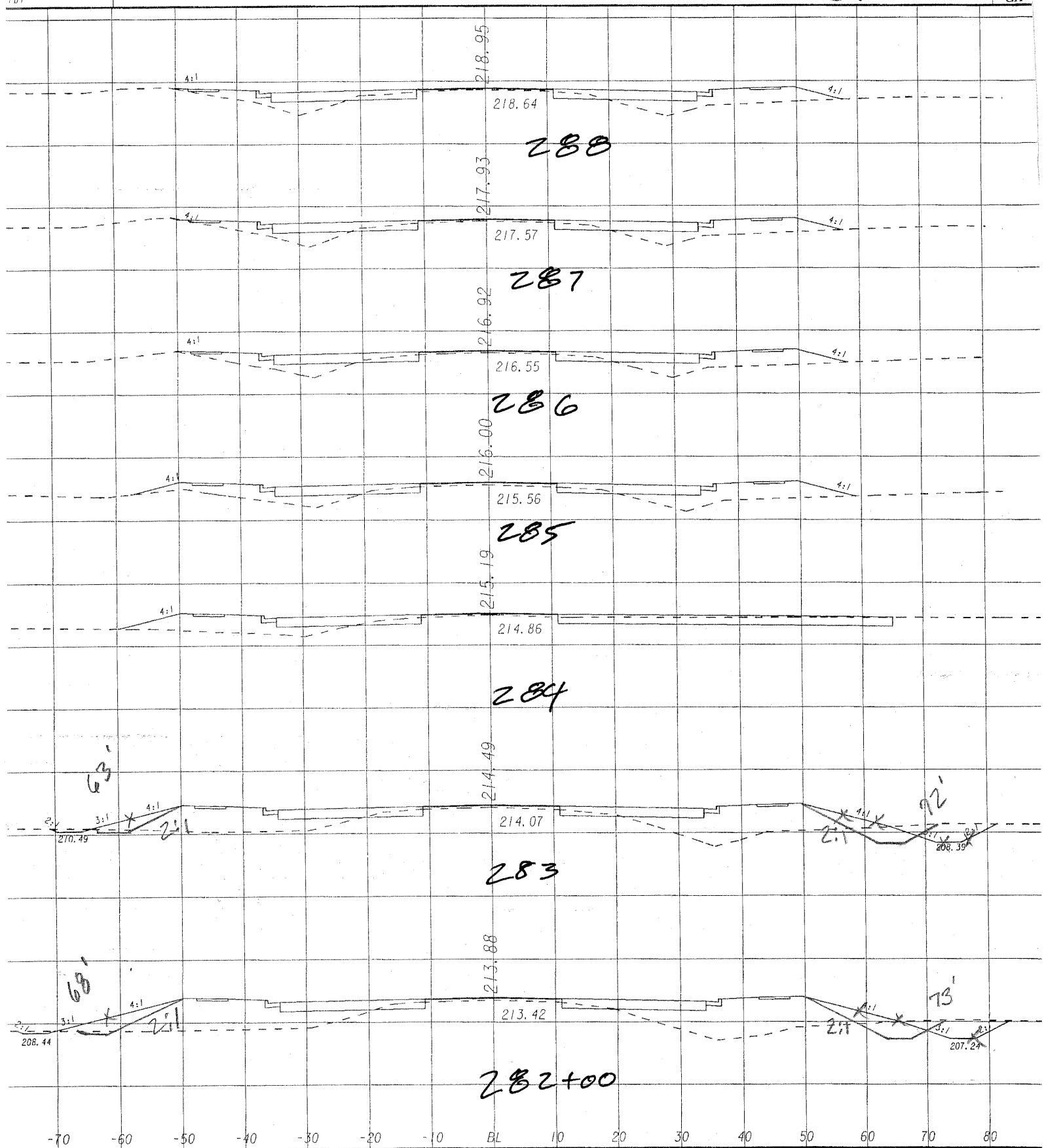
Sketch A11.S-8

8/10

tbl

C:\DGN\450200\450200X01.DGN ON: 1-9, 11-18, 20, 21, 23-63

STATE GA



REVISION DATES

23-13

CALCULATIONS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-8

SHEET NO.: 9 of 10

Original R/W saved from STA 262+82 to STA 283+80.

Lt. side R/W saved: $\frac{21,600\ SF}{43,560} = 0.50\ AC$

Rt. side R/W saved: $\frac{11,000\ SF}{43,560} = 0.26\ AC$

Total R/W saved = .76 AC

This area appears Residential Potential

Save 14LF of 4'x4' concrete Box Culvert see attached X-section sketch for culvert Length. (Design 1)

Concrete: 14 L.F. x 0.778 CY/LF = 11.0 CY (Class "A" Concrete)

Reinf. Steel: 14 L.F. x 100 Lbs/LF = 1400 Lbs (Bar Reinf. Steel)

Save 18" Storm Drain Pipes:
Approximately 160 L.F.
Save 24" Storm Drain Pipe: 20 LF
Save 36" Storm Drain Pipe: 10 LF

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET**
Project No. STP00-04921-00(001) - Lowndes County,

ALTERNATIVE NO.: S-B

DESCRIPTION:

SHEET NO.: 10 of 10

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original Costs Saved:							
Construction:							
Class "A" Conc.	CY	11	750	8,250			
Bar Reinf. steel	Lbs	1400	1.00	1,400			
18" Storm Dr. Pipe	LF	60	33.60	2,016			
24" Storm Dr. Pipe	LF	20	52	1,040			
36" Storm Dr. Pipe	LF	10	81.30	813			
Less Borrow	CY	800	9	7,200			
R/W saved #	AC	0.76	10,000	7,600			
Construction Subt				20,719			
Constr. Mkup 14%				2,901			
R/W Subtotal				7,600			
Markup (%) at 115%				8,740			
TOTAL				39,960			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-9**

DESCRIPTION: **CONSTRUCT PROJECT IN TWO PHASES; USE A SECTION OF THREE LANES WITH RURAL SHOULDERS ON FOUR LANES OF RIGHT-OF-WAY INITIALLY**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (sketch attached)

The current design proposes widening N. Forrest Street to a four-lane roadway with a 14-ft-wide flush median/"middle" left-turn lane.

ALTERNATIVE: (sketch attached)

Widen to a three lane roadway (two lanes with a 14-ft-wide flush median/"middle" left-turn lane and rural shoulders. Acquire the full four lanes of right-of-way for future four-lane widening.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- Reduces capacity for through traffic
- Requires second phase of funding and construction

DISCUSSION:

The alternate design would widen N. Forrest Street for a 14-ft flush median (middle left-turn lane) and postpone the widening to four lanes to a future date. The alternate design would use 8-ft rural shoulders (6.5-ft paved) to eliminate the need to use curb and gutter until the "future" widening to four lanes. Also, the alternate design still preserves the right-of-way for four lanes by acquiring it now. The alternate design would upgrade the operational characteristics of CR138 by adding required turn lanes at all intersections.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 8,661,651	–	$ 8,661,651
ALTERNATIVE	$ 1,127,658	–	$ 1,127,658
SAVINGS (Original minus Alternative)	$ 7,533,993	–	$ 7,533,993

SKETCH

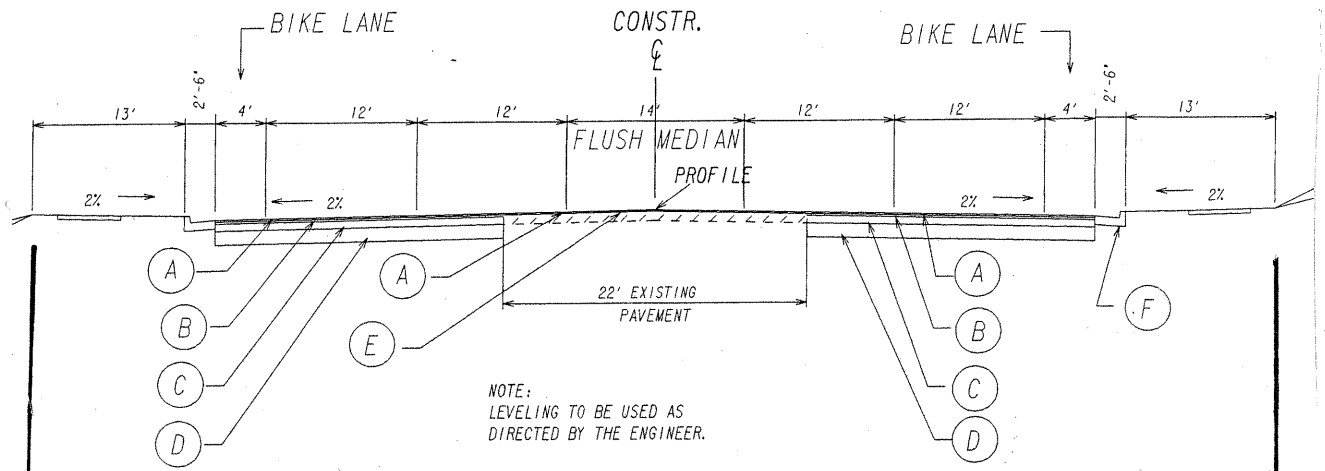
PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-9

