Georgia Department of Transportation

SR 400/Interstate 85 Connector Ramps

Project No. NH000-0085-02(153)

P.I. No. 762380

Fulton County, Georgia

Value Engineering Study Report

Concept Design Submittal

January 2009

Designer:

HNTB

Value Engineering Consultant

Lewis & Zimmerman Associates, Inc.

Lewis & Zimmerman Associates, Inc.
Taking the Chance out of Change
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January 26, 2009

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

re: SR400/Interstate 85 Connector Ramps
Project No. NH000-0085-02(153) - Fulton County, Georgia
P.I. No. 762380
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to present two hard copies and one CD of the 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 project. Some of the key alternatives optimized the profiles and sections of both ramps. These alternatives provide lower profiles while maintaining a 45 mph design speed.

We appreciate the excellent participation of the GDOT staff and HNTB design team throughout the study. Please feel free to contact me 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

Enclosure

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study 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 SR 400/Interstate 85 Connector Ramps Project No. NH000-0085-02(153), P.I. No. 762380, located in Atlanta, Georgia. This project is being designed by the HNTB design team.

The VE study was conducted January 12 - 15, 2009 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 and 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 if accepted by the project users and design team, may impact the final scope, design documents, budget, schedule, functionality, and appearance of the SR 400/Interstate 85 Connector Ramps Project. The task of the VE team is to identify possible solutions, whereas the task of the GDOT and the design team is to choose the most favorable of the VE alternatives for incorporation into the project.

PROJECT DESCRIPTION

This project will reconstruct the interchange of SR 400/I-85 by providing connector ramps from SR 400 Southbound to I-85 Northbound and from I-85 Southbound to SR 400 Northbound. The total length of the project is 0.34 miles and the total project cost is approximately $39M. The project is located entirely inside the City of Atlanta, in Fulton County. The project will greatly improve the Level of Service (LOS) along this busy corridor and remove traffic from the surface streets in the Lenox Mall area.

I-85 SB to SR 400 NB Ramp

- The proposed ramp would exit the existing I-85 SB mainline with the existing off-ramp to Buford Highway SB. After exiting as a single two-lane ramp, the ramps to SR 400 NB and to Buford Highway SB would share a two-lane section for approximately 1,000 feet before splitting. Then the proposed ramp to SR 400 NB would turn north. From this point, the proposed ramp would cross over Sidney Marcus Boulevard and then join SR 400 NB mainline as the third lane south of the northbound on-ramp from Sidney Marcus Boulevard. The existing SR 400 NB lane addition, which is immediately north of I-85 and widens SR 400 NB to three lanes, would be eliminated to accommodate the proposed ramp from I-85 SB. The proposed posted speed limit for this ramp would be 45 mph. The existing ramp from I-85 SB to SR 13/Buford Highway has AADT of 17,250 in 2007. The projected AADT is 21,000 and 23,650 in 2015 and 2035, respectively.

SR 400 SB to I-85 NB Ramp

- The proposed flyover ramp would exit from the right side of SR 400 SB mainline approximately 1000 feet south of the SR 400 SB off-ramp to Sidney Marcus Boulevard. From this point, it would cross over Sidney Marcus Boulevard and the existing SR 400/I-85 Interchange structures. Continuing elevated to I-85, it would cross over the existing Buford Highway on-ramp and then turn north to join the I-85 NB mainline on the right side of the existing Buford Highway on-ramp. The existing I-85 NB lane addition, which is immediately north of the SR 400 NB off-ramp and widens I-85 to five lanes, would be eliminated to accommodate an additional lane on I-85 NB from the SR 400 SB to I-85 NB ramp. The existing Buford Highway on-ramp would shift to the left and join with a reduced four-lane I-85 NB mainline, which opens a lane for the proposed ramp. The proposed posted speed limit for this ramp would be 45 miles per hour (mph) and a typical section that would consist of a 16-ft wide travel lane with a 6-ft wide inside shoulder and a 10-ft wide outside shoulder.

RESULTS

The VE team explored over 27 ideas that could enhance the value of the project and address the concerns of GDOT. Evaluation and research of the ideas yielded 14 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. A discussion of some of the more salient alternatives and design suggestions developed by the VE team follows.

The VE team searched for ways to optimize the design from a traffic perspective and looked for schemes to reduce capital cost and right of way expenditures. The most significant finding of the study was two alternatives on the SB SR 400 to NB I-85 ramp that would utilize existing facilities at Lindbergh Drive. The most promising option would exit traffic from SR 400 to a new stop light on Lindbergh, cross east over Lindbergh Drive and turn left onto a new entry ramp to NB I-85. Using this modified combination of ramps and surface streets could save $12 – 17 M depending upon final implications to the structures and right of way. The Lindbergh Drive option is unique to the solutions previously sought for this project and will require further analysis; however, substantial savings are expected even with potential increases in right of way impacts. Reductions in section width would also assist in achieving some reduction in capital cost.

The following table, Summary of Potential Cost Savings, summarizes all of the alternatives developed. The Study Results section of the report provides backup for each alternative. Note that all of the alternatives were developed independent of each other. Therefore, some are inter-related or mutually exclusive and the total cost savings achievable is dependent on the combination of ideas selected for final implementation.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS PROJECT**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SB I-85 TO NB SR 400 RAMP						
ALIGNMENT (AS)						
AS-1	Replace the SB I-85 ramp with a partial surface solution using Sidney Marcus Blvd.; tie new elevated off-ramp into the West end of Sidney Marcus, close Pine Street, add cost for new ROW, and include new wall on north side of Sidney Marcus	$3,476,205	$6,305,055	($2,828,850)		($2,828,850)
AS-1A	Replace the SB I-85 ramp with a full at-grade solution using Sidney Marcus Blvd.; tie new off-ramp from I-85 into the East end of Sidney Marcus, and add additional ROW	$3,476,205	$3,301,813	$174,392		$174,392
AS-3/4	Reduce the design speed from 50 mph to 40 mph and shorten the curve radius from 1,130ft to 600ft	$3,476,205	$2,162,041	$1,314,164		$1,314,164
SECTION (SS)						
SS-1	Use a 30ft wide section with a 14ft wide travel lane flanked by 6ft and 10ft shoulders in lieu of a 32ft wide section	$6,733,440	$6,314,112	$419,328		$419,328
SS-2	Use a 28ft wide section with 14ft wide travel lane flanked by 4ft and 10ft shoulders in lieu of the 32ft wide section	$6,733,440	$5,893,171	$840,269		$840,269
SS-3	Use a 26ft wide section with 12ft wide travel lane flanked by 4ft and 10ft shoulders in lieu of the 32ft wide section	$6,733,440	$5,472,230	$1,261,210		$1,261,210
BRIDGE (BS)						
BS-2	Shorten the bridge span over Buford Highway from 170ft to 165ft and use 74 inch deep precast concrete bulb tee girders in lieu of steel plate girders	$1,073,946	$912,106	$161,840		$161,840

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS PROJECT**
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ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SB SR 400 TO NB I-85 RAMP						
ALIGNMENT (AN)						
AN-3	Replace the flyover ramp with a loop using Lindbergh Drive. Exit SR 400 SB to a new stop light on Lindbergh, cross east over Lindberg Dr. and turn left onto the existing HOV ramp to NB I-85	$17,841,600	$364,762	$17,476,838		$17,476,838
AN-4	Replace the flyover ramp with a loop using Lindbergh Drive. Exit SR 400 to a new stop light on Lindbergh, cross East over Lindbergh Dr. and turn left onto a new entry ramp to NB I-85.	$17,841,600	$494,680	$17,346,920		$17,346,920
SECTION (SN)						
SN-1	Use a 30ft wide section with a 14ft travel lane flanked by 6ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$14,655,939	$1,949,181		$1,949,181
SN-2	Use a 28ft wide section with a 14ft travel lane flanked by 4ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$13,879,622	$2,725,498		$2,725,498
SN-3	Use a 26ft wide section with a 12ft travel lane flanked by 4ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$12,995,584	$3,609,536		$3,609,536
BRIDGE (BN)						
BN-1	Lower the profile of the SR 400 SB to I-85 NB ramp by using steeper grades, minimum truck clearance, and a 45mph design speed.	$94,039	$0	$94,039		$94,039

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ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SB SR 400 TO NB I-85 RAMP						
BRIDGE (BN) (cont.)						
BN-5	Use radially oriented piers and eliminate the skew on the pier bents	DESIGN SUGGESTION				
BN-8	Add a new exit ramp from I-85 to Cheshire Bridge Road to improve traffic flow	$0	$1,232,013	($1,232,013)		($1,232,013)
BN-9	SB SR 400 to NB I-85 Ramp - Use long span steel girders over I-85 with 74 inch precast concrete bulb tees for all of the other approach spans. Reduce the number of columns required	DESIGN SUGGESTION				

STUDY RESULTS

GENERAL

The results of this value engineering study conducted on the SR 400/Interstate 85 Connector Ramp Project represent the benefits that can be realized by GDOT and the patrons that use this busy corridor in Atlanta, GA.

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 12%, 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 design discipline, category, function, project element listed below:

DESIGN, DISCIPLINE, CATEGORY, FUNCTION, OR PROJECT ELEMENT	PREFIX
General	G
(SB I-85 to NB SR 400 Ramp)	
Alignment	AS
Section	SS
Bridge	BS
(SB SR 400 to NB I-85 Ramp)	
Alignment	AN
Section	SN
Bridge	BN

Summaries of the alternatives and design suggestions are provided on the Summary of Value Engineering Alternatives tables. The tables are divided into design disciplines 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 right of way constraints, drainage issues near the I-85 ramp, the sizable investment required for the SB SR 400 to NB I-85 flyover, and need to fit numerous concrete columns into an already congested footprint. During the development of the design more than a dozen alternate routes were studied for the ramps. 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 secondary goal of the project is to remove as much traffic from the local roads in the Lenox area and reduce the travel time for patrons needing to make the transition from SB SR 400 to NB I-85 and SB I-85 to NB SR 400.

STUDY OBJECTIVES

The VE team reviewed all previously studied routes and confirmed that the currently selected routes provided all of the needed functions at the least total cost to GDOT. The challenge to the VE team was the optimization of these two designs.

However, the VE team also rated several key constraints that must be addressed in the design and any alternatives that the team might develop:

- The proposed alignments of the two ramps is complicated by a number of factors including a dense grid of interstate and local roads, desire to maintain a 45mph design speed on the ramps, and the elevations of the mainlines.
- An old Home Depot site may be clipped by the SB SR 400 to NB I-85 ramp and some real estate damage may occur due to the present alignment.
- Existing HOV lanes are present in the I-85 area and must be maintained in the new configuration.
- Critical weave distances exist within the corridor, especially on Lindbergh Drive.
- Peachtree Creek is located below existing I-85 and precludes options which might use more surface movements to provide for the needed ramp functions.
- Historic areas exist just south of the proposed SB SR 400 to NB I-85 flyover and require that the ramp be as far north as possible.
- Rail lines exist for MARTA facilities including a traction power substation.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 14 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 overall capital cost of the ramps, amount of project right of way, and the proximity of storm drainage facilities.

SB I-85 to NB SR 400 Ramp

Alignment (AS)

- Several alternatives were explored to optimize the ramp by utilizing a combination of existing surface facilities near Sidney Marcus Blvd. but both resulted in higher capital cost. One option would be to replace the SB I-85 ramp with a partial surface solution using Sidney Marcus Blvd., tie the new elevated off-ramp into the West end of Sidney Marcus, close Pine Street, add cost for new ROW, and include new wall on north side of Sidney Marcus. Although an interesting option, it was found that Right of Way costs actually resulted in costs higher than the currently selected route.

- Similarly, replacing the SB I-85 ramp with a full at-grade solution using Sidney Marcus Blvd., tying a new off-ramp from I-85 into the East end of Sidney Marcus, and adding additional ROW resulted in some additional project costs. The results of the analysis reveals that an elevated ramp is the least cost solution to meet the traffic needs for the SB I-85 to NB SR 400 movement.

Section (SS)

- Several section options were explored by the VE team to provide a range of solutions for the single lane ramp. The present design uses a 32-ft-wide section with 16-ft-wide travel lane

flanked by shoulders of 6 feet and 10 feet. Sections 30-ft-wide, 28-ft-wide, and 26-ft-wide were explored by the VE team and found to offer cost savings of approximately $400,000, $800,000, and $1.2M, respectively. These sections would maintain the 45mph design speed and appear to meet the stopping sight distance requirements for the ramp.

Bridge (BS)

- The most feasible material options for the bridge would include either steel or precast concrete bulb tee girders. To optimize the design it is recommended that the current steel span over Buford Highway be reduced from 170 ft to 165 ft, allowing the use of 74-inch deep precast concrete girders for this segment. It is anticipated that this change would result in a net savings to the project in the range of $160,000.

SB SR 400 to NB I-85 Ramp

Alignment (AN)

- The current ramp as designed appears to provide all required functions at the least cost for a free-flowing ramp connector between the SR 400 and I-85. However, other combinations of surface and interstate facilities was explored by the VE team. The most promising option would replace the flyover ramp with a loop using Lindbergh Drive. Traffic would exit SR 400 to a new stop light on Lindbergh, cross East over Lindbergh Drive and turn left onto a new entry ramp to NB I-85. The cost savings using this option could be in the range of $12 to 17M depending upon final right of way impacts and the potential need to place the new NB ramp on structure. However, the savings is so attractive even with constraints for new right of way and structure cost that further investigation of this option is highly recommended.

Section (SN)

- Several section options were explored by the VE team to provide a range of solutions for the single-lane ramp. The present design uses a 32-ft-wide section with 16-ft-wide travel lane flanked by shoulders of 6 feet and 10 feet. Sections 30-ft-wide, 28-ft-wide, and 26-ft-wide were explored by the VE team and found to offer cost savings of approximately $1.9M, $2.7M, and $3.6M, respectively. These sections would maintain the 45mph design speed and appear to meet the stopping sight distance requirements for the ramp.

Bridge (BN)

- The profile of the ramp was reviewed by the VE team and several optimizations in grades and truck clearances were explored. These resulted in changing the grade on from 3.2% to 4% and the lowering of the structure down to the minimum truck height. The main benefit of these changes would be the shortening of the ramp columns and a potential savings in the range of $100,000. These changes were based on the assumption that 74-inch deep precast concrete bulb tee girders would be used for the spans.

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: **SR 400/INTERSTATE 85 CONNECTOR RAMPS PROJECT**
Project No. NH000-0085-02(153) - Fulton County, Georgia

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AS-1A	Replace the SB I-85 ramp with a full at-grade solution using Sidney Marcus Blvd.; tie new off-ramp from I-85 into the East end of Sidney Marcus, and add additional ROW	$3,476,205	$3,301,813	$174,392		$174,392
AS-3/4	Reduce the design speed from 50 mph to 40 mph and shorten the curve radius from 1,130ft to 600ft	$3,476,205	$2,162,041	$1,314,164		$1,314,164
SECTION (SS)						
SS-1	Use a 30ft wide section with a 14ft wide travel lane flanked by 6ft and 10ft shoulders in lieu of a 32ft wide section	$6,733,440	$6,314,112	$419,328		$419,328
SS-2	Use a 28ft wide section with 14ft wide travel lane flanked by 4ft and 10ft shoulders in lieu of the 32ft wide section	$6,733,440	$5,893,171	$840,269		$840,269
SS-3	Use a 26ft wide section with 12ft wide travel lane flanked by 4ft and 10ft shoulders in lieu of the 32ft wide section	$6,733,440	$5,472,230	$1,261,210		$1,261,210
BRIDGE (BS)						
BS-2	Shorten the bridge span over Buford Highway from 170ft to 165ft and use 74 inch deep precast concrete bulb tee girders in lieu of steel plate girders	$1,073,946	$912,106	$161,840		$161,840

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **AS-1**

DESCRIPTION: **REPLACE THE SB I-85 RAMP WITH A PARTIAL SURFACE SOLUTION USING SIDNEY MARCUS BLVD; CLOSE PINE STREET**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN:

Use a combination of elevated and at-grade sections connecting SB I-85 to NB SR 400. Bridge structures would be needed to span over Buford Highway on the East end and Sidney Marcus Boulevard on the West. The section would be 35-ft-wide.

ALTERNATIVE:

Consider a partial surface solution in order to reduce the amount of structure. Exit SB I-85 on grade, then span over Buford Highway. Transition to at-grade on the south side of Buford Highway and merge onto the south side of Sidney Marcus Blvd. Use the existing NB ramp to SR 400. A 31-ft-wide section would be used on the structure over Buford Highway, transitioning to a 28-ft-wide at-grade section on Sidney Marcus. The ramp would touchdown near Pine Tree Road, requiring that the side road be closed.

ADVANTAGES:

- Eliminates structure over Sidney Marcus Blvd.

DISADVANTAGES:

- Requires ramp traffic to use the western end of Sidney Marcus Blvd prior to entering on NB SR 400
- Requires additional right-of-way
- Higher cost

DISCUSSION:

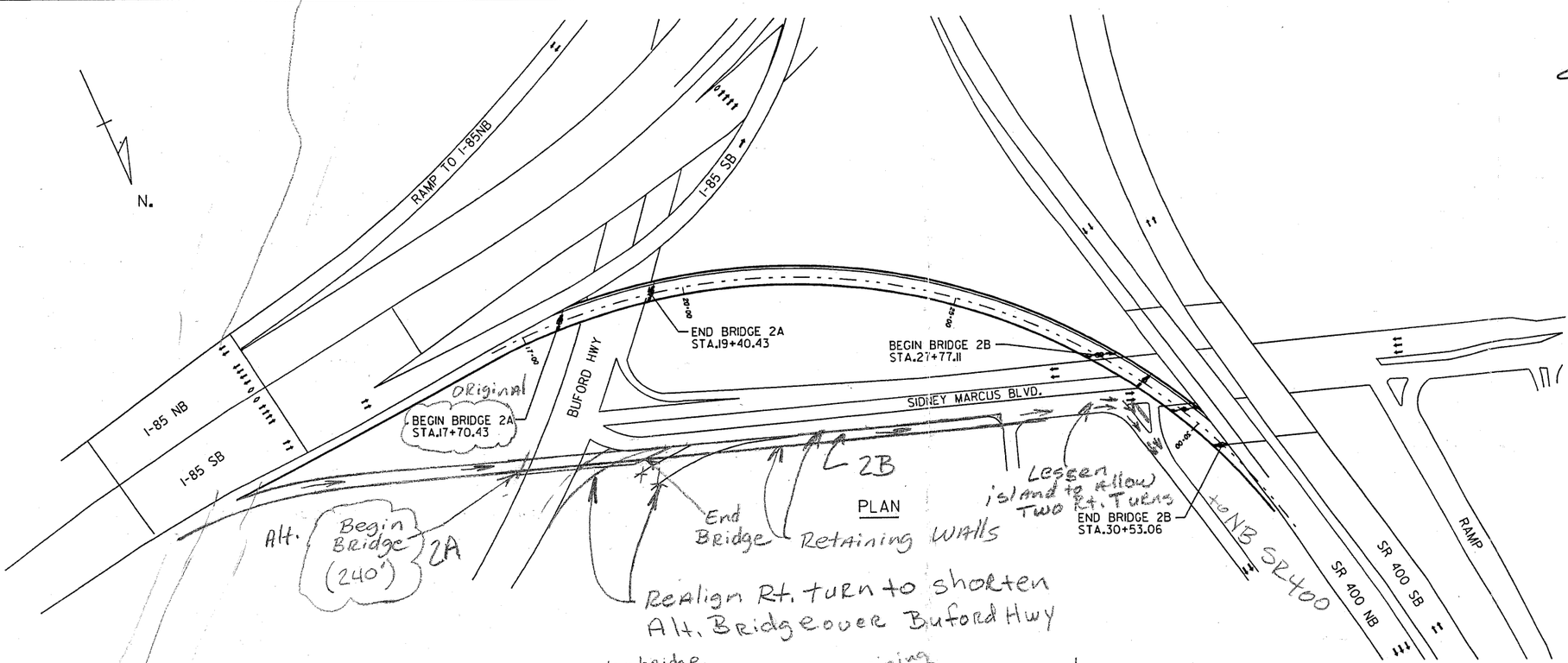
The alternative reduces construction cost by eliminating one of the structures over Sidney Marcus Blvd. Some realignment would also be needed for the movement from NB Buford Highway to WB Sidney Marcus Blvd. This realignment would allow a shorter bridge structure over Buford Highway. However, the additional right-of-way required will increase the overall cost significantly.

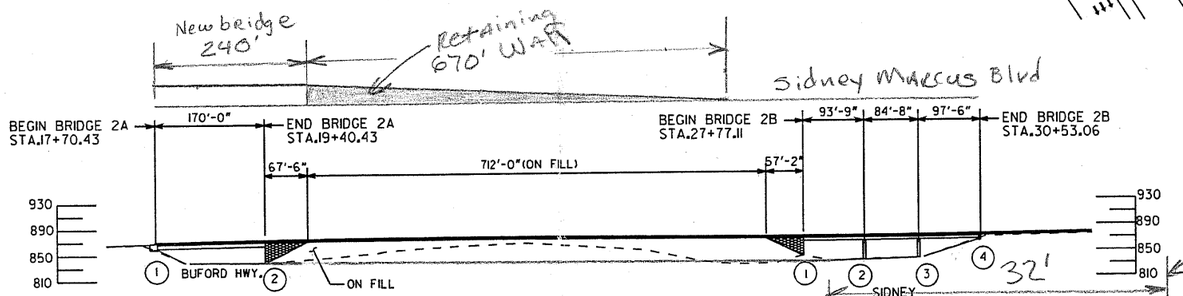
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 3,476,205	—	$ 3,476,205
ALTERNATIVE	$ 6,305,055	—	$ 6,305,055
SAVINGS (Original minus Alternative)	$ (2,828,850)	—	$ (2,828,850)

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.			

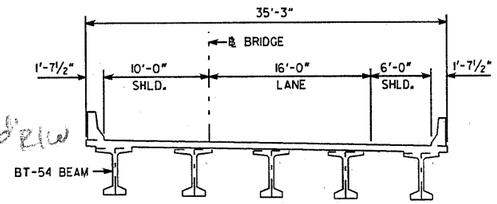
Sketch Alt. AS-1

2/5



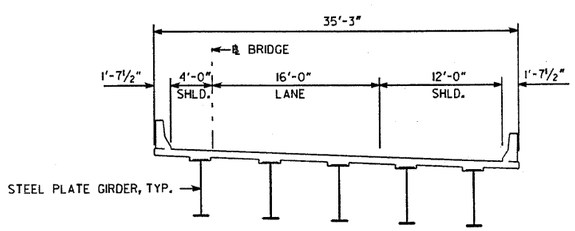


ELEVATION



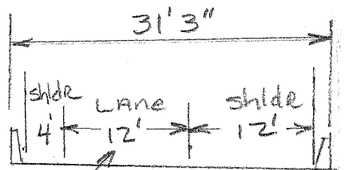
SECTION - 2B

Original Design



SECTION - 2A

Original Design



12' Lane is sufficient for tangent Alignment & slower speed.

Alt. Design "2A"

Alt. Design "2B" Section at R.E. Walls.

BRIDGE 2A CONSISTS OF

1 - STEEL PLATE GIRDER SPAN ---------- SPECIAL DESIGN
2 - END BENTS ---------- SPECIAL DESIGN

BRIDGE 2B CONSISTS OF

3 - BT-54 PSC BEAM SPANS ---------- SPECIAL DESIGN
2 - CONCRETE INTERMEDIATE BENTS ---------- SPECIAL DESIGN
2 - END BENTS ---------- SPECIAL DESIGN

BRIDGE NO. 2

HNTB
3715 NORTHSIDE PARKWAY
400 NORTHCREEK, SUITE 600
ATLANTA, GEORGIA 30327

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

BRIDGE CONCEPT
I-85 SOUTHBOUND TO SR 400 NORTHBOUND
SR 400/I-85 CONNECTOR RAMPS
FULTON COUNTY NH-85-2(153)

SCALE: DECEMBER 2008

DESIGNED AP	CHECKED LDP	REVIEWED
DRAWN JTC	DESIGN GROUP	APPROVED PVL

REVISIONS: DATE / BY

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: Alt-1

SHEET NO.: 3 of 5

Cost Comparison between "Original" Design I-85 SB to SR 400 NB Ramp. & Alt. Design (I-85 SB Exit Ramp to Sidney Marcus). Assume Cost from I-85 SB to Buford Hwy are the same for both designs. Begin cost comparison at Buford Hwy.

Alt. Design:

- Bridge over Buford Hwy (240' x 31.25') = 7,500 s.f. ←
- R.E. Walls: 2 walls x $\left(\frac{20'}{2} \times 670'\right)$ = 17,420 s.f. ←
- End R.E. Wall under Bridge (20' x 35') = 700 s.f. ←
- Roadway Pavement from Bridge over Buford Hwy to touch-down on Sidney Marcus Blvd.

$\frac{670' \times 28'}{9 sf/sy}$ = 2,085 sy ← Conc. Pavement + Base

- Side barrier 670' x 2 sides = 1,340 L.F. ←

R/W Required from Condo Landscaped Area:

Would Req'd 22'. of R/W & 5' of temp easement.

- 22' x 550' = 12,100 sf. of add'l R/W ←
- 5' x 550' = 2,750 sf. of Temp. Easem't ←

- Original Costs
- Bridge over Buford Hwy: 35.25' x 170' = 5,993 s.f. ←
- Bridge over Sidney Marcus: 35.25' x 279' = 9,835 s.f. ←
- R.E. Wall @ Buford Hwy: 2 walls x $\left(\frac{67.5'}{2} \times 25'\right) + (20' \times 39')$ = 2,470 s.f. ←

R.E. Wall @ Sidney Marcus: 2 walls x $\left(\frac{57.2}{2} \times 25'\right) + (20' \times 39)$ = 2,210 s.f. ←

Ramp Pavement Between bridges: $\frac{837' \times 32'}{9 sf/sy}$ = 2,976 sy Conc. Pavem't ←

Side Barrier between bridges = 837' x 2 sides = 1,674 L.F. ←

Earth Embankment: $\left(\frac{40' + 120'}{2}\right) \times 20'_{Avg.} \times 800' / 27 cf/cy \approx 59,000$ c.y. ←

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: AS-1

SHEET NO.: 4 of 5

Typical Pavement sections

12" P.C.C. Conc.	=	$ 80/SY
3" 19mm	=	$ 16.50/SY
12" GAB	=	$ 25.00/SY
(Full Depth) Total:		$ 121.50/SY

$$\frac{330\ lbs}{SY} \times \frac{TN}{2000\ lbs} \times \frac{\$100}{TN} = \frac{\$16.50}{S.Y.}$$

↑ Spread Rate for 3" of 19mm Mix Asph. Conc.

Add'l Alternate Costs:

Clearing & Grubbing $\frac{(12{,}100sf + 2{,}750sf)}{43{,}560sf/AC} = 0.34/AC$

Excavation for Bridge & RE Wall: 5,000 C.Y.

Realign Traffic Signal at Buford & Sidney Marcus: ≈ $ 50,000

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: AS-1

SHEET NO.: 5 of 5

PROJECT ITEM		ORIGINAL ESTIMATE			Alt. PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original							
Br. over Buford	s.f.	5,993	120	719,160			
Br. over Sidney Marcus	s.f.	9,835	120	1,180,200			
RE Walls 2470+2210	s.f.	4680	50	234,000			
Full depth Pavem't	s.y.	2,976	121.50	361,584			
Side Barrier	LF	1,674	65	108,810			
EARth Embankment	C.Y.	50,000	10	$500,000			
Alternate:							
clearing & Grubbing	ac				0,341	8,000	2728
Unclass Excav	CY				5,000	10	50,000
Realign Traffic Sig	LS				50,000	50,000	50,000
Br. over Buford	s.f.				7,500	120	900,000
RE Walls 17,420+700	s.f.				18,120	50	906,000
Full depth Pavem't	s.y.				2,085	121.50	253,328
Side Barrier	L.F.				1,340	65	87,100
Add'l R/W Costs							
R/W	s.f.				12,100	$100	1,210,000
Temp. Constr. Esmt	s.f.				2,750	$ 20	55,000
R/W subtotal							1,256,000
R/W Mkup 2.0							2,530,00
Constr. **Subtotal**				3,103,754			2249156
Markup (%) at Constr. **12%**				372,451			269,899
TOTAL				3,476,205			6,305055

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **AS-1A**

DESCRIPTION: **REPLACE THE SB I-85 RAMP WITH AN AT-GRADE (SIDNEY MARUCS BLVD) SOLUTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Use a combination of elevated and at-grade sections connecting SB I-85 to NB SR 400. Bridge structures would be needed to span over Buford Highway on the East end and Sidney Marcus Boulevard on the West. The section would be 35-ft-wide.