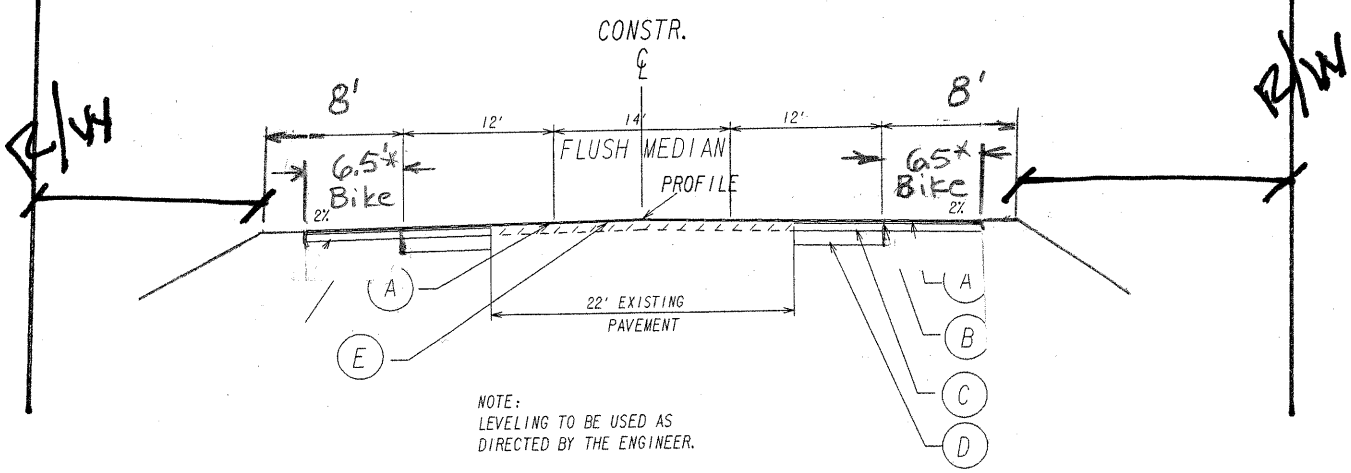
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: 2 of 6

Original



Alternate



* Paved shoulder w/ Bike Accommodations

Paved shoulder = 1½" (12.5mm); 2" (19mm); 8" GAB

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-9

SHEET NO.: 3 of 6

Pavement Full-Depth Cost: (Alt

Mix (12.5mm) $\frac{165\#}{SY} \times \frac{T}{2000\#} \times \frac{\$96}{T} = \$7.92/SY$

Mix (19mm) $\frac{220\#}{SY} \times \frac{T}{2000\#} \times \frac{\$87.67}{T} = \$9.64/SY$

mix (25mm) $\frac{550\#}{SY} \times \frac{T}{2000\#} \times \frac{90.16}{T} = \$24.79/SY$

(10") GAB (from GDOT estimate) = $17.06/SY

Total Section Cost: $59.41/SY ←

Shoulder (6.5') Pavement:

(12.5mm) 1½" = $7.92/SY

(19mm) 2" = $9.64/SY

GAB 8" (.5 x $17.06/SY) = $13.65/SY

6.5' shoulder = $31.21/SY ←

Above are unit costs ($/SY) for Pavement to be used in All Alternates.

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-9

SHEET NO.: 4 of 6

Original Costs Saved:

- 2 Lanes & Bike Lanes (Pavement Area): $\frac{(24'+4+4') \times 3.22\,mi \times 5{,}280'/mi}{9\,sf/sy} =$
  $= 60{,}400\,sy$
- 8" x 30" C&G: 2 sides x 3.22 mi x 5,280'/mi = 34,003 LF
- Urban Longitudinal Drainage = $2,000,000 from GDOT cost estimate (minus drainage for Lake and Ave)
  $2,300,000 − $300,000 = $2,000,000
- Grading Saved:
  $\frac{(101'-54') \times 3.22\,mi \times 5{,}280'/mi \times 2.5'_{Avg.}}{27\,cf/cy} \approx 74{,}000$ c.y.
  $9/cy for Earthwork/Borrow
- Erosion Control: $800,000 (GDOT Estimate) / (3.22 mi x 1.33) = $186,000/mi
  ($186,000/mile x (.47) = $87,420/mi)
  Use $\frac{54'}{101'} = 53\%$ of work required for 3-Lanes sections
  Work/Cost Saved 100% − 53% = 47% (Saved)
- Traffic Control: 47% saved.
- Signing & Striping: 47% saved

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: 3-9

SHEET NO.: 5 of 6

Alternate Additional Cost

Paved 6.5' shoulders: (6.5' x 2 sides x 5,280'/mi. x 3.22 mi) / 9 sf/sy

= 24,557 sy (of Rural Paved Shoulder)

Ditch protection: use $36.25/sy

estimate 5,000 sy of Plain Conc. Ditch Paving

estimate 5,000 sy of Palm Soil Reinf. Mat. ($4.66/sy)

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET**
Project No. STP00-04921-00(001) - Lowndes County,

ALTERNATIVE NO.: S-9

DESCRIPTION: 3 Lanes w/ Rural shldes.

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
Original Saved:							
Full Depth Pavmt	SY	60400	$59.41	$3,588,360			
8" & 30" C&G	LF	34,000	$17.34	$589,560			
Longitudinal Drainage	LS	LS	2,000,000	$2,000,000			
Grading	CY	74,000	$9	$666,000			
Eros. Control	mi	3.22	$186,000	$598,920			
Traffic Control	LS	$200,000	.47	$94,000			
Signing & Marking	LS	$130,000	.47	$61,100			
Alt. Add'l Cost:							
6.5 Paved Shldes	SY				24,557	$31.21	766,424
Ditch Protection							
Plain Conc. Ditch	SY				5,000	$36.25	181,250
Perm Soil Reinf. Mat	SY				5,000	$4.70	23,500
Rip Rap 24"	SY				300	60	18,000
Const R. Subtotal				$7,597,940			$989,174
Markup (%) at 14%				$1,063,711			$138,484
TOTAL				$8,661,651			$1,127,658

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-10**

DESCRIPTION: **REDUCE THE GRASS STRIP ON THE SHOULDER FROM SIX FEET WIDE TO TWO FEET WIDE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Based on the typical section, the proposed urban shoulders have a 6-ft wide grass strip at the back of the curb and 2-ft wide grass strip at the back of the sidewalk.

ALTERNATIVE:

Use only a 2-ft-wide strip in front and behind the sidewalk in lieu of the full 6-ft-wide grass strip.

ADVANTAGES:

- Saves on grassing costs
- Saves on right-of-way costs

DISADVANTAGES:

- Section would have to be modified slightly

DISCUSSION:

Although there is a desirable 6-ft-wide grass strip on the urban shoulders, it is not required and a 2-ft-wide strip will serve the same purpose while reducing right-of-way and erosion costs.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 123,216	–	$ 123,216
ALTERNATIVE	$ 6,773	–	$ 6,773
SAVINGS (Original minus Alternative)	$ 116,443	–	$ 116,443