ALTERNATIVE:

Replace the SB I-85 ramp with a full at-grade solution using Sidney Marcus Boulevard; tie new off-ramp from I-85 into the East end of Sydney Marcus and add additional right-of-way.

ADVANTAGES:

- Reduces construction cost

DISADVANTAGES:

- Provides an at-grade intersection versus a free flow ramp

DISCUSSION:

This alternate would have to study the grade from I-85 SB to the intersection of Sidney Marcus Boulevard and Buford highway. The VE team did not have enough information for elevations at this intersection. It might be required to exit I-85 SB "sooner" to provide more distance so Sidney Marcus in order to flatten/lower the profile grade.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 3,476,205	—	$ 3,476,205
ALTERNATIVE	$ 3,301,813	—	$ 3,301,813
SAVINGS (Original minus Alternative)	$ 174,392	—	$ 174,392

CALCULATIONS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.:

SHEET NO.: 2 of 3

Calculations Would be Alt 1-A
Alt. Cost (on exist. Interstate R/W)

Earth work
- Small Ret. Wall along Sidewalks (400'x8') x $50 = $160,000
- 100'w x 30'H x 400' x $10 = $444,450
  27 CY

R/W = (400' x 20') x $10/sf = $80,000

- Adjust Signal: $50,000
- extra pavement: 500' - 300' = 200'

$\frac{200' \times (12' \times 12' + 4')}{9} = 6235.4.$ → 1,146 SY

- extra $\frac{800' \times \frac{1}{2}'}{9} = 533$

6235.4 x $121.50 = $75,695

- Clearing & Grubb: $\frac{500' \times 100'}{43,560 SF/Ac} \times \$10,000/Ac = \$11,500$

"Original": Begin Alt Cost Buford Hwy.
Same cost for both Designs to widen I-85 SB exit Bridge
: $3,103,754 - See Alt 1 for Same Original Costs

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: AS-1A

SHEET NO.: 3 of 3

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
see AS-1 for Original Cost							
Alt.							
Retaining wall	SF				3200	$50	160000
Earthwork	CY				44,450	10	444,450
Modify Signal	LS				LS	50,000	50,000
Earth Pavement	SY				1146	121,50	139,240
Clear & Grubbing	AC				1.15	10,000	11,500
RW	SF				8000	100	800,000
RW Subtotal							800,000
HW Mark up 2							1,600,000
Constr Subtotal				3,105,754			805,190
Markup (%) at Constr. 12%				372,451			96,623
TOTAL				3,478,205			3,351,813

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **AS-3, AS-4**

DESCRIPTION: **FOR THE I-85 SB TO SR 400 NB RAMP REDUCE THE DESIGN SPEED FROM 50 MPH TO 40 MPH AND SHORTEN THE CURVE RADIUS FROM 1,130FT TO 600FT**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN:

The design for the I-85 SB to SR 400 NB ramp uses a design speed of 50mph and a radius of 1,130 ft.

ALTERNATIVE:

Reduce the design speed from 50mph to 40mph, use a compound radii, and change the radius to 600 ft and 500 ft. This would shorten the ramp by tying into SR 400 NB prior to Sidney Marcus Blvd. on an existing 3-lane SR 400.

ADVANTAGES:

- Eliminates the bridge over Sidney Marcus Blvd.
- Shortens ramp
- Reduces construction cost

DISADVANTAGES:

- Reduces design speed

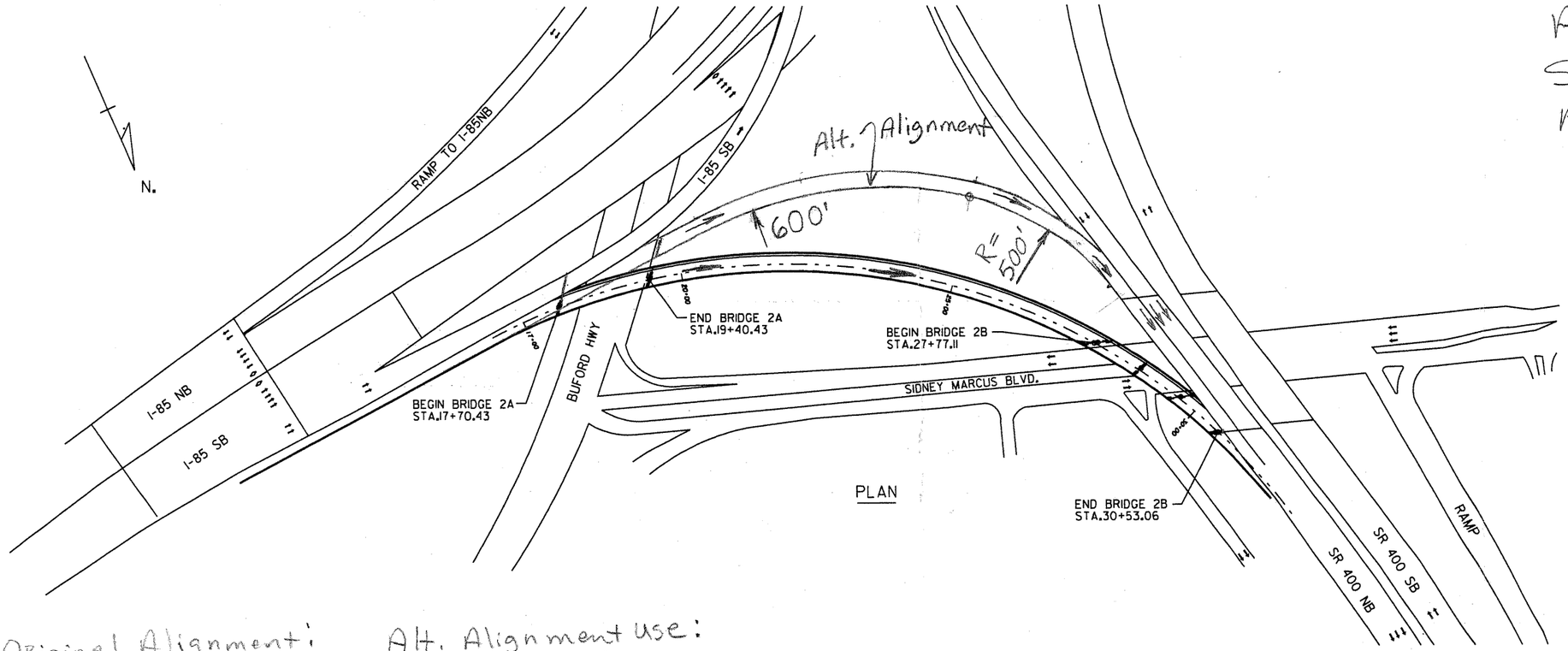
DISCUSSION:

The intent of the alternate is to shorten the ramp enough to utilize the existing 3-lane section of SR 400 NB and eliminate the bridge over Sidney Marcus Blvd. SR 400 begins widening from two lanes to three just south of the tangent point with the new revised ramp. This proximity to the existing third lane is ideal for connecting to the new ramp.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 3,476,205	—	$ 3,476,205
ALTERNATIVE	$ 2,162,041	—	$ 2,162,041
SAVINGS (Original minus Alternative)	$ 1,314,164	—	$ 1,314,164

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.			

Alternate Sketch 2/5
Alt. AS-3, AS-4



PLAN

BRIDGE 2A CONSISTS OF

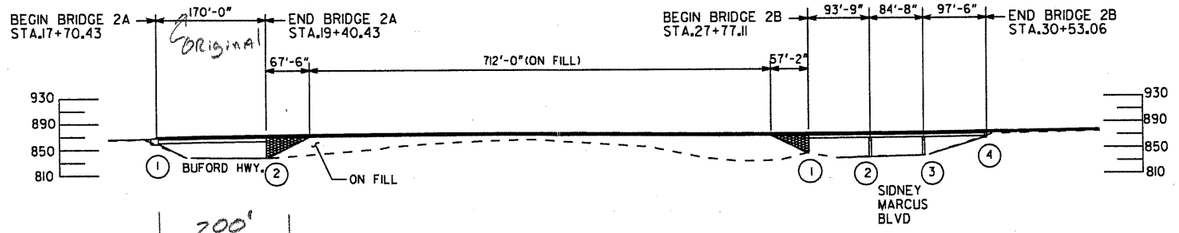
1 - STEEL PLATE GIRDER SPAN ---------- SPECIAL DESIGN
2 - END BENTS ---------- SPECIAL DESIGN

BRIDGE 2B CONSISTS OF

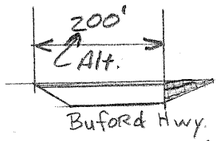
3 - BT-54 PSC BEAM SPANS ---------- SPECIAL DESIGN
2 - CONCRETE INTERMEDIATE BENTS ---------- SPECIAL DESIGN
2 - END BENTS ---------- SPECIAL DESIGN

Original Alignment:
R = 1,130'

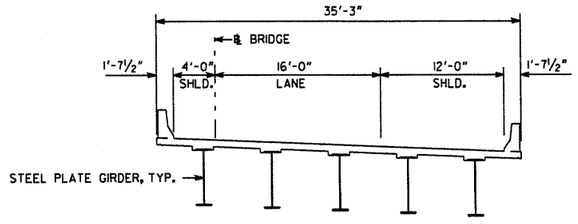
Alt. Alignment use:
Compound Radii
R_1 = 600' & R_2 = 500'



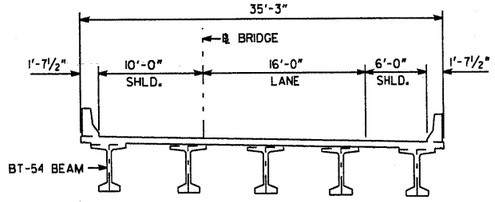
ELEVATION



Alt. Bridge is Longer due to more skew.



SECTION - 2A



SECTION - 2B

BRIDGE NO. 2

HNTB
3715 NORTHSIDE PARKWAY
400 NORTHCREEK, SUITE 600
ATLANTA, GEORGIA 30327

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

BRIDGE CONCEPT
I-85 SOUTHBOUND TO SR 400 NORTHBOUND
SR 400/I-85 CONNECTOR RAMPS
FULTON COUNTY NH-85-2(153)

SCALE: DECEMBER 2008

DESIGNED AP | CHECKED LDP | REVIEWED
DRAWN JTC | DESIGN GROUP | APPROVED PVL

DATE | REVISIONS | BY

Original Sketch Alt. AS-3 & AS-4

3/5

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: AS-3, AS-4

SHEET NO.: 4 of 5

Cost Comparison "Original Cost"
I-85 SB to SR400 NB Ramp & Alt. Design.
Assume the Original and Alt. costs are the same up to the Ramp bridge over Buford Hwy.

Alt. Design:
Bridge over Buford Hwy. (200' x 35.25') = 7,050 sf ←
R.E. Wall @ Buford Hwy for Br. Abutment = (from Alt. AS-1) =
= 2,470 s.f. ←

Roadway Pavement Area: $\frac{32' \times 820'}{9 sf/sy}$ = 2,916 s.y. ←
side barrier: 2 sides x 820' = 1,640 L.F. ←
Earthwork embankment: ≈ 50,000 c.y. ←

Original Design:
Bridge over Buford: 5,993 s.f. (from AS-1) ←
Bridge over Sidney Marcus Blvd: 9,835 s.f. (from AS-1) ←
R.E. Walls: 2,470 s.f. + 2,210 s.f. = 4,680 s.f. ←
(2,470 s.f. from (AS-1))
Ramp Pavem't Area: 2,976 s.y. from (AS-1) ←
side Barrier: 1,674 from (AS-1) ←
Earth work Embankment: 50,000 c.y. ←

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: A3-3 A3-4

SHEET NO.: 5 of 5

PROJECT ITEM		ORIGINAL ESTIMATE			Alt. ~~PROPOSED~~ ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original:							
BR over Buford	sf	5993	120	719,160			
BR over Sidney Marcus	sf	9835	120	1,180,200			
R.E. Walls	sf	4680	50	234,000			
Full depth Pavemt	sy	2976	121.50	361,584			
side Barrier	L.F.	1674	65	108810			
EARTH Embankmt	cy	50,000	10	500,000			
Alternate							
BR over Buford	sf				750	120	846,000
RE Walls	sf				2470	50	123,500
Full depth Pavement	sy				2916	121.50	354,294
Side Barrier	L.F.				1640	65	106,600
EARTH Embankmt	cy				50,000	10	500,000
Subtotal				3,103,754			1,930,394
Markup (%) at 12%				372,451			231,647
TOTAL				3,476,205			2,162,041

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SS-1**

DESCRIPTION: **USE A 30-FT-WIDE SECTION WITH A 14-FT INSIDE LANE FLANKED BY 6-FT AND 10-FT SHOULDERS IN LIEU OF A 32-FT SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The SB I-85 to NB SR 400 connector ramp consists of a 32-ft-wide section consisting of a 16-ft-wide travel lane flanked by 6-ft and 10-ft wide shoulders.

ALTERNATIVE:

Construct a 30-ft wide section consisting of a 14-ft wide travel lane flanked by 6-ft and 10-ft wide shoulders.

ADVANTAGES:

- Reduces total pavement width by 2 ft and saves cost

DISADVANTAGES:

- Reduces section width

DISCUSSION:

Per AASHTO Exhibit 3.50, the minimum width needed for an 18 wheel trailer (WB-65) on a single-lane road and one-way conditions is 26-ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 30-ft-wide section more than meets this requirement. It may be of some advantage if the allowable speed is reduced from 45 mph to 35 mph.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,733,440	—	$ 6,733,440
ALTERNATIVE	$ 6,314,112	—	$ 6,314,112
SAVINGS (Original minus Alternative)	$ 419,328	—	$ 419,328

SKETCH

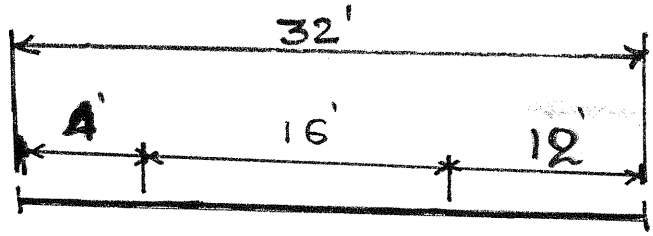
PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-1

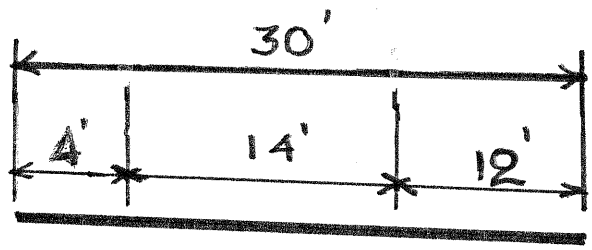
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4

Original Design



Alternate Design



CALCULATIONS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-1

SHEET NO.: 3 of 4

As given, the length of first bridge is: 19+40 - 17+70 = 176'
the length of 2nd bridge is: 30+53 - 27+77 = 276'
Total bridge length on this ramp = 446'
+ bridge length from beginning (0+25) to about station 9+70 + 945'
1,391 ft

Paving Section:

At the beginning of the ramp, the pavement length is from station approximately 9+70 to the beginning of the first bridge at 17+70 for a length of 800 feet. The pavement then begins at the end of the first bridge at 19+40 and ends at the beginning of the 2nd bridge at 27+77 for a length of 837 feet. The final leg of the pavement begins at the end of 2nd bridge at 30+53 to where it meets NB GA 400 at station approximately 32+16 for a length of 163 feet.

Thus, the total pavement length = 800 + 837 + 163 = 1,800'

Total pavement area as designed = $\frac{1,800 \times 32}{9}$ = 6,400 SY

Total pavement area per this alternative = $\frac{1800 \times 30}{9}$ = 6,000 SY

Total bridge area per this alternative = 1,391 x 30 = 41,730 sf

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SS-1

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	44,500	120	5,340,000	41,730	120	5,007,600
12" G.A.B.	SY	6,400	25	160,000	6,000	25	150,000
12" P.C.C. Pavement	SY	6400	80	512,000	6,000	80	480,000
Subtotal				6012,000			5637,600
Markup (%) at	12%			721,440			676,512
TOTAL				6,733,440			6,314,112

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SS-2**

DESCRIPTION: **USE A 28-FT-WIDE SECTION WITH 14-FT-WIDE TRAVEL LANE FLANKED BY 4-FT AND 10-FT WIDE SHOULDERS IN LIEU OF THE 32-FT-WIDE SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The SB I-85 to NB SR 400 connector ramp consists of a 32-ft-wide section with a 16-ft wide travel lane and shoulders of 6 ft and 10 ft.

ALTERNATIVE:

Use a 28-ft-wide section consisting of a 14-ft-wide travel lane and shoulders of 4 ft and 10 ft.

ADVANTAGES:

- Reduces pavement width and saves cost

DISADVANTAGES:

- Slightly narrower ramp

DISCUSSION:

Per AASHTO Exhibit 3-50, the minimum width needed for an 18 wheel trailer (WB-65) on a single-lane road and one-way conditions is 26 ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 28-ft-wide section more than meets this requirement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,733,440	—	$ 6,733,440
ALTERNATIVE	$ 5,893,171	—	$ 5,893,171
SAVINGS (Original minus Alternative)	$ 840,269	—	$ 840,269

SKETCH

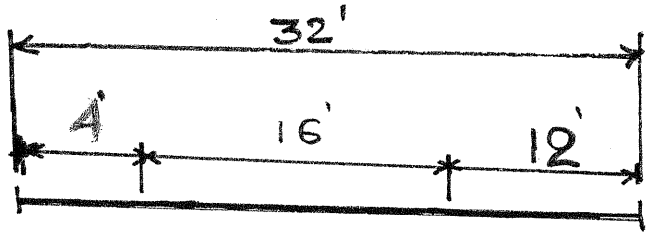
PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-2

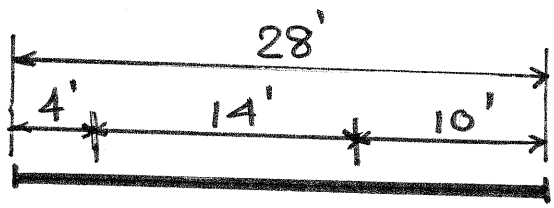
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: 2 of 4

Original Design



Alternate Design



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-2

SHEET NO.: 3 of 4

As given, the length of first bridge is 19+40 - 17+70 = 170'
the length of 2nd bridge is: 30+53 - 27+77 = 276'
Total bridge length on this ramp = 446'
+ bridge length from beginning (0+25) to about station 9+70 + 945'
1,391 ft

Paving Section:

At the beginning of the ramp, the pavement length is from station approximately 9+70 to the beginning of the first bridge at 17+70 for a length of 800 feet. The pavement then begins at the end of the first bridge at 19+40 and ends at the beginning of the 2nd bridge at 27+77 for a length of 837 feet. The final leg of the pavement begins at the end of 2nd bridge at 30+53 to where it meets NB GA 400 at station approximately 32+16 for a length of 163 ft.

Thus, the total pavement length = 800 + 837 + 163 = 1,800'

Total pavement area as designed = $\frac{1,800 \times 32}{9}$ = 6,400 SY

Total pavement area per this alternative = $\frac{1800 \times 28}{9}$ = 5,600 SY

Total bridge area per this alternative = 1,391 x 28 = 38,948 sf

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SS-

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
Bridge	SF	44,500	120	5,340,000	38,948	120	4,673,760
12" G.A.B.	SY	6,400	25	160,000	5,600	25	140,000
12" P.C.C. Pavement	SY	6,400	80	512,000	5,600	80	448,000
Subtotal				6012,000			5,261,760
Markup (%) at	12%			721,440			631,411
TOTAL				6,733,440			5893,171

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SS-3**

DESCRIPTION: **USE A 26-FT-WIDE SECTION WITH 12-FT-WIDE TRAVEL LANE FLANKED BY 4 FT AND 10 FT WIDE SHOULDERS IN LIEU OF THE 32-FT-WIDE SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The SB I-85 to NB SR 400 connector ramp consists of a 32-ft-wide section with a 16-ft-wide travel lane and shoulders of 6 ft and 10 ft.

ALTERNATIVE:

Use a 26-ft-wide section consisting of a 12-ft-wide travel lane and shoulders of 4 ft and 10 ft.

ADVANTAGES:

- Reduces pavement width and saves cost

DISADVANTAGES:

- Slightly narrower ramp

DISCUSSION:

Per AASHTO Exhibit 3-50, the minimum width needed for an 18 wheel trailer (WB-65) on a single-lane road and one-way conditions is 26 ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 26-ft-wide section meets this requirement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,733,440	—	$ 6,733,440
ALTERNATIVE	$ 5,472,230	—	$ 5,472,230
SAVINGS (Original minus Alternative)	$ 1,261,210	—	$ 1,261,210

SKETCH

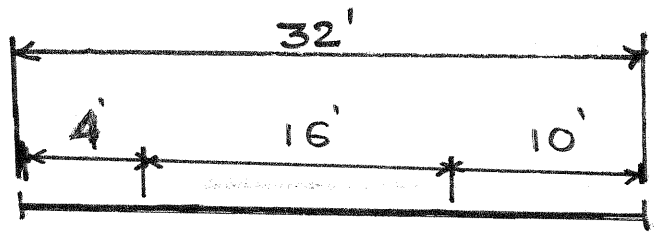
PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-3

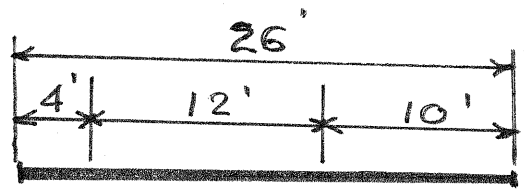
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4

Original Design



Alternate Design



CALCULATIONS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SS-3

SHEET NO.: 3 of 4

As given, the length of first bridge is 19+40 - 17+70 = 170'
the length of 2nd bridge is: 30+53 - 27+77 = 276'
Total bridge length on this ramp = 446'
+ bridge length from beginning (0+25) to about station 9+70 + 945'
1,391 ft

Paving Section:

At the beginning of the ramp, the pavement length is from station approximately 9+70 to the beginning of the first bridge at 17+70 for a length of 800 feet. The pavement then begins at the end of the first bridge at 19+40 and ends at the beginning of the 2nd bridge at 27+77 for a length of 837 feet. The final leg of the pavement begins at the end of 2nd bridge at 30+53 to either it meets NB GA 400 at station approximately 32+16 for a length of 163 feet.

Thus, the total pavement length = 800 + 837 + 163 = 1,800'

Total pavement area as designed = $\frac{1,800 \times 32}{9}$ = 6,400 SY

Total pavement area per this alternative = $\frac{1800 \times 26}{9}$ = 5,200 SY

Total bridge area per this alternative = 1,391 x 26' = 36,166 sf

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SS-3

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	44,500	120	5,340,000	36,166	120	4339920
12" G.A.B.	SY	6,400	25	160,000	5,200	25	130,000
12" P.C.C. Pavement	SY	6,400	80	512,000	5,200	80	416,000
Subtotal				6012,000			4885,920
Markup (%) at	12%			721,440			586,310
TOTAL				6,733,440			5,472,230

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BS-2**

DESCRIPTION: **SHORTEN THE BRIDGE SPAN OVER BUFORD HIGHWAY FROM 170 FT TO 165 FT AND USE 74-INCH-DEEP PRECAST BULB TEE GIRDERS IN LIEU OF STEEL PLATE GIRDERS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The I-85 SB connector ramp over Buford Highway uses 170-ft-long single-span steel girders.

ALTERNATIVE:

Optimize the design by using a span length of 165 ft and 74-inch-deep precast bulb tee girders in lieu of the steel girders.

ADVANTAGES:

- Uses lower cost precast bulb tee beams
- Higher strength concrete (10,000psi)
- No painting required

DISADVANTAGES:

- Need to shorten the span by 5 ft
- May require more earthwork

DISCUSSION:

Readjusting the span lengths to 165 ft allows the use of the more economical precast bulb tee girders. This could be done by an alignment change to flatten the skew over Buford Highway or by using a compound curve. Another solution to reduce the length would be to move the end bent closer to Buford Highway. The use of high strength (10,000psi) concrete will be necessary to meet the required load carrying capacity.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,073,946	—	$ 1,073,946
ALTERNATIVE	$ 912,106	—	$ 912,106
SAVINGS (Original minus Alternative)	$ 161,840	—	$ 161,840

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: BS-2

Shorten Bridge Over Buford Hwy (I-85 SB)

SHEET NO.: 2 of 4

Current = 170' x 35'-3" x 160 $/SF (Steel) = $958 800

Proposed = Say 165' x 35'-3" x 140 $/SF (74 BT) = $814 275

$144 525

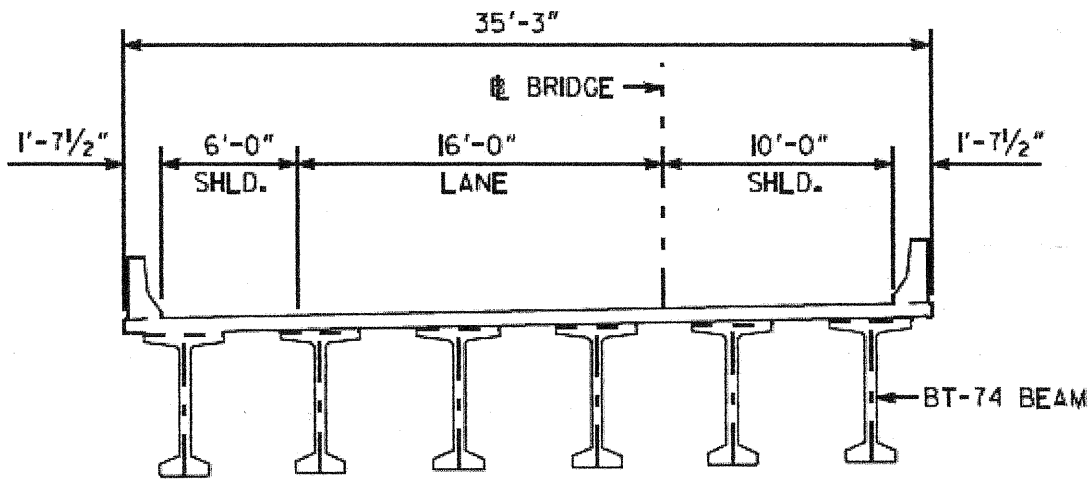
SKETCH

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BS-2**

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN X BOTH ☐

SHEET NO.: 3 of 4



SECTION

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS** ALTERNATIVE NO.: B5 - 2
Project No. NH000-0085-02(153) - Fulton County, Georgia
Shorten Bridge over Buford Hwy (I-85 SB) 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
I-85 SB over Buford Hwy	SF	5993	160	958 880	5817	140	814 380
Subtotal				958,880			814,380
Markup (%) at 12%				115,066			97,726
TOTAL				1,073,946			912,106

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS PROJECT**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SB SR 400 TO NB I-85 RAMP						
ALIGNMENT (AN)						
AN-3	Replace the flyover ramp with a loop using Lindbergh Drive. Exit SR 400 SB to a new stop light on Lindbergh, cross east over Lindberg Dr. and turn left onto the existing HOV ramp to NB I-85	$17,841,600	$364,762	$17,476,838		$17,476,838
AN-4	Replace the flyover ramp with a loop using Lindbergh Drive. Exit SR 400 to a new stop light on Lindbergh, cross East over Lindbergh Dr. and turn left onto a new entry ramp to NB I-85.	$17,841,600	$494,680	$17,346,920		$17,346,920
SECTION (SN)						
SN-1	Use a 30ft wide section with a 14ft travel lane flanked by 6ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$14,655,939	$1,949,181		$1,949,181
SN-2	Use a 28ft wide section with a 14ft travel lane flanked by 4ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$13,879,622	$2,725,498		$2,725,498
SN-3	Use a 26ft wide section with a 12ft travel lane flanked by 4ft and 10ft shoulders in lieu of a 32ft section	$16,605,120	$12,995,584	$3,609,536		$3,609,536
BRIDGE (BN)						
BN-1	Lower the profile of the SR 400 SB to I-85 NB ramp by using steeper grades, minimum truck clearance, and a 45mph design speed.	$94,039	$0	$94,039		$94,039

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **AN-3**

DESCRIPTION: **REPLACE THE FLYOVER RAMP WITH A LOOP USING LINDBERGH DRIVE. EXIT SR 400 SB TO A NEW STOP LIGHT ON LINDBERGH, CROSS EAST OVER LINDBERG DR. AND TURN LEFT ONTO THE EXISTING HOV RAMP TO NB I-85.**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Currently traffic uses surface streets between SB SR 400 and NB I-85. Vehicles exit at Sidney Marcus Blvd and turn left. At Buford Highway they turn left again. Then at Lenox Road, the traffic turns right and then finally the traffic turns left to get onto I-85. The traffic goes through five unsynchronized signals at intersections that are operating at a Level of Service "F." The original scheme provides full movement between the two facilities using a 50 mph design speed on the flyover.