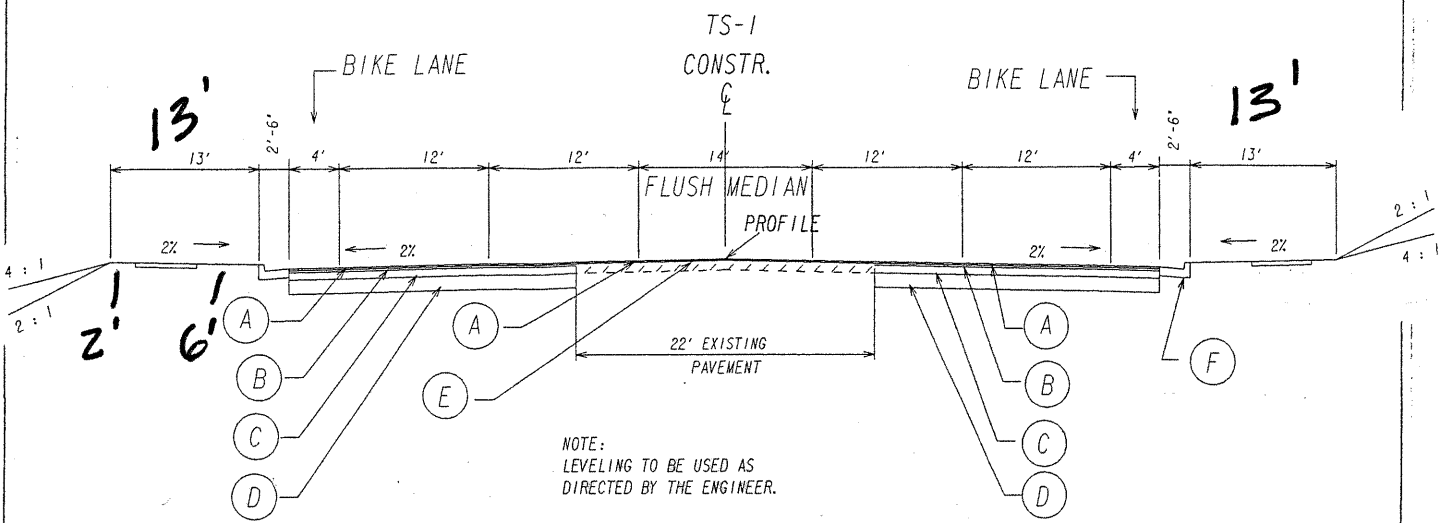
SKETCH

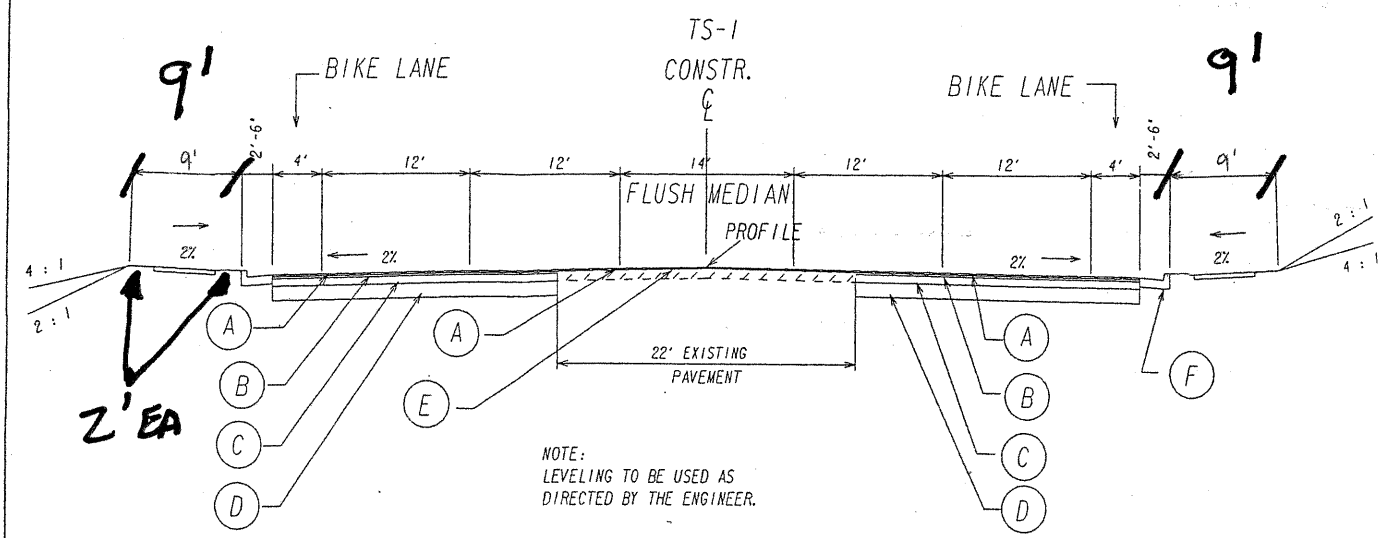
PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: S-10

Project No. STP00-04921-00(001) - Lowndes County, Georgia

Preliminary Submittal

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑ SHEET NO.: 2 of 4





CALCULATIONS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.**
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: S-10

SHEET NO.: 3 of 4

Project Length = 17002 ft

Original Design: 8' grass strip (6 inside sidewalk 2 outside sidewalk) / per side

(16')(17002') = 272,032 ft² ↓ 30,226 sy

30,226 sy × .0002066115 AC / 1 sy = 4.25 AC

(6.25 AC)($7/904) = $11,900

Alternate Design: 4' grass strip (2' inside sdwlk 2' outside sdwlk) / per side

(8')(17002') = 136,016 ft² ↓ 15,113 sy

15,113 sy × .0002066115 AC / 1 sy = 3.12 AC

(3.12 AC)($7/904) = $5941

R/W save (4' off of each side)(17,002 ft) = 68008 ft² ↓ 7556 sy ⇒ 7556 sy × .0002066115 / 1 sy ↓ 1.6 AC

1 AC resid ($10,000/AC) = $10,000
.4 AC comm ($100,000/AC) = $40,000
.2 AC agric ($5,000/AC) = $1000
$51,000

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET** ALTERNATIVE NO.: S-10
Project No. STP00-04921-00(001) - Lowndes County,

DESCRIPTION: Reduce grass strip on shoulder from 6' to 2' 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
Permanent Grassing	AC	6.25	$1904	$11,900			
					3.12	$1904	$5941
R/W Cost Save	AC	$51,000					
markup	(115%)	$58,650					
				$109,650			
Subtotal				$11,900			$5,941
Markup (%) at 14				$1666			$832
TOTAL				$13,566			$6,773

+ 109,650 R/W
123,216

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING & RECONSTRUCTION OF N. FORREST STREET**
Project No. STP00-04921-00(001) Lowndes County, Georgia
Preliminary Submittal

ALTERNATIVE NO.: **S-11**

DESCRIPTION: **USE GEOGRID FABRIC IN THE PAVEMENT SECTION AND REDUCE THE DEPTH OF THE BASE MATERIAL**

SHEET NO.: **1 of 9**

ORIGINAL DESIGN: (sketch attached)

The current pavement section is as follows:

1.25 inches – Wearing Course

2 inches – Binder

5 inches Base

10 inches GAB

ALTERNATIVE: (sketch attached)

Add Tensar geogrid fabric to the section and reduce the Base thickness from 5 inches to 2.5 inches.

ADVANTAGES:

- Reduces amount of base required

DISADVANTAGES:

- Requires modified section

DISCUSSION:

The use of geofabrics are a proven method of optimizing pavement sections and has proven to increase pavement longevity.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,580,502	–	$ 6,580,502
ALTERNATIVE	$ 5,629,504	–	$ 5,629,504
SAVINGS (Original minus Alternative)	$ 950,998	–	$ 950,998

S-11
2/9

CONTECH®
CONSTRUCTION PRODUCTS INC.

December 8, 2008

Delon Hampton & Associates, Chartered
229 Peachtree Street, NE
International Towers
Suite 1510
Atlanta, GA 30303

Attn: Harley Griffin

RE: **Proposed Geogrid Alternate for GDOT – Byron, GA**

Thank you for the opportunity to provide you with an alternate pavement section. I am pleased to offer you this suggestion for utilizing geogrid in the construction of the pavement for the GDOT project located in Byron, Georgia. The suggestion is based on the following assumptions:

1.) Any large organic material encountered will be removed to prevent future decay.

2.) The proposed section is designed to provide an equivalent pavement section to the GDOT design section of:
   a. GDOT Pavement Section
      i. 10" Graded Aggregate Base (GAB)
      ii. 5" Base Course Asphalt (25mm SP)
      iii. 2" Binder Course Asphalt (19mm SP)
      iv. 1.25" Wearing Course Asphalt (9.5mm SP)

3.) An assumed subgrade CBR value of 3.3% was converted to Subgrade Resilient Modulus (expressed in psi) using the following formula:
   a. $M_r = 1500 * CBR$

4.) The analysis was performed by inputting the proposed pavement section into the Standard Method Base Reinforcement module of the SpectraPave3 Software v3.11, copyright 1998-2007 Tensar International Corporation, Inc. to determine approximately equivalent sections utilizing Tensar biaxial geogrid within the pavement sections. The software is utilized for the design of flexible pavements in full accordance with the requirements of the AASHTO (1993) guidelines. The user is able to determine the benefits of using Tensar geogrids to reinforce the unbound aggregate layers within the pavement.