ALTERNATIVE:

Build a 1,500-foot-long exit ramp from SB SR 400 to Lindberg Drive. Install two traffic signals on Lindbergh Drive, with two left turn movements, and allow traffic to enter NB I-85 on the existing I-85 NB HOV ramp. Add signage to the HOV ramp notifying "Driver only Vehicles" to exist the HOV lane within the next 1,000 ft.

ADVANTAGES:

- Greatly reduces the scope of work
- Saves time on contract

DISADVANTAGES:

- Users still have to go through two signals
- Traffic will increase on Lindbergh Drive
- Increased risk of accidents on Lindbergh Drive

DISCUSSION:

Assuming a 20 ft storage length per vehicle, the existing lane will have room for approximately 75 vehicles. All construction under this alternative will be within existing GDOT right-of-way. This is an unusual approach to solving the connector problem, but the potential savings in construction cost and the ability to relieve traffic congestion in the Lenox area make this a very favorable concept.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 17,841,600	—	$ 17,841,600
ALTERNATIVE	$ 364,762	—	$ 364,762
SAVINGS (Original minus Alternative)	$ 17,476,838	—	$ 17,476,838

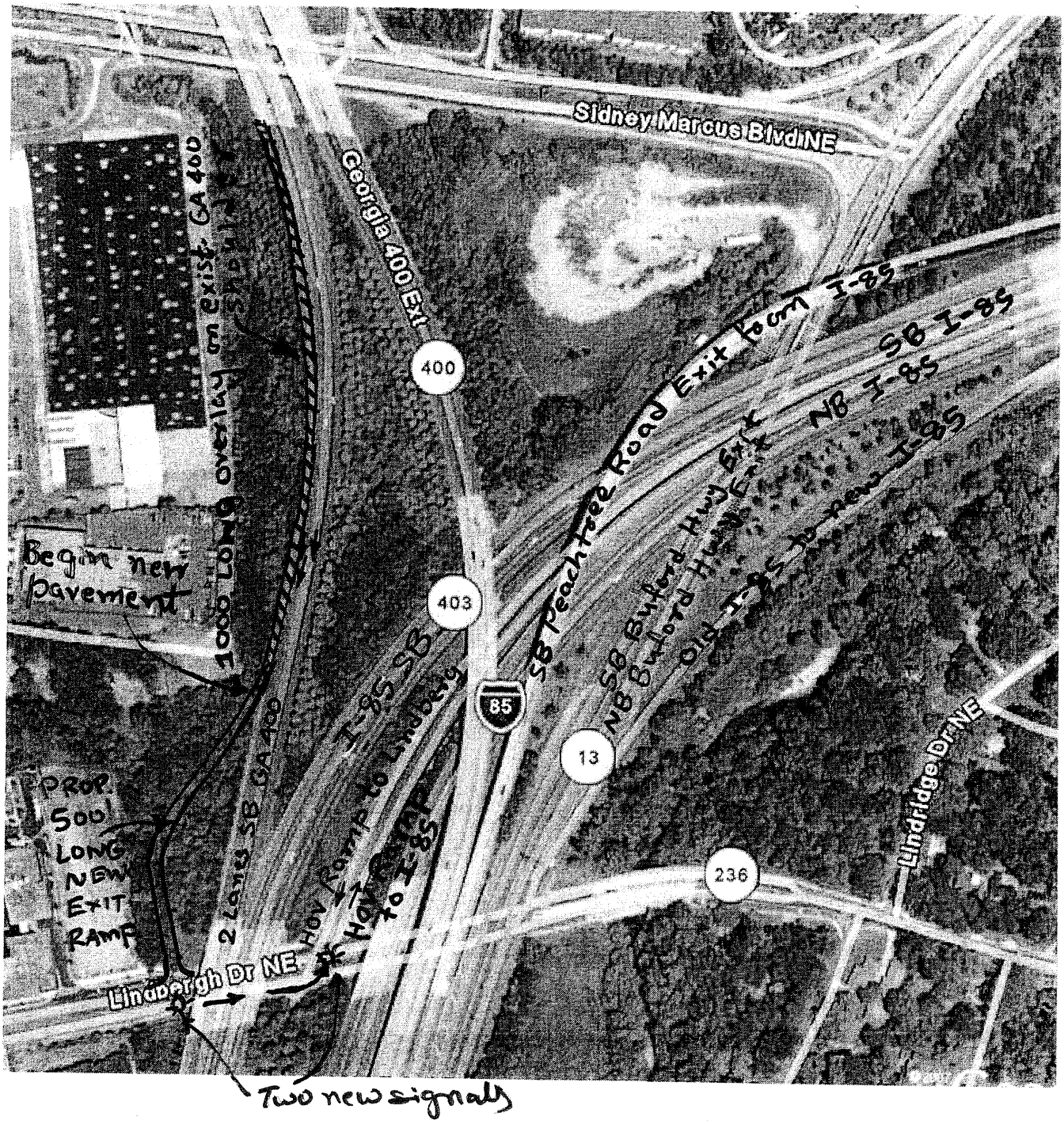
SKETCH

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: A&B-B

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

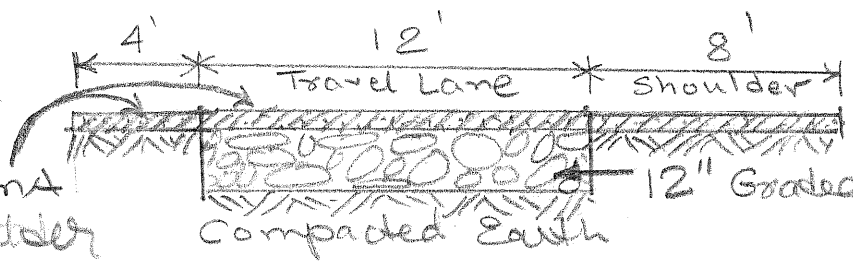
ALTERNATIVE NO.: AS-2

SHEET NO.: 3 of 4

Currently, a 20' shoulder exists on SB 400 from the Sidney Marcus Blvd exit ramp to SB I-85. The shoulder is flanked by two SB GA 400 lanes on its left and a 4' gutter/barrier on its right.

After the exit lanes to SB I-85 crosses Sidney Marcus Blvd., the bridge over asphalt pavement shoulder begins. This alternative proposes to overlay this pavement shoulder from this point to a distance of 1,000 feet to the south. This overlay will be 3" 19 mm SMA asphaltic concrete and is proposed to be 12 feet wide.

The next 500 feet upto Lindberg Drive will be a new 12' pavement. The section will be as follows:



Total area of 3" 19 mm overlay: $[(8+4)500 + 12\times1500]/9$
$= 2,667$ SY

Total area of 12" G.A.B: $(500\times12)/9 = 667$ SY

19 mm. overlay → $\frac{330\ lbs}{SY} \times \frac{TN}{2000\ lbs} \times \frac{\$100}{TN} = \$16.50/SY$

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: AN-3

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge SR 400 → I-85	SF	103,500	140	14,490,000			
Retaining/MSE Wall	SF	13,625	50	681,250			
P.C.C. Pavement	SY	2,500	80	200,000			
G.A.B. Base	SY	2,500	25	62,500	667	25.00	16,675
3" 19 mm overlay	SY	2,500	16.50	41,250	2,667	16.50	44,005
Concrete Barrier	LF	4,000	65	455,000	1,000	65.00	65,000
Traffic Signals	EA				2	100,000.00	200,000
Subtotal				15,930,000			325,680
Markup (%) at 12%				1,911,600			39,082
TOTAL				17,841,600			364,762

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **AN-4**

DESCRIPTION: **REPLACE THE FLYOVER RAMP WITH A LOOP USING LINDBERGH DRIVE. EXIT SR 400 SB TO A NEW STOP LIGHT ON LINDBERGH, CROSS EAST OVER LINDBERG DR. AND TURN LEFT ONTO A NEW ENTRY RAMP TO NB I-85.**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Currently traffic uses surface streets between SB SR 400 and NB I-85. Vehicles exit at Sidney Marcus Blvd and turn left. At Buford Highway they turn left again. Then at Lenox Road, the traffic turns right and then finally the traffic turns left to get onto I-85. The traffic goes through five unsynchronized signals at intersections that are operating at a Level of Service "F." The original scheme provides full movement between the two facilities using a 50 mph design speed on the flyover.

ALTERNATIVE:

Construct a 1,500-ft-long exit ramp from SB SR 400 to Lindbergh Drive. Construct a 1,000-ft-long entry ramp from Lindberg Drive to Old NB I-85. Also, construct a 500-ft-long entry ramp from I-85 to Lindberg Drive. Install two traffic signals on Lindbergh Drive, with two left turn movements. This will help drivers get quickly to the Lindbergh MARTA Station and the LaVista/Lenox intersection while reducing traffic volumes on NB I-85.

ADVANTAGES:

- Major savings in time and money
- Reduces travel time

DISADVANTAGES:

- Users will still have to go through two signals
- Traffic will increase on Lindbergh Drive
- Increased risk of accidents on Lindbergh Drive due to higher volumes

DISCUSSION:

All construction is expected to occur within GDOT right of way. Assuming a 20 ft storage length per vehicle, the exit lane will have room for 75 vehicles. The entry lane to NB Old I-85 will have to be constructed such that the adjacent creek is not impacted. The east lane from Old I-85 to Lindbergh Drive will be able to store approximately 25 vehicles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 17,841,000	—	$ 17,841,000
ALTERNATIVE	$ 494,680	—	$ 494,680
SAVINGS (Original minus Alternative)	$ 17,346,320	—	$ 17,346,320

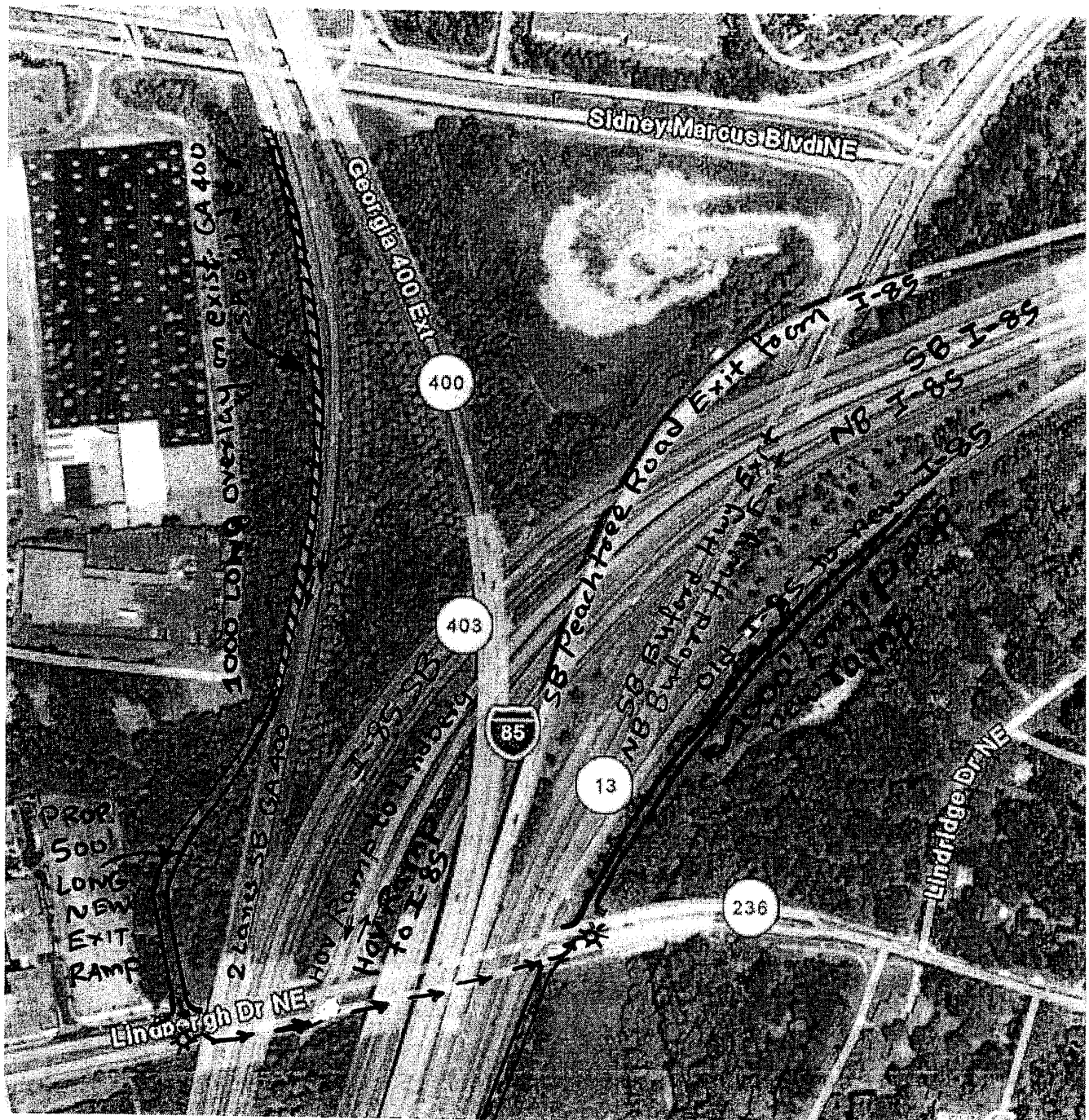
SKETCH

PROJECT: SR 400/INTERSTATE 85 CONNECTOR RAMPS
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: AN-B4

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4



← Proposed exit ramp to Lindberg Dr. from old I-85 NB : 500' long

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: AD 4

SHEET NO.: 3 of 4

For exit ramp from SB GA400 to Lindberg Drive, see calculations computed under AS-2.

For exit ramp from old I-85 to Lindberg Drive and from Lindberg Drive to old I-85, use the same AS-2 asphaltic concrete section.

Exit ramp from old I-85 to Lindberg Drive;
Total area of 3" 19 mm overlay: $(8+4+12)\frac{500}{9} = 1,333$ SY
Total area of 12" G.A.B: $\frac{12 \times 500}{9} = 667$ SY

Entry ramp from Lindberg Drive to old I-85:
Total area of 3" 19 mm overlay: $(8+4+12)\frac{1000}{9} = 2,667$ SY
Total area of 12" G.A.B. $\frac{12 \times 1000}{9} = 1,333$ SY

Thus, total of all three ramps:
3" 19 mm overlay: 2,667 + 1,333 + 2,667 = 6,667 SY
12" G.A.B. 667 + 667 + 1,333 = 2667 SY

19 mm overlay → $\frac{330 \text{ lbs}}{\text{S-1}} \times \frac{\text{TN}}{2000 \text{ lbs}} \times \frac{\$110}{\text{TN}} = \$16.50/\text{SY}$

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: Alt 4

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge SR 400 → I-85	SF	103,500	140	14,490,000			
Retaining/MSE Wall	SF	13,625	50	681,250			
P.C.C. Pavement	SY	2,500	80	200,000			
G.A.B. Base	SY	2,500	25	62,500	2,667	25.00	66,675
3" 19 mm overlay	SY	2,500	16.50	41,250	6,667	16.50	110,005
Concrete Barrier	LF	4,000	65	455,000	1,000	65.00	65,000
Traffic Signals	EA				2	100,000	200,000
Subtotal				15930,000			441,680
Markup (%) at 12%				1911,600			53,000
TOTAL				17,841,600			494,680

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SN-1**

DESCRIPTION: **USE A 30-FT-WIDE SECTION WITH A 14-FT INSIDE LANE FLANKED BY 6FT AND 10 FT SHOULDERS IN LIEU OF A 32 FT SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Construct a 32-ft-wide section consisting of a 16-ft-wide travel lane flanked by 6-ft and 10-ft wide shoulders.

ALTERNATIVE:

Construct a 30-ft-wide section consisting of a 14-ft-wide travel lane flanked by 6-ft and 10-ft-wide shoulders.

ADVANTAGES:

- Reduces total pavement width by 2 ft and saves cost

DISADVANTAGES:

- Slightly narrower section

DISCUSSION:

Per AASHTO Exhibit 3.50, the minimum width needed for an 18-wheel trailer (WB-65) on a single-lane road and one-way conditions is 26 ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 30-ft-wide section more than meets this requirement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 16,605,120	—	$ 16,605,120
ALTERNATIVE	$ 14,655,939	—	$ 14,655,939
SAVINGS (Original minus Alternative)	$ 1,949,181	—	$ 1,949,181

SKETCH

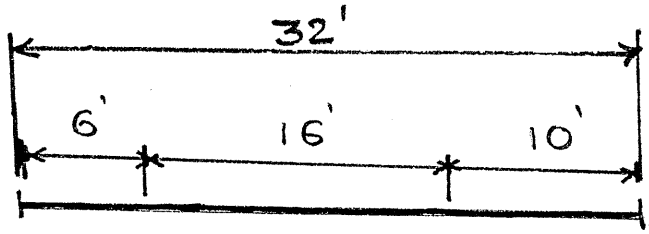
PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-1

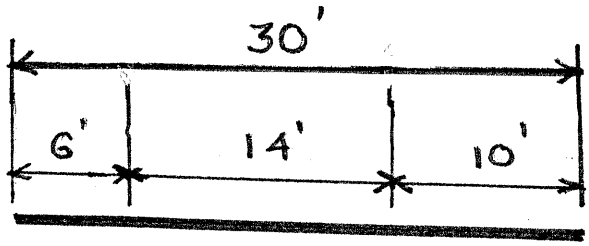
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4

Original Design



Alternate Design



CALCULATIONS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-1

SHEET NO.: 3 of 4

As given: The total bridge length is: 2743'-5"

Alternative width of the bridge: 30'+3.25' = 33.25'

Alternative SF of bridge = 2743.416 × 33.25' = 91,219. sf

Paving Section:

At the beginning of the ramp, the pavement length is from station approximately 318+02 and ends at 323+02 for a length of 500 feet

At the end of the ramp, the pavement length is from station 350+46 to the end approximately at station 354+46 for a length of 400 feet.

Total pavement length = 500 + 400 = 900 feet

Total pavement area as designed = $\frac{900 \times 32}{9}$ = 3,200 SY

Total pavement area as proposed = $\frac{900 \times 30}{9}$ = 3,000 SY

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SN-1

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			AH. ~~PROPOSED~~ ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	103,500	140	14,490,000	91,219	140	12,770,660
12" G.A.B.	SY	3,200	25	80,000	3,000	25	75,000
12" P.C.C. Pavement	SY	3,200	80	256,000	3,000	80	240,000
Subtotal				14,826,000			13,085,660
Markup (%) at 12%				1,779,120			1,570,279
TOTAL				16,605,120			14,655,939

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SN-2**

DESCRIPTION: **USE A 28-FT-WIDE SECTION WITH 14-FT-WIDE TRAVEL LANE FLANKED BY 4-FT AND 10-FT WIDE SHOULDERS IN LIEU OF THE 32-FT-WIDE SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The SB SR 400 to NB I-85 connector ramp consists of a 32-ft-wide section with a 16-ft-wide travel lane and shoulders of 6 ft and 10 ft.

ALTERNATIVE:

Use a 28-ft-wide section consisting of a 14-ft-wide travel lane and shoulders of 4 ft and 10 ft.

ADVANTAGES:

- Reduces pavement width and saves cost

DISADVANTAGES:

- Slightly narrower ramp

DISCUSSION:

Per AASHTO Exhibit 3.50, the minimum width needed for an 18-wheel trailer (WB-65) on a single-lane road and one-way conditions is 26 ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 28-ft-wide section more than meets this requirement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 16,605,120	—	$ 16,605,120
ALTERNATIVE	$ 13,879,622	—	$ 13,879,622
SAVINGS (Original minus Alternative)	$ 2,725,498	—	$ 2,725,498

SKETCH

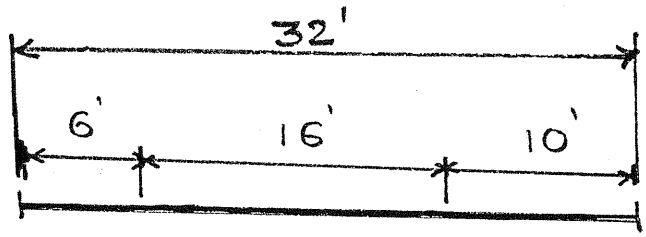
PROJECT: SR 400/INTERSTATE 85 CONNECTOR RAMPS
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-2

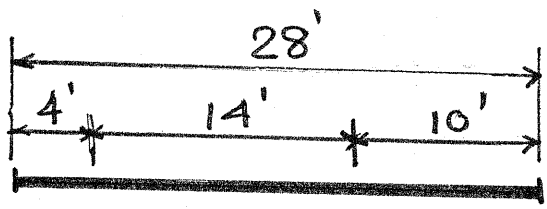
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4

Original Design



Alternate Design



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-2

SHEET NO.: 3 of 4

Alternative square feet of the bridge =
= alternative width of the bridge × given bridge length
= 2,743.416' × 28' = 76,816 sf
+ 2,743.416' × (1.75 + 1.75) = 9,602 sf (for barriers)
Per SN-1 Calculation Sheet, 86,418 sf
The total pavement area as designed = 3,200 SY
Per this alternative,
the total pavement area = $\frac{900 \times 28}{9}$ = 2,800 SY

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SN-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
Bridge	SF	103500	140	14,490,000	86418	140	12,098,520
12" G.A.B.	SY	3,200	25	80,000	2,800	25	70,000
12" P.C.C. Pavement	SY	3,200	80	256,000	2,800	80	224,000

Subtotal		14,826,000	12,392,520
Markup (%) at	12%	1,779,120	1,487,102
TOTAL		16,605,120	13,879,622

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **SN-3**

DESCRIPTION: **USE A 26-FT-WIDE SECTION WITH 14-FT-WIDE TRAVEL LANE FLANKED BY 4-FT AND 10-FT-WIDE SHOULDERS IN LIEU OF THE 32-FT-WIDE SECTION**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The SB SR 400 to NB I-85 connector ramp consists of a 32-ft-wide section with a 16-ft-wide travel lane and shoulders of 6 ft and 10 ft.

ALTERNATIVE:

Use a 26-ft wide section consisting of a 14-ft wide travel lane and shoulders of 4 ft and 10 ft.

ADVANTAGES:

- Reduces pavement width and saves cost

DISADVANTAGES:

- Slightly narrower ramp

DISCUSSION:

Per AASHTO Exhibit 3.50, the minimum width needed for an 18-wheel trailer (WB-65) on a single lane road and one way conditions is 26 ft, allowing for a stalled vehicle to be passed by another of the same type. The proposed 26-ft-wide section meets this requirement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 16,605,120	—	$ 16,605,120
ALTERNATIVE	$ 12,995,584	—	$ 12,995,584
SAVINGS (Original minus Alternative)	$ 3,609,536	—	$ 3,609,536

SKETCH

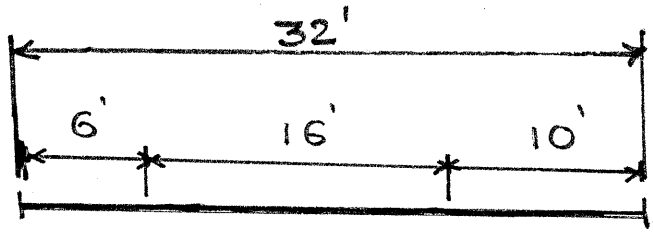
PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-3

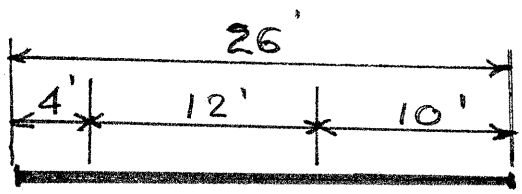
ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

SHEET NO.: 2 of 4

Original Design



Alternate Design



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: SN-3

SHEET NO.: 3 of 4

Alternative square feet of the bridge =
alternative width of the bridge x given length of the bridge
= 2,743'-5" x 26' = 71,329 sf
+ 2,743'-5" x (1.75 + 1.75) = 9601 sf (for bridge under barrier)
Total: 80930 sf

Per SN-1 calculation sheet,
the total pavement area as designed = 3,200 sy
Per this alternative,
the total pavement area = $\frac{900' \times 26'}{9}$ = 2,600 sy

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: SN - 3

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	103500	140	14 490 000	80930	140	11 330 200
12" G.A.B.	SY	3,200	25	80,000	2,600	25	65,000
12" P.C.C. Pavement	SY	3,200	80	256,000	2,600	80	208,000
Subtotal				14,826,000			11 603 200
Markup (%) at	12%			1,779,120			1392384
TOTAL				16,605,120			12 995 584

16 605 120

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BN-1, 2, 3, 4**

DESCRIPTION: **LOWER THE PROFILE OF THE SR 400 SB TO I-85 NB RAMP BY USING STEEPER GRADES, MINIMUM TRUCK CLEARANCE, AND A 35 MPH DESIGN SPEED**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The design for the SR 400 SB to I-85 NB ramp is based on 45 mph (desirable criteria) and approximately 30 ft of vertical clearance.

ALTERNATIVE:

Lower the profile for the SR 400 SB to I-85 NB ramp by increasing the grade over Sidney Marcus from 3% to 4.6% and increasing the length of the vertical curve from 798 ft to 1,000 ft. This changes the "k" value from 84 to 94 and the vertical clearance from approximately 30 ft to 25 ft. The design speed remains the same at 50 mph.