S-11
3/9

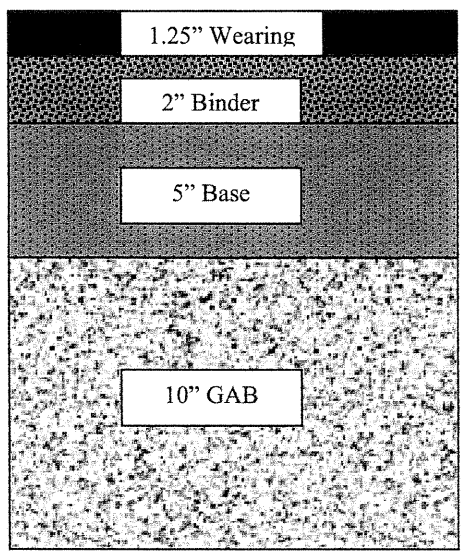
5.) The values in the following tables were utilized in this analysis.

Material	Structural Coefficient
Asphalt Wearing Course (9.5mm SP)	0.44
Asphalt Binder Course (19mm SP)	0.44
Asphalt Base Course (25mm SP)	0.40
Graded Aggregate Base Course	0.14
Tensar TX160 geogrid	n/a
Reliability, %	95
Standard Deviation	0.49
Initial Serviceability	4.2
Terminal Serviceability	2.0
Subgrade Resilient Modulus	5,000 psi

Material	Installed Unit Cost
Asphalt Surface Mix	$85.00/ton
Asphalt Base Mix	$85.00/ton
Graded Aggregate Base	$25.65/ton ($16/10")
Tensar TX160 geogrid	$5.25/sy

Based on these assumptions, CONTECH offers the following suggestions:

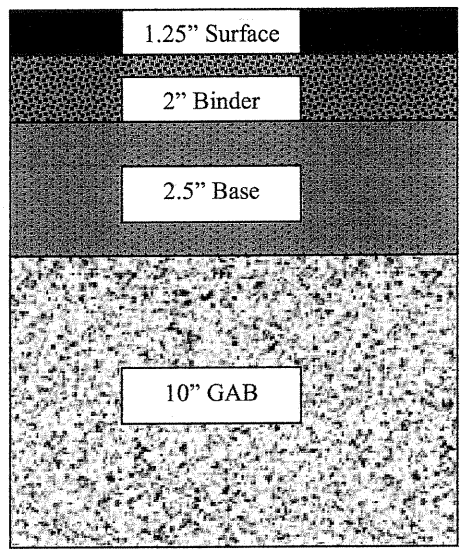
Here are representations of the current design section:



Design Section – 2,669,000 ESAL

S-11
4/9

The preceding diagram illustrates the current design section and its predicted performance. I suggest that one the following geogrid section be used throughout the pavement areas:



Tensar TX160 – 3,630,000 ESAL

Triaxial Geogrid	Original Section	TX160 Geogrid
Wearing Course	1.25	1.25
Binder Course	2	2
Base Course	5	2.5
Aggregate Base	10	10
Geogrid	n/a	TX160
Calculated ESAL's	2,669,000	3,630,000
Unit Cost	$63.66/sy	$54.46/sy

The Tensar TX160 geogrid will allow for a reduction of 2-½ inches of base course asphalt for the pavement section and **decreases the cost of the pavement by $9.20/sy** while providing a 36% increase in estimated design traffic capacity of the pavement.

The use of the Tensar triaxial geogrid reduces the lift thickness of the base course asphalt to 2.5 inches, which allows for that layer to be placed and compacted in one lift. This should also reduce the time of construction for the project by reducing compaction and placement time of asphalt by approximately 25 percent.

The use of the geogrid increases the level of compaction throughout the aggregate base layer by confining the aggregate during the compaction process. Instead of utilizing the subgrade soils to provide a platform to compact against, the grid "locks in" the aggregate, allowing the bottom of the aggregate layer to be utilized as a platform to compact the top of the aggregate layer against it. Thus, the aggregate layer is being compacted from the

S-11
5/9

bottom up and the top down; effectively increasing the level of compaction throughout the section.

The use of geogrid will also separate the aggregate base from the underlying subgrade soils. By interlocking the base, the geogrid provides lateral confinement of the stone which will prevent the subgrade soils from contaminating the base stone. The base stone will therefore maintain its thickness throughout the life of the pavement, providing additional life to the pavement.

Please note that CONTECH is a material supplier, and as such, should not be considered as the engineer-of-record for the project. Any variation from the approved project plans and specifications should be approved by the owner and the engineer-of-record prior to installation.

CONTECH is glad to offer this construction suggestion. Installation is very simple and an Installation Guide can be provided. In addition, CONTECH personnel are available to be on-site during the initial installation if requested. Please note that CONTECH's personnel will need sufficient notice prior to the start of construction so that proper clearances can be obtained. Proper overlap is needed and will be determined by the subgrade conditions, although it is anticipated that 1 foot of overlap will be required on these projects. If you need any further information or have questions concerning our suggestions, please call me at 404-969-7505.

Regards,

David L. Richardson

David L. Richardson, P.E.
Regional Tensar Specialist

CONTECH
CONSTRUCTION PRODUCTS INC.

Attachments - Calculations

S-11
6/9

Calculations

Original Design

AASHTO Design Equation for Estimating Pavement Life (1993):

$$\log_{10}(W_{18}) = \left\{ Z_R(S_0) + 9.36\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2-1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32\log_{10}(M_R) - 8.07 \right\}$$

$$(W_{18})_R = W_{18}(TBR)$$

where,

W_{18} = Equivalent 18-kip Single Axle Loads (ESALs)
Z_R = Standard Normal Deviate (based on Reliability Level, R)
S_0 = Standard Deviation
SN = Structural Number
ΔPSI = Difference between terminal and initial serviceability indices
M_R = Resilient Modulus of Subgrade
$(W_{18})_R$ = Reinforced ESALs Due to Geogrid
TBR = Traffic Benefit Ratio

Variables	Value
Z_R	-1.645
S_0	0.49
SN	4.72
ΔPSI	2.2
$M_{R,\ psi}$	5,000

$$\log_{10}(W_{18}) = \left\{ -1.645(0.49) + 9.36\log_{10}(4.72+1) - 0.20 + \frac{\log_{10}\left[\frac{2.2}{4.2-1.5}\right]}{0.40 + \frac{1094}{(4.72+1)^{5.19}}} + 2.32\log_{10}(5000) - 8.07 \right\}$$

W_{18} = 2,669,249 ESALs

S-11
7/9

Triaxial Geogrid Design

AASHTO Design Equation for Estimating Pavement Life (1993):

$$\log_{10}(W_{18}) = \left\{ Z_R(S_0) + 9.36\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2-1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32\log_{10}(M_R) - 8.07 \right\}$$

$$(W_{18})_R = W_{18}(TBR)$$

where,

W_{18} = Equivalent 18-kip Single Axle Loads (ESALs)
Z_R = Standard Normal Deviate (based on Reliability Level, R)
S_0 = Standard Deviation
SN = Structural Number
ΔPSI = Difference between terminal and initial serviceability indices
M_R = Resilient Modulus of Subgrade
$(W_{18})_R$ = Reinforced ESALs Due to Geogrid
TBR = Traffic Benefit Ratio

Variables	Value
Z_R	-1.645
S_0	0.49
SN	3.83
ΔPSI	2.3
$M_{R,\ psi}$	5,000
TBR, Tensar TX160	6

$$\log_{10}(W_{18}) = \left\{ -1.645(0.49) + 9.36\log_{10}(3.83+1) - 0.20 + \frac{\log_{10}\left[\frac{2.2}{4.2-1.5}\right]}{0.40 + \frac{1094}{(3.83+1)^{5.19}}} + 2.32\log_{10}(5000) - 8.07 \right\}$$

$W_{18} = 605{,}029$ ESALs

$(W_{18})_R = W_{18}(TBR)$

$(W_{18})_{R-TX160} = 605{,}029(6) = 3{,}630{,}172$ ESALs

CALCULATIONS

PROJECT: **WIDENING & RECONSTRUCTION OF NO. FORREST ST.** ALTERNATIVE NO.: S-11
Project No. STP00-04921-00(001) - Lowndes County, Georgia
Preliminary Submittal

SHEET NO.: 8 of 9

Area of Full-Depth pavement:

$$\frac{\left[(4' + 24' + 14' + 24' + 4') - (22')\right] \times 3.22\,mi \times 5{,}280'/mi}{9\,sf/sy} =$$

(New Typical; Σ Exist. Pavement Retained)

$= 90{,}675$ s.y.