ADVANTAGES:

- Shorter columns on the bridges
- Slightly shorter bridge spans
- Reduces bridge cost

DISADVANTAGES:

- Slightly higher grade

DISCUSSION:

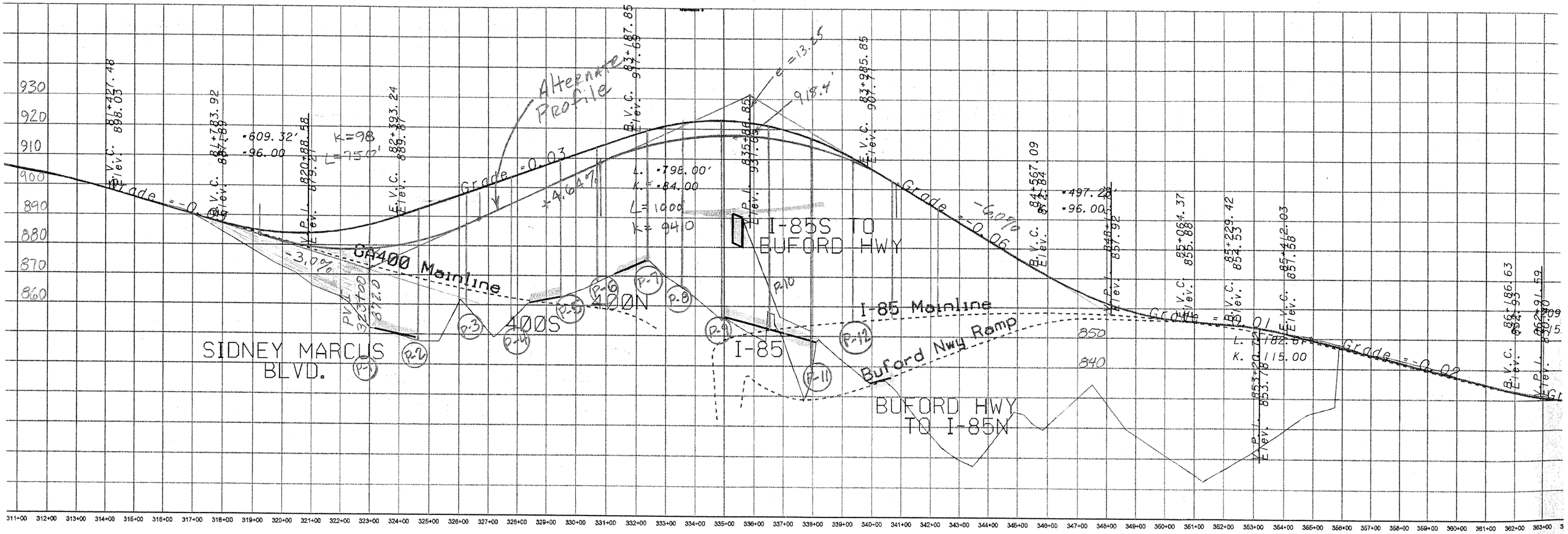
Lowering the profile for SR 400 SB to I-85 NB ramp would shorten the bridge columns, reducing the amount of steel and concrete. A total of 62LF of columns can be saved by lowering the profile. This will also save on construction time, beam placement, and overall access to the structure.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 94,039	—	$ 94,039
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 94,039	—	$ 94,039

Sketch Alt. Bn 1, 2, 3, 4

2/4

400 SOUTHBOUND TO I-85 NORTHBOUND



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: BN-1,2,3,4

SHEET NO.: 3 of 4

See Attached Alternate and Original (Current Design) Profiles. The Alt. profile will shorten bridge Columns: (see sketch)

P-2	shorten	10'
P-3	shorten	10'
P-4	shorten	9'
P-5	shorten	7'
P-6	shorten	5.5'
P-7	shorten	5'
P-8	shorten	5'
P-9	shorten	4.5'
P-10	shorten	3'
P-11	shorten	2.5'
P-12	shorten	1'
total		62.5'

$$\frac{(62.5' \times 16' \text{ w} \times 4' \text{ Tk})}{27 \text{ cf/cy}} \approx 150 \text{ c.y.}$$

150 c.y. @ Class "A" Conc. ($377/cy)

215 #/c.y. x 150 c.y. = 32,250 # (ReBar)

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALTERNATIVE NO.: BM-1, 2, 3 4

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			~~PROPOSED~~ ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Save Original Cost							
Class "A" Conc.	C.Y.	150	377	$56,550			
Reinf. Bar	lbs	32,350	0.85	$27,413			
Constr.	Subtotal			$83,963			
Markup (%) at	12%			$10,076			
	TOTAL			$94,039			

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS PROJECT**
Project No. NH000-0085-02(153) - Fulton County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
SB SR 400 TO NB I-85 RAMP						
BRIDGE (BN) (cont.)						
BN-5	Use radially oriented piers and eliminate the skew on the pier bents	DESIGN SUGGESTION				
BN-8	Add a new exit ramp from I-85 to Cheshire Bridge Road to improve traffic flow	$0	$1,232,013	($1,232,013)		($1,232,013)
BN-9	SB SR 400 to NB I-85 Ramp - Use long span steel girders over I-85 with 74 inch precast concrete bulb tees for all of the other approach spans. Reduce the number of columns required	DESIGN SUGGESTION				

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BN-5**

DESCRIPTION: **USE RADIALLY ORIENTED PIERS AND ELIMINATE THE SKEW ON THE PIER BENTS**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

Some piers are skewed to follow the road.

ALTERNATIVE:

Eliminate as many of the skews as possible by orienting them in a radial fashion.

ADVANTAGES:

- Uses same pier dimensions
- More efficient structure

DISADVANTAGES:

- May create a few longer spans
- Minor design change

DISCUSSION:

Using radial piers will standardize the pier dimensions and create a more efficient structure.

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

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BN-8**

DESCRIPTION: **ADD A NEW EXIT RAMP FROM I-85 NB TO CHESHIRE BRIDGE ROAD TO IMPROVE TRAFFIC FLOW**

ORIGINAL DESIGN:

A ramp is designed to go from SB SR 400 to NB I-85. There is no exit ramp or turn capability to Cheshire Bridge Road.

ALTERNATIVE:

Construct a 500ft long exit ramp to Cheshire Bridge Road. The ramp will be 12-ft-wide flanked by 4 ft and 8 ft shoulders. Users of the exit ramp will only be allowed to turn right with a yield sign.

ADVANTAGES:

- Saves user time when driving south to Cheshire Bridge and LaVista Drive
- Relieves congestion at Sidney Marcus, Buford Highway, and Lenox Drive

DISADVANTAGES:

- Adds cost to the project
- May require structure

DISCUSSION:

The Buford Highway and Lenox Drive intersection is currently operating at LOS "F" and needs improvement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 0	—	$ 0
ALTERNATIVE	$ 1,232,013	—	$ 1,232,013
SAVINGS (Original minus Alternative)	$ (1,232,013)	—	$ (1,232,013)

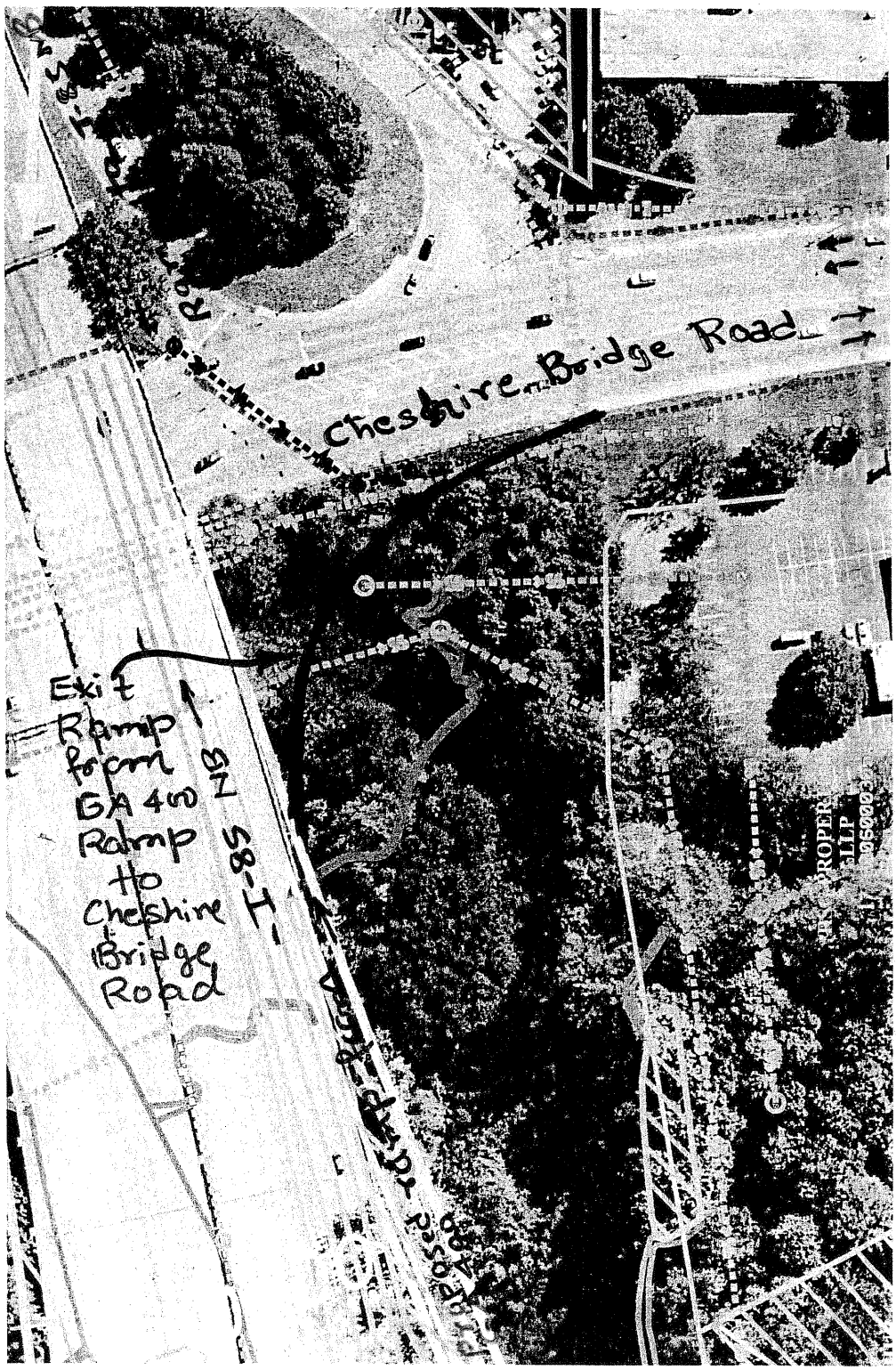
SKETCH

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: BN-8

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☑

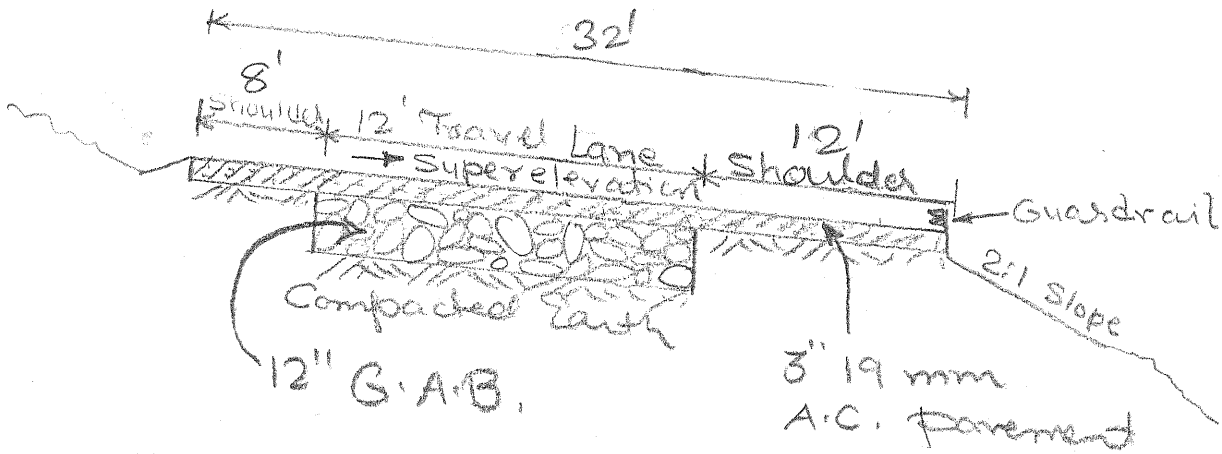
SHEET NO.: 2 of 4



PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: BN-8

SHEET NO.: 3 of 4



Pavement Section

Total area of pavement:

3" 19 mm overlay: $\frac{32 \times 500}{9} = 1,778$ SY

12" G.A.B. $\frac{12 \times 500}{9} = 667$ SY

Cost in SY for overlay:

$\frac{330 \text{ lbs}}{SY} \times \frac{TN}{2000} \times \frac{\$100}{TN} = \frac{\$16.50}{SY}$

Earthwork: $[(24' + 12') \times 500 \times 2'] / 27 = 4,000$ CY

If bridge is constructed due to topography then:
32 x 400 = 12,800 SF. At $80/SF, the cost will be $1,024,000

COST WORKSHEET

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS** ALTERNATIVE NO.: **BN-8**

Project No. NH000-0085-02(153) - Fulton County, Georgia

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
19 mm overlay	SY				1,778	16.50	29,337
Graded aggregate base	SY				667	25.00	16,675
Guard rail	LF				400	20.00	8,000
Earthwork	CY				4,000	5.00	20,000
Clearing and grubbing	LS						2,000
Structure	SF				12,800	80.00	1,024,000
Subtotal							1,100,012
Markup (%) at 12%							132,001
TOTAL							1,232,013

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia
Concept Report

ALTERNATIVE NO.: **BN-9**

DESCRIPTION: **SB SR 400 TO NB I-85 RAMP - USE LONG SPAN STEEL GIRDERS OVER I-85 WITH 74 IN PRECAST BULB TEES FOR THE APPROACHES**

SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

Use 74-inch-deep precast bulb tees for all spans on the SB SR 400 to NB I-85 ramp.

ALTERNATIVE:

Span I-85 using long-span steel girders with 74-inch-deep precast bulb tees used on the approach spans.

ADVANTAGES:

- Eliminates some columns
- Moves columns away from travel lanes

DISADVANTAGES:

- Increases construction time
- Need to use long-span steel or post-tensioned concrete superstructure
- Requires an additional trade

DISCUSSION:

Columns can be eliminated by using long spans (300 ft or more) to span I-85. This would increase the construction time, but remove some of the columns adjacent to travel lanes. Long span steel or post-tensioned concrete girders would need to be used for the superstructure. There would be minimal, if any, cost savings to this alternative.