COST WORKSHEET

PROJECT: **WIDENING OF NO. FORREST STREET**
Project No. STP00-04921-00(001) - Lowndes County,

ALTERNATIVE NO.: **S-11**

DESCRIPTION:

SHEET NO.: **9 of 9**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement Section	SY	90,675	63.66	5,772,371			
Section with Tensar Geogrid	SY				90,675	54.46	4,938,161
Subtotal				5,772,371			4,938,161
Markup (%) at	**14.00%**			808,132			691,343
TOTAL				6,580,503			5,629,504

PROJECT DESCRIPTION

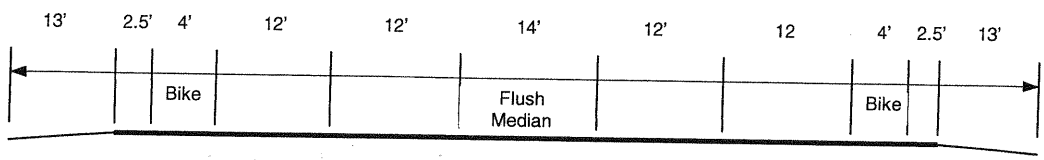
PURPOSE AND NEED

This project is the widening and reconstruction of North Forrest Street/CR 138 from Park Avenue/SR 31 to Bemiss Road/SR 125 in Lowndes County, Valdosta, Georgia. The proposed project length is 3.22 miles. The existing road consists of a two lane rural roadway on 60 – 80 feet of right of way. North Forrest Street / CR 138 currently functions at an acceptable Level of Service; however, traffic is projected to reach unacceptable levels within the next 10 years. There were 91 accidents, 54 injuries and one fatality along this corridor between 1995 and 1997, with the vast majority of the accidents attributed to following too close. Widening North Forrest Street will improve safety along this route and provide needed facilities for pedestrians and bikes.

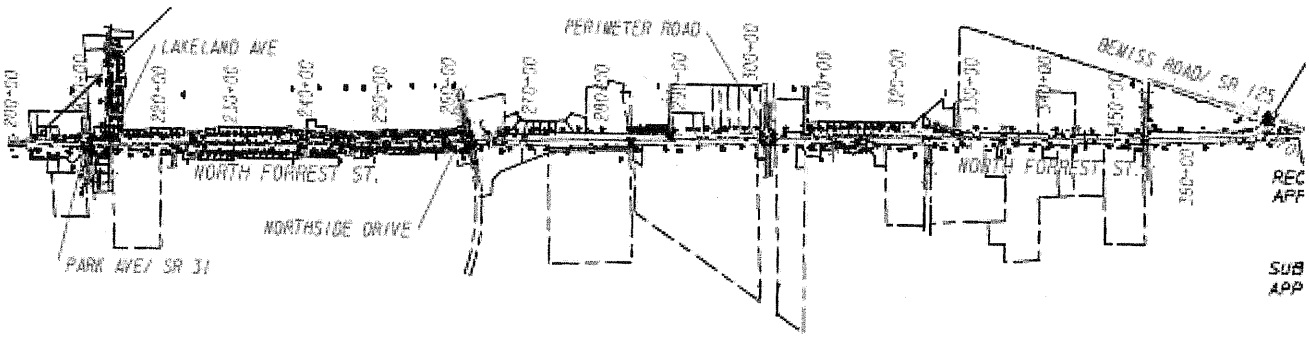
Traffic along North Forrest Street/CR 138 peaks near Park Avenue and decreases as traffic approaches SR 125. Land use along North Forrest is mostly residential. There are three schools located with the project limits. Near Park Avenue, there is some commercial property and a school. Traffic volumes are at 13,300 ADT (2006) and 22,500 ADT (2026) in this area. Land use at the north section of the project turns agricultural and the traffic volumes decrease to 10,800 ADT.

The proposed construction will widen North Forrest Street/CR 138 to provide four, 12-ft lanes with a 20-ft center turn lane, curb and gutter, and sidewalks on 110-ft of minimum right-of-way. The proposed typical section consists of a 5-lane urban with two 12-ft lanes in each direction and a 20-ft flush turn lane with curb, gutter and sidewalks. The five existing traffic signals along this route will be reused. The additional lanes will reduce the number of cars per lane thus increasing the distance between vehicles and will allow traffic to go around vehicles that are completing a turning movement. Design speed on the roadway is 45mph with truck traffic of approximately 3%.

Total construction cost is estimated at $18.9M with an additional $6.9M needed for right-of-way. Construction is expected to take between 18 and 24 months.



SECTION



PROJECT PLAN

Estimate Report for file "450200"

Section Roadway

Item Number	Quantity	Units	Unit Price	Item Description	Cost
150-1000	Lump	LS	200000.00	TRAFFIC CONTROL - STP00-4921-00 (001)	200000.00
210-0100	Lump	LS	750000.00	GRADING COMPLETE - STP00-4921-00 (001)	750000.00
310-5100	97564	sy	17.06	GR AGGR BASE CRS, 10 INCH, INCL MATL	1664441.84
318-3000	1250	TN	36.00	AGGR SURF CRS	45000.00
402-1801	20	TN	108.97	RECYCLED ASPH CONC PATCHING, INCL BITUM MATL	2179.40
402-1812	1485	TN	87.00	RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME	129195.00
402-3121	31103	TN	90.16	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	2804246.48
402-3130	13099	TN	96.00	RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME	1257504.00
402-3190	12442	TN	87.67	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2,INCL BITUM MATL & H LIME	1090790.14
413-1000	19462	GL	2.50	BITUM TACK COAT	48655.00
441-0104	16190	SY	45.35	CONC SIDEWALK, 4 IN	734216.50
441-4030	2111	SY	53.75	CONC VALLEY GUTTER, 8 IN	113466.25
441-5003	693	LF	21.60	CONCRETE HEADER CURB, 8 IN, TP 3	14968.80
441-6222	33968	LF	17.34	CONC CURB & GUTTER, 8 IN X 30 IN, TP 2	589005.12
446-1100	34005	LF	5.35	PVMT REINF FABRIC STRIPS, TP 2, 18 INCH WIDTH	181926.75
500-9999	130	CY	600.00	CLASS B CONC, BASE OR PVMT WIDENING	78000.00
550-1180	19118	LF	33.56	STORM DRAIN PIPE, 18 IN, H 1-10	641600.08
550-1240	15107	LF	51.92	STORM DRAIN PIPE, 24 IN, H 1-10	784355.44
550-1300	1966	LF	62.32	STORM DRAIN PIPE, 30 IN, H 1-10	122521.12
550-1360	800	LF	81.28	STORM DRAIN PIPE, 36 IN, H 1-10	65024.00
550-1480	576	LF	105.43	STORM DRAIN PIPE, 48 IN, H 1-10	60727.68
550-4218	10	EA	611.40	FLARED END SECTION 18 IN, STORM DRAIN	6114.00
550-4224	10	EA	908.86	FLARED END SECTION 24 IN, STORM DRAIN	9088.60
550-4236	3	EA	1009.71	FLARED END SECTION 36 IN, STORM DRAIN	3029.13
634-1200	175	EA	125.00	RIGHT OF WAY MARKERS	21875.00
668-1100	147	EA	2459.57	CATCH BASIN, GP 1	361556.79
668-2100	123	EA	2045.60	DROP INLET, GP 1	251608.80
				Section Sub Total:	**$12,031,095.92**

Section Highway Signing and Marking

Item Number	Quantity	Units	Unit Price	Item Description	Cost
636-1033	400	SF	26.00	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 9	10400.00
636-2070	950	LF	16.00	GALV STEEL POSTS, TP 7	15200.00
652-0094	6	EA	63.00	PAVEMENT MARKING, SYMBOL, TP 4	378.00

652-0110	6	EA	47.25	PAVEMENT MARKING, ARROW, TP 1	283.50
652-2501	7	LM	636.39	SOLID TRAFFIC STRIPE, 5 IN, WHITE	4454.73
652-5303	7	LM	576.80	SOLID TRAFFIC STRIPE, 6 IN, WHITE	4037.60
652-6301	3379	GLF	0.16	SKIP TRAF STRIPE, 6 IN, WHITE	540.64
652-6501	3379	GLF	0.21	SKIP TRAFFIC STRIPE, 5 IN, WHITE	709.59
653-0120	134	EA	73.99	THERMOPLASTIC PVMT MARKING, ARROW, TP 2	9914.66
653-0130	1	EA	105.33	THERMOPLASTIC PVMT MARKING, ARROW, TP 3	105.33
653-0170	2	EA	95.87	THERMOPLASTIC PVMT MARKING, ARROW, TP 7	191.74
653-0210	2	EA	120.11	THERMOPLASTIC PVMT MARKING, WORD, TP 1	240.22
653-1704	1007	LF	34.71	THERMOPLASTIC SOLID TRAF STRIPE, 24 IN, WHITE	34952.97
653-1804	8789	LF	2.01	THERMOPLASTIC SOLID TRAF STRIPE, 8 IN, WHITE	17665.89
653-2501	8	LM	1394.96	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, WHITE	11159.68
653-2502	7	LM	1405.24	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, YELLOW	9836.68
653-4501	7	GLM	911.05	THERMOPLASTIC SKIP TRAF STRIPE, 5 IN, WHITE	6377.35
653-4502	4	GLM	874.07	THERMOPLASTIC SKIP TRAF STRIPE, 5 IN, YELLOW	3496.28
653-6006	403	SY	3.32	THERMOPLASTIC TRAF STRIPING, YELLOW	1337.96
654-1001	525	EA	4.74	RAISED PVMT MARKERS TP 1	2488.50
654-1003	669	EA	4.66	RAISED PVMT MARKERS TP 3	3117.54
				Section Sub Total:	**$136,888.86**

Section Culvert No. 1

Item Number	Quantity	Units	Unit Price	Item Description	Cost
207-0203	100	CY	75.00	FOUND BKFILL MATL, TP II	7500.00
500-3101	106	CY	750.00	CLASS A CONCRETE	79500.00
511-1000	12879	LB	1.00	BAR REINF STEEL	12879.00
603-2018	62	SY	96.03	STN DUMPED RIP RAP, TP 1, 18 IN	5953.86
603-7000	62	SY	5.79	PLASTIC FILTER FABRIC	358.98
				Section Sub Total:	**$106,191.84**

Section Temporary Erosion Control

Item Number	Quantity	Units	Unit Price	Item Description	Cost
163-0232	34	AC	900.00	TEMPORARY GRASSING	30600.00
163-0240	544	TN	231.41	MULCH	125887.04
163-0300	10	EA	1965.00	CONSTRUCTION EXIT	19650.00
163-0530	4500	LF	4.05	CONSTRUCT AND REMOVE BALED STRAW EROSION CHECK	18225.00
163-0550	264	EA	315.68	CONSTRUCT AND REMOVE INLET SEDIMENT TRAP	83339.52
165-0030	14250	LF	2.31	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	32917.50
165-0070	2250	LF	5.79	MAINTENANCE OF BALED STRAW EROSION CHECK	13027.50
165-0101	10	EA	675.00	MAINTENANCE OF CONSTRUCTION EXIT	6750.00
165-0105	264	EA	113.33	MAINTENANCE OF INLET SEDIMENT TRAP	29919.12

167-1000	2	EA	1400.00	WATER QUALITY MONITORING AND SAMPLING	2800.00
167-1500	30	MO	1600.00	WATER QUALITY INSPECTIONS	48000.00
171-0030	28500	LF	5.75	TEMPORARY SILT FENCE, TYPE C	163875.00
				Section Sub Total:	**$574,990.68**

Section Permanent Erosion Control

Item Number	Quantity	Units	Unit Price	Item Description	Cost
603-2180	500	SY	86.78	STN DUMPED RIP RAP, TP 3, 12 IN	43390.00
603-7000	500	SY	5.79	PLASTIC FILTER FABRIC	2895.00
700-6910	34	AC	1904.00	PERMANENT GRASSING	64736.00
700-7000	68	TN	83.00	AGRICULTURAL LIME	5644.00
700-7010	85	GL	26.00	LIQUID LIME	2210.00
700-8000	28	TN	635.00	FERTILIZER MIXED GRADE	17780.00
700-8100	3400	LB	26.00	FERTILIZER NITROGEN CONTENT	88400.00
				Section Sub Total:	**$225,055.00**

Total Estimated Cost: $13,074,222.30

Subtotal Construction Cost	**$13,074,222.30**
E&C Rate 0.0 %	$0.00
Inflation Rate 0.0 % @ 0 Years	$0.00
Total Construction Cost	**$13,074,222.30**
Right Of Way	$0.00
ReImb. Utilities	$0.00
Grand Total Project Cost	**$13,074,222.30**

Department of Transportation

State of Georgia D-4 DESIGN APR 18 2008

Interdepartmental Correspondence

FILE	R/W Cost Estimate	**OFFICE**	Atlanta
		DATE	April 18, 2008
FROM	Phil Copeland, Right of Way Administrator		
TO	Mike Popp Tifton District Design		
SUBJECT	**Preliminary Right of Way Cost Estimate** **Project:STP00-4921-00(001)Lowndes** **P.I. No.:450200** **Description: Widening of North Forrest Street**		

Per your request, attached is a copy of the approved Preliminary Right of Way Cost Estimate on the above referenced project.

Please note the area of Required R/W was furnished with your request.

If you have any questions, please contact Jerry Milligan at the West Annex Right of Way Office at (770) 986-1541.

PC::GAM
Attachments
c: Brian Summers, Engineering Services
Wes Brock, R/W
Windy Bickers, Financial Management
File

Preliminary Right of Way Cost Estimate

Phil Copeland
Right of Way Administrator
By: Jerry Milligan

Date: April 18, 2008
Project: STP00-4921-00(001)Lowndes
Existing/Required R/W: Varies/Varies
Project Termini : Widening of North Forrest Street/CR 138
from Park Ave. to Bemiss Rd/SR 125
Project Description: Widening of North Forrest Street

P.I. Number: 450200
No. Parcels: 166

Land:			
Commercial R/W: 3.9 acres @ $ 100,000/acre	$ 390,000		
Agicultural R/W: 3.6 acres @ $5,000/acre	18,000		
Residential R/W: 12.9 acres @ $ 10,000/acre	128,795		
Residential Esmt.: 1.3 acres @ $10,000/acre @ 50%	6,289	$	543,084
Improvements : houses, landscaping, monitor well, fencing, misc. site improvements			1,150,000
Relocation: Commercial (0) Residential (7)			280,000
Damage : Proximity (78) Consequential (0) Cost to Cure (2)			830,000
Net Cost		$	2,803,084

Net Cost		$	2,803,084
Scheduling Contingency	55 %		1,541,696
Adm/Court Cost	60 %		2,606,868
		$	6,951,648

Total Cost $6,951,650

Note: The Market Appreciation (40%) is not included in the updated Preliminary Cost Estimate.

VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis (VA) procedure used during the VE study conducted for the North Forrest Street Widening Project by Lewis & Zimmerman Associates, Inc. The workshop was performed December 8 – 11, 2008 at the preliminary stage of completion. GDOT District 4 is designing the project and provided information for the VE team to use as the bases of the studies.

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. The documents listed below were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- Project Plans and Sections, dated December 2008, prepared by GDOT District 4
- Project Cost Estimate, dated November 19, 2008, prepared by GDOT District 4
- Preliminary Right of Way Estimate, dated April 18, 2008, prepared by GDOT District 4
- Project Concept Report, dated August 20, 2008, prepared by GDOT District 4

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 VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by GDOT District 4 to develop cost models for the project. The models were

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

used to distribute the total project cost among the various elements or functions of the project. The VE team used this model to identify the high-cost elements or functions that drive the project and the elements or functions 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 four-day effort beginning with an orientation/kickoff meeting on Monday December 8, 2008 and concluding with the final VE Presentation on Thursday, December 11, 2008. During the workshop, the VE Job Plan was followed in compliance with GDOT and FHWA 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 Phase
- 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 District 4 design 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. Following the presentation, the VE team reviewed the project documents to become familiar with site conditions and traffic considerations in order to enhance their understanding of the project.

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 model(s) 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 may assign costs to provide the functions or group of functions indicated by a specific project element using the cost estimate and cost model(s). 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 can be 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.

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.

The GDOT design team may wish to review these creative lists since they 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 the GDOT value objectives identified through conversations during the design 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 and recorded on the Creative Idea Listing worksheets. 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. These are also developed in the next phase of the VE process.

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 the Study Results section of this report. Design suggestions include the same information as the alternatives except that no cost analysis is performed. They too are included in the Study Results section.

Presentation Phase

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Saving worksheets to hand out at the presentation, and to present the key VE alternatives and design suggestions to the GDOT District 4 design team and Central Office staff.

The presentation was held on December 11, 2008 at the GDOT Central Office. 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.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from the GDOT District 4 design team will analyze each alternative and prepare a short 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. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

Upon completing their reviews, the owner and designer will meet and, by consensus, select VE alternatives and design suggestions to incorporate into the project.