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

PROJECT DESCRIPTION

PURPOSE AND NEED

This project will reconstruct the interchange of SR 400/I-85 by providing connector ramps from SR 400 Southbound to I-85 Northbound and from I-85 Southbound to SR 400 Northbound. The total length of the project is 0.34 miles and total project cost is approximately $39M. The project is located entirely inside the City of Atlanta, in Fulton County.

I-85 SB to SR 400 NB Ramp

- The proposed ramp would exit the existing I-85 SB mainline with the existing off-ramp to Buford Highway SB. After exiting as a single two-lane ramp, the ramps to SR 400 NB and to Buford Highway SB would share a two-lane section for approximately 1,000 feet before splitting. Then the proposed ramp to SR 400 NB would turn north. From this point, the proposed ramp would cross over Sidney Marcus Boulevard and then join SR 400 NB mainline as the third lane south of the northbound on-ramp from Sidney Marcus Boulevard. The existing SR 400 NB lane addition, which is immediately north of I-85 and widens SR 400 NB to three lanes, would be eliminated to accommodate the proposed ramp from I-85 SB. The proposed posted speed limit for this ramp would be 45 mph.

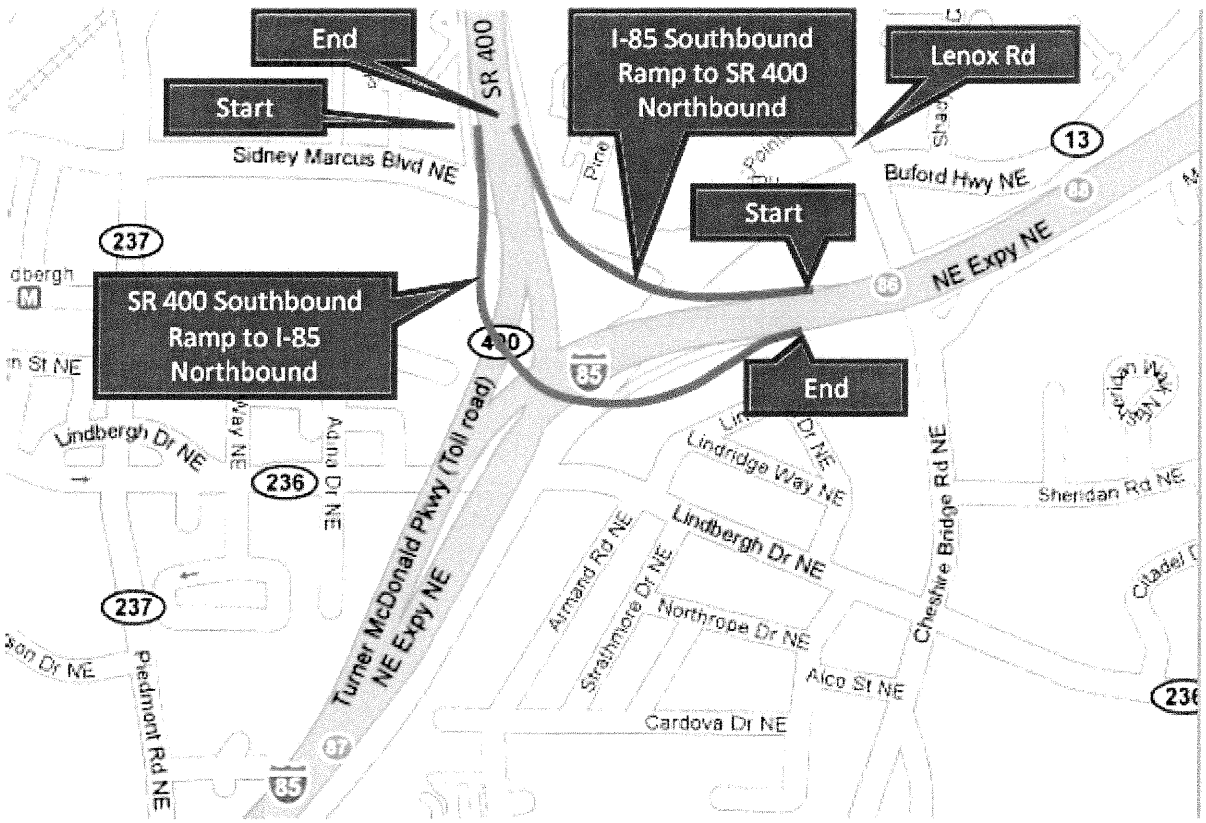
The typical Section is one 16-foot-wide travel lane with a 4-foot-wide inside shoulder and a 12-foot-wide outside shoulder. The bridge over Buford Highway and the Sidney Marcus Boulevard could be constructed using prestressed concrete girders or steel members.

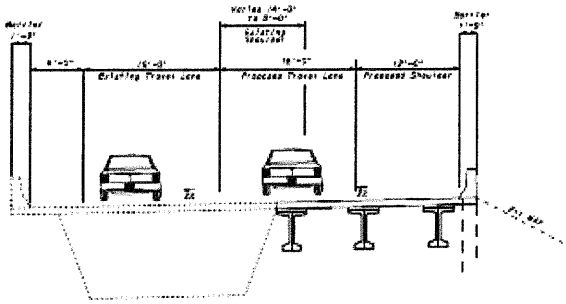
SR 400 SB to I-85 NB Ramp

- The proposed flyover ramp would exit from the right side of SR 400 SB mainline approximately 1000 feet south of the SR 400 SB off-ramp to Sidney Marcus Boulevard. From this point, it would cross over Sidney Marcus Boulevard and the existing SR 400/I-85 Interchange structures. Continuing elevated to I-85, it would cross over the existing Buford Highway on-ramp and then turn north to join the I-85 NB mainline on the right side of the existing Buford Highway on-ramp. The existing I-85 NB lane addition, which is immediately north of the SR 400 NB off-ramp and widens I-85 to five lanes, would be eliminated to accommodate an additional lane on I-85 NB from the SR 400 SB to I-85 NB ramp. The existing Buford Highway on-ramp would shift to the left and join with a reduced four-lane I-85 NB mainline, which opens a lane for the proposed ramp. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

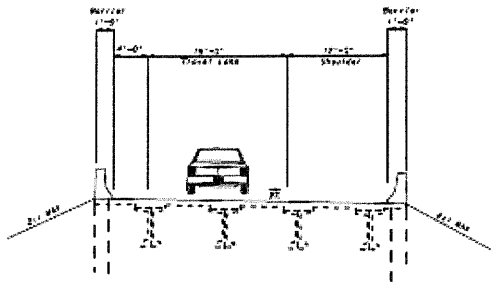
The typical Section is one 16-foot-wide travel lane with a 6-foot-wide inside shoulder and a 10-foot-wide outside shoulder. The structure could be constructed using prestressed concrete girders or steel members.

PROJECT PLAN

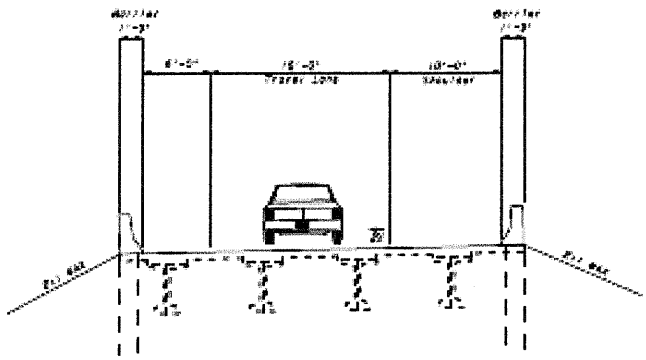




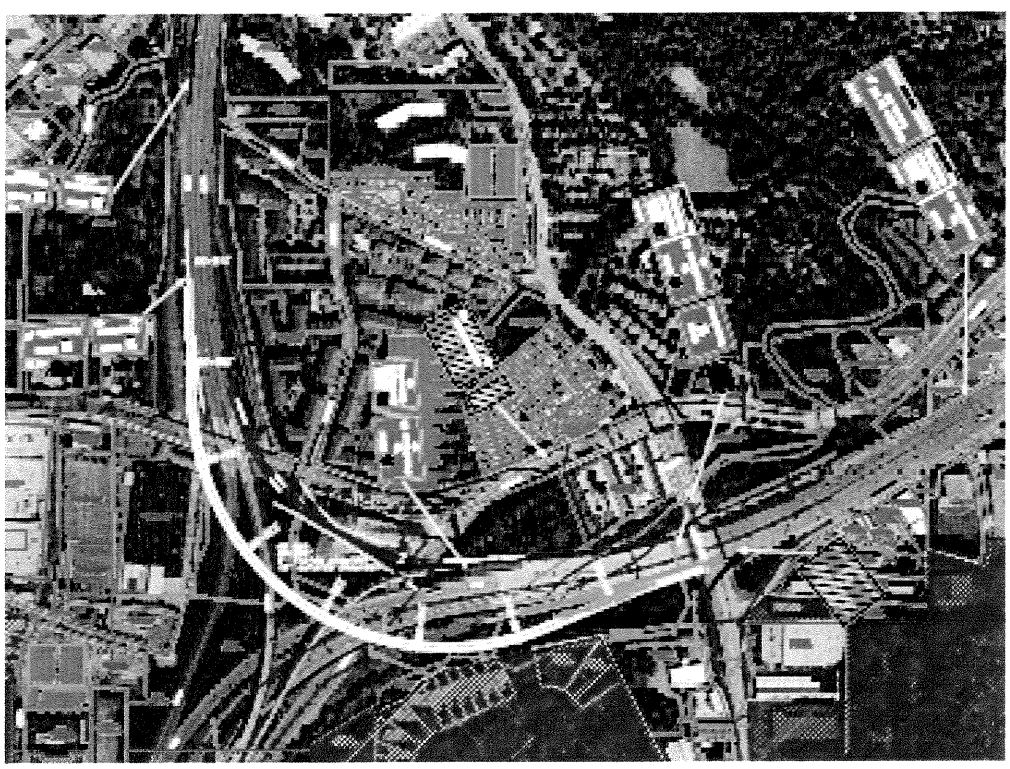
I-85 SOUTHBOUND TO
BUFORD HIGHWAY (SR 13) SOUTHBOUND/SR 400 NORTHBOUND

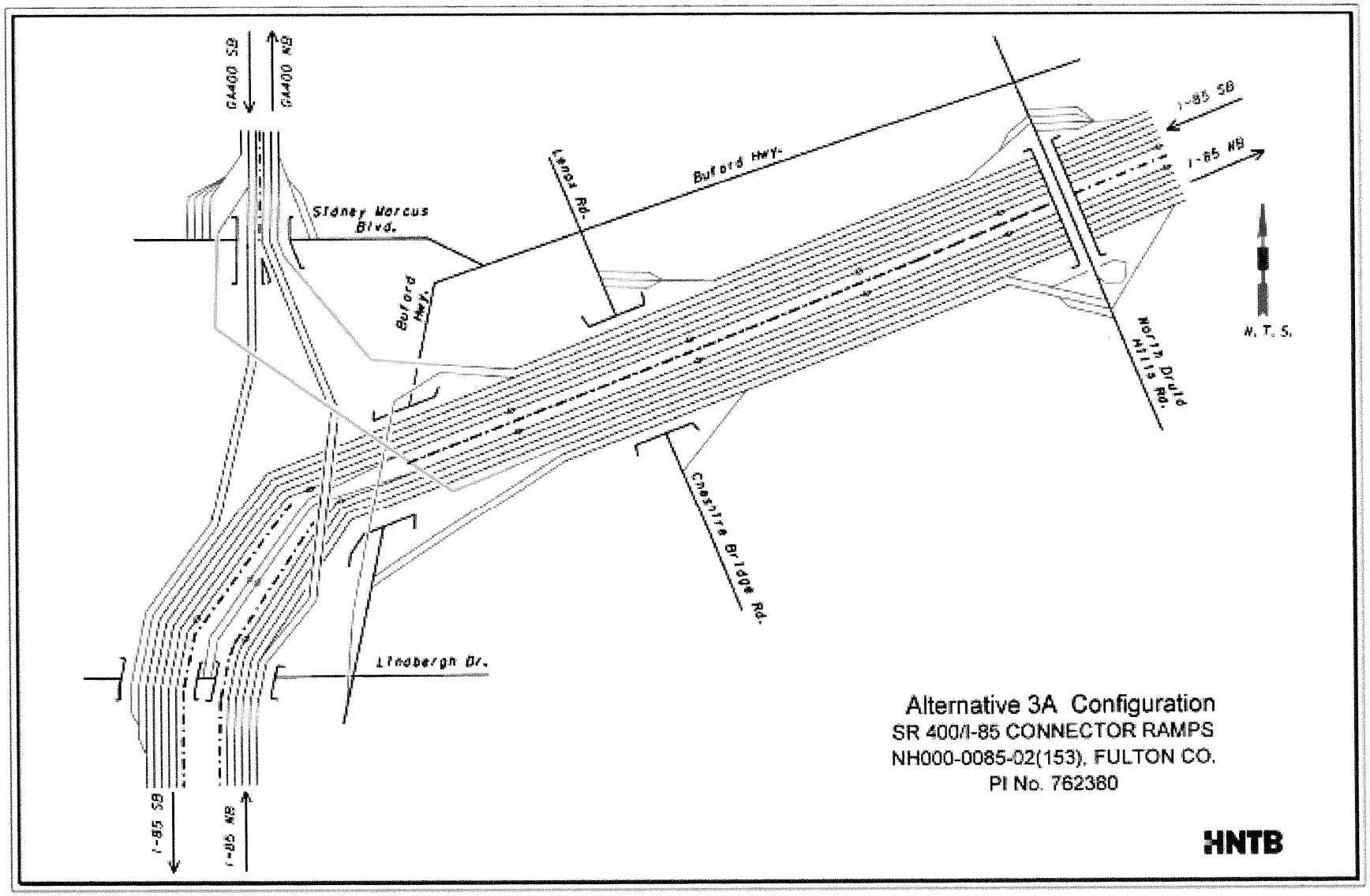