VALUE ENGINEERING STUDY AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will facilitate a 30-hour value engineering (VE) study on the Preliminary Design Submittal of the **Widening and Reconstruction of North Forrest Street / CR 138 from Park Avenue /SR 31 to Bemiss Road / SR 125** , STP00- 4921-00(001), P.I. No. 450200, Lowndes County, Georgia. The Georgia Department of Transportation (GDOT) project management and 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 December 8 – 11, 2008 at the offices of:

GDOT
600 West Peachtree Street, 5th Floor
Atlanta, Georgia 30308
Conference Room 5CR1L2

The point-of-contact is Ms. Lisa Myers, GDOT Value Engineering Coordinator, who may be reached at 404-631-1770.

VE STUDY AGENDA

Monday, December 8, 2008

8:00 am - 9:00 am **VE Team Members Arrive and Review Documents**

10:00 am – 11:00 am **Owner's/Designer's Presentation**

GDOT and the design consultants 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 - 2:00 pm **Lunch and Site Visit**

2:00 pm - 3:00 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.

3:00 pm – 4:00 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.

4:00 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, December 9, 2008

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, December 10, 2008

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 PBS&J design team representatives. The team will review all documentation and prepare for the presentation.

Thursday, December 11, 2008

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

9:00 am – 12:00 noon **Presentation Phase**

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
Vinique Word, PE	Civil Engineer	Delon Hampton & Associates

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the unique project elements involved with the North Forrest Street Widening Project. The multidisciplinary team comprised professionals with highway design experience and a working knowledge of VE procedures:

Participant	Specialization	Affiliation
David Hamilton, PE, CVS, CCE	VE Team Leader	Lewis & Zimmerman Associates
Joe Leoni, PE	Highway Design	ARCADIS
Vinique Word, PE	Civil & Drainage	Delon Hampton & Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, December 8, 2008 by representatives from the GDOT District 4 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 owner and 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, December 11, 2008 at the GDOT Central Office to review VE alternatives with the owner and representatives from the design team. Copies of the Draft Summary of Potential Cost Savings worksheet were provided to the attendees. An attendance list for the meeting is attached.

VE STUDY SIGN-IN SHEET

Project No.: STP00-4921-00(001) County: Lowndes PI No.: 450200 Date: December 8-11, 2008

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
Lisa L. Myers	00244168	Engineering Services	404-631-1770	lmyers@dot.ga.gov
Sandy Griffin	00364518	Dist. 4	229-386-3618	sgriffin@. . . .
James M. Popp	00249519	Dist. 4/Design	229-386-3081	Mpopp@dot.ga.gov
Brent Thomas	00255901	Dist 4/Precst	229-386-3300	bthomas@dot.ga.gov
Joe Leoni		ARCADIS	770-431-8666	joe.leoni@arcadis-us.com
Vinique Word		Delon Hampton + Assoc	404-419-8438	vword@delonhampton.com
Ken Werho	00258268	GDOT T.O. Des Rev	404-635-8144	KWERHO@DOT.GA.GOV
James Magnus	00208161	GDOT Constr	404-631-1971	
DAVE HAMILTON		ARCADIS	253.229.7703	DAHAMILTON@LZA.COM
Jerry Milligan		GDOT R/W	404 347 6170	
Ron Wisham	00208180	GDOT EPG SENV	404-631-1753	rwisham@dot.ga.gov

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 the GDOT and the District 4 design team. The following parameters were used when calculating discounted present worth:

Year of Analysis:	2008
Construction Start Date:	2010
Construction Completion Date:	2011
Planning Period (n):	30 years starting in 2008
Net Discount Rate (i):	3.1%
Escalation Rate (e):	0%
Annual Present Worth Factor (PWF) (n, i, e)	19.3495

When computing capital costs, direct material, labor and equipment costs are marked up using a composite markup of 14% that includes:

Construction Administration & Engineering	14%

COST MODEL

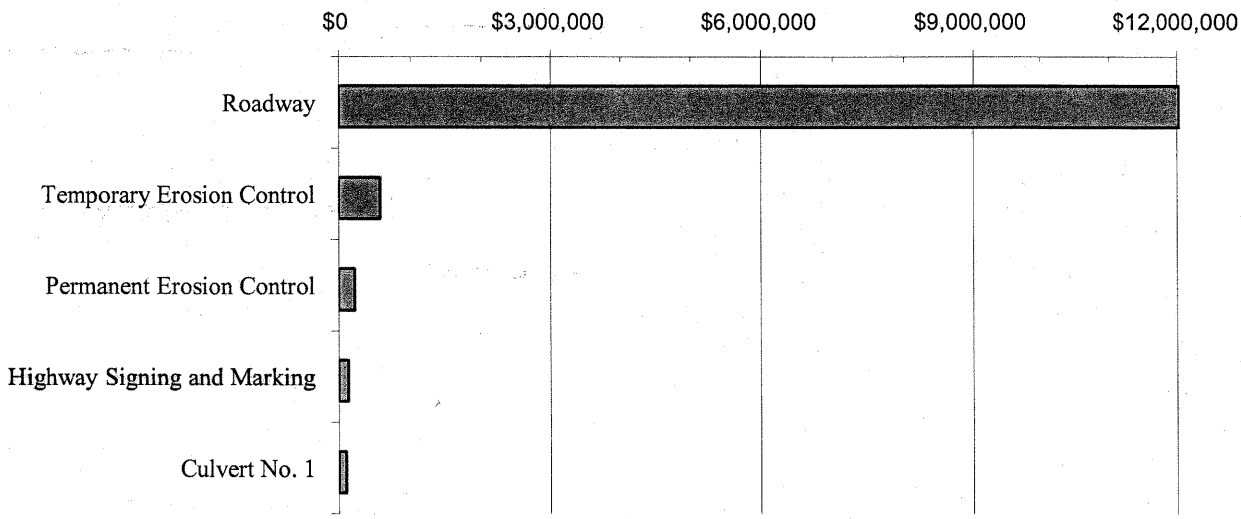
The VE team prepared a Pareto Chart, or Cost Histogram, for the project that follows this page. This Cost Histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project.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

From this analysis, it can be seen that grading and drainage is a major component of the overall project cost and appears to be driven by the pavement area and total length of the roadway. Other cost components such as base and paving appear prudent for a road widening project, but optimization measures can be applied.

COST HISTOGRAM

PROJECT: **WIDENING AND RECONSTRUCTION OF NORTH FORREST STREET**
Project STP00-4921-00(001)

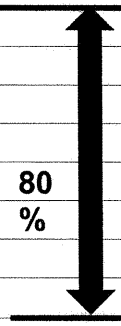
TOTAL PROJECT	COST	PERCENT	CUM. PERCENT
Roadway	12,031,095	92.02%	92.02%
Temporary Erosion Control	574,990	4.40%	96.42%
Permanent Erosion Control	225,055	1.72%	98.14%
Highway Signing and Marking	136,889	1.05%	99.19%
Culvert No. 1	106,192	0.81%	100.00%
Construction Subtotal	***13,074,221***	100.00%	
Rights of Way	6,951,650		
TOTAL CONSTRUCTION & RIGHT OF WAY	**$ 20,025,871**		



COST HISTOGRAM

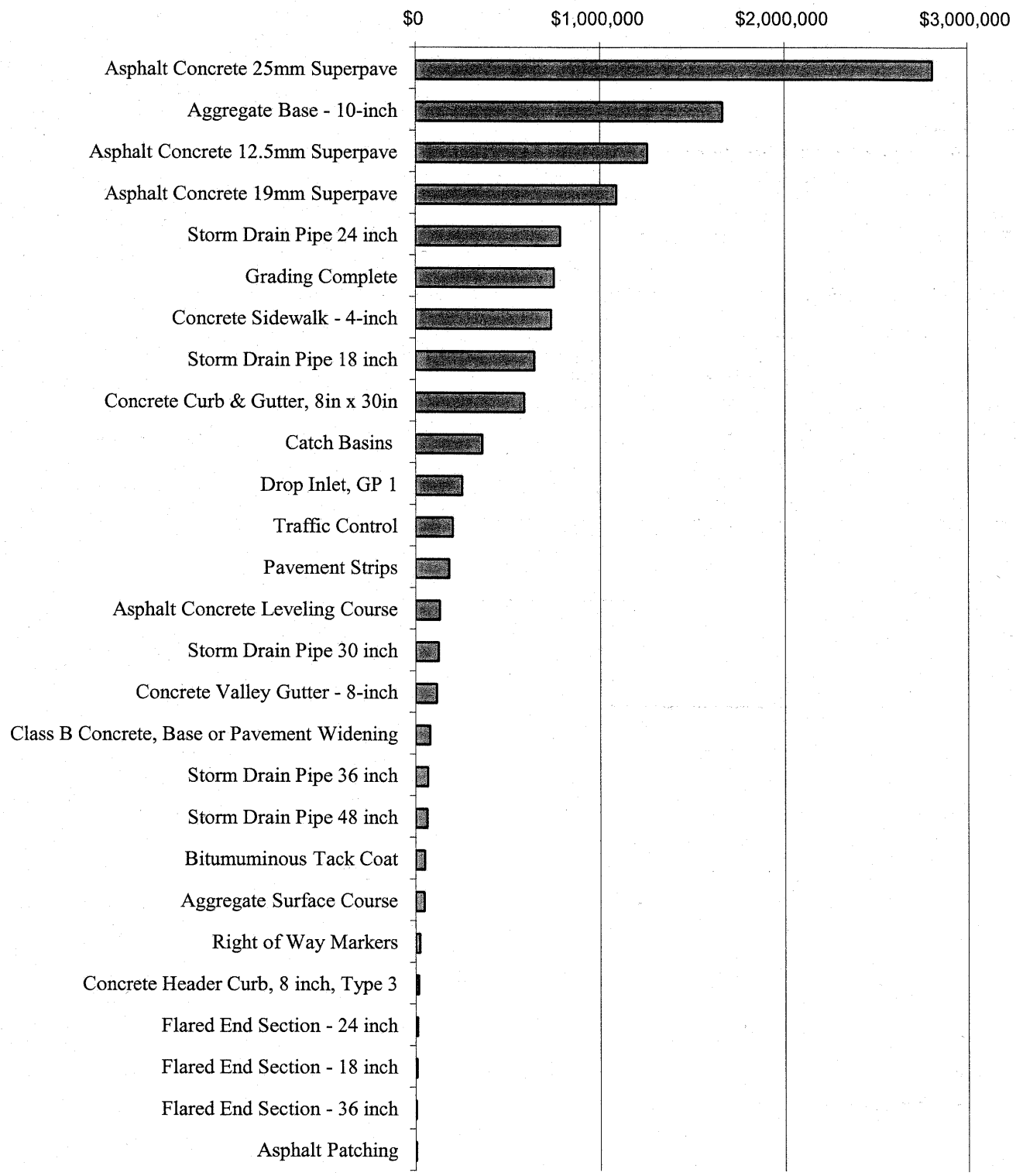
PROJECT: **WIDENING AND RECONSTRUCTION OF NORTH FORREST STREET**
Project STP00-4921-00(001)

TOTAL ROADWAY	COST	PERCENT	CUM. PERCENT
Asphalt Concrete 25mm Superpave	2,804,246	23.31%	23.31%
Aggregate Base - 10-inch	1,664,441	13.83%	37.14%
Asphalt Concrete 12.5mm Superpave	1,257,504	10.45%	47.59%
Asphalt Concrete 19mm Superpave	1,090,790	9.07%	56.66%
Storm Drain Pipe 24 inch	784,355	6.52%	63.18%
Grading Complete	750,000	6.23%	69.41%
Concrete Sidewalk - 4-inch	734,216	6.10%	75.52%
Storm Drain Pipe 18 inch	641,600	5.33%	80.85%
Concrete Curb & Gutter, 8in x 30in	589,005	4.90%	85.75%
Catch Basins	361,557	3.01%	88.75%
Drop Inlet, GP 1	251,608	2.09%	90.84%
Traffic Control	200,000	1.66%	92.50%
Pavement Strips	181,927	1.51%	94.02%
Asphalt Concrete Leveling Course	129,195	1.07%	95.09%
Storm Drain Pipe 30 inch	122,521	1.02%	96.11%
Concrete Valley Gutter - 8-inch	113,466	0.94%	97.05%
Class B Concrete, Base or Pavement Widening	78,000	0.65%	97.70%
Storm Drain Pipe 36 inch	65,024	0.54%	98.24%
Storm Drain Pipe 48 inch	60,727	0.50%	98.75%
Bitumuminous Tack Coat	48,655	0.40%	99.15%
Aggregate Surface Course	45,000	0.37%	99.52%
Right of Way Markers	21,875	0.18%	99.71%
Concrete Header Curb, 8 inch, Type 3	14,969	0.12%	99.83%
Flared End Section - 24 inch	9,088	0.08%	99.91%
Flared End Section - 18 inch	6,114	0.05%	99.96%
Flared End Section - 36 inch	3,029	0.03%	99.98%
Asphalt Patching	2,179	0.02%	100.00%
Construction Subtotal	**12,031,091**	100.00%	



COST HISTOGRAM

PROJECT: **WIDENING AND RECONSTRUCTION OF NORTH FORREST STREET**
Project STP00-4921-00(001)



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.

The key issues that evolved from the function analysis session were the concurrence of the project needs and purpose. The basic function of the project is to "Improve Safety" and "Reduce Accidents." However, "Increase Capacity" and "Accommodate Growth" are key required project goals that must be included in the project. Because of the nature of the construction, the functions of "Control Budget" and "Protect Environment" are client driven goals.

The results of the function analysis are as follows:

- The project need and purpose are justified;
- Accidents must be reduced in this segment and a separate five-lane system will improve conditions; and
- The relatively high traffic counts at the five intersections appear to justify replacement and upgrade of the signals

RANDOM FUNCTION ANALYSIS

PROJECT: **WIDENING OF NORTH FORREST STREET** SHEET NO.: **1 of 1**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Total Project Purpose and Need	***Increase***	***Capacity***	***B***
	Reduce	***Accidents***	***B***
	Accommodate	***Development***	***HO***
	Accommodate	Bikes/Peds	RS
	Reduce	Delays	RS
	Improve	Access	G
	Encourage	Development	RS
	Eliminate	Deficiencies	RS
	Reduce	Maintenance	G
	Control	Traffic	RS
	Improve	***LOS***	***B***
	Accommodate	***Growth***	***RS***
	Maintain	Schedule	RS
	Control	Budget	RS
	Protect	Environment	RS
	Improve	Life	G
	Control	Stormwater	RS
	Relocate	Utilities	RS
	Route	Stormwater	RS
	Control	Erosion	RS
	Increase	Revenue	G
	Preserve	Alignment	RS
	Maximize	Safety	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 North Forrest Street Widening Project using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped into the following categories and numbered according to the order in which they were conceived. The following letter prefixes were used to identify the categories.

	PREFIX
Alignment	A
Section	S
Drainage	D

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:

- Minimize accidents in the corridor
- Level of Service should be acceptable at the design year
- Right of way cost should be optimized to fit the roadway section
- Life cycle cost should optimized through durable design features

After discussing each idea, the team evaluated the ideas by consensus. This produced 8 ideas rated 4 or 5 to research and develop into formal VE alternatives and 4 ideas to develop as design suggestions 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

PROJECT: **WIDENING OF NORTH FORREST STREET / SR 138**
Project No. STP00-04921-00(001) - Lowndes County, Georgia

SHEET NO.: **1 of 1**

NO.	IDEA DESCRIPTION	RATING
ALIGNMENT (A)		
A-1	Add traffic signal at Forrest / SR 125.	DS
A-2	Add raised median on Forrest from STA 367 to 371+00.	DS
A-3	Replace all traffic signals and include in budget.	DS
SECTION (S)		
S-1	Change from 4:1 to 2:1 slide slopes at STA 316 to STA 325 and reduce the amount of right of way required.	4
S-2	Use four 11ft lanes in lieu of 12 ft wide lanes.	4
S-3	Use two 11ft and two 12 ft wide lanes for the typical section.	5
S-4	Use a multi-use path in lieu of two sidewalks.	3
S-5	One urban shoulder and one rural shoulder.	4
S-6	Change the flow of the drainage at STA 280 and simplify the shoulder grading.	3
S-7	Use rural shoulders on both sides where feasible.	4
S-8	Use 18ft shoulder with 2:1 front slope ditches in lieu 4:1.	4
S-9	Three lanes with rural shoulders within a 4-lane right of way section.	4
S-10	Reduce the grass strip on the shoulder from 6 ft wide to 2 ft.	5
S-11	Use Tensar fabric and modify the pavement section.	5
S-12	Use an 18 ft wide median on North Forrest.	4
DRAINAGE (D)		
D-1	Convert the box culvert structure at STA 277 from CIP to pipe. Say two 72-inch pipes.	4
D-2	Reduce the number of catch basins.	4
D-3	Allow the use of alternate pipe materials such as ABS or Hobas pipe.	4
D-4	Verify that all yard drains are necessary.	DS
D-5	Modify the yard drain piping and shorten the length.	4
D-6	Reduce the amount of drain pipe.	5
D-7	Use a paved ditch on Lakeland Ave. in lieu of the three buried pipes.	4
D-8	Add storm detention basins to slow down the time of concentration.	5
D-9	Use larger but fewer elliptical pipes in lieu of circular drain pipes.	4

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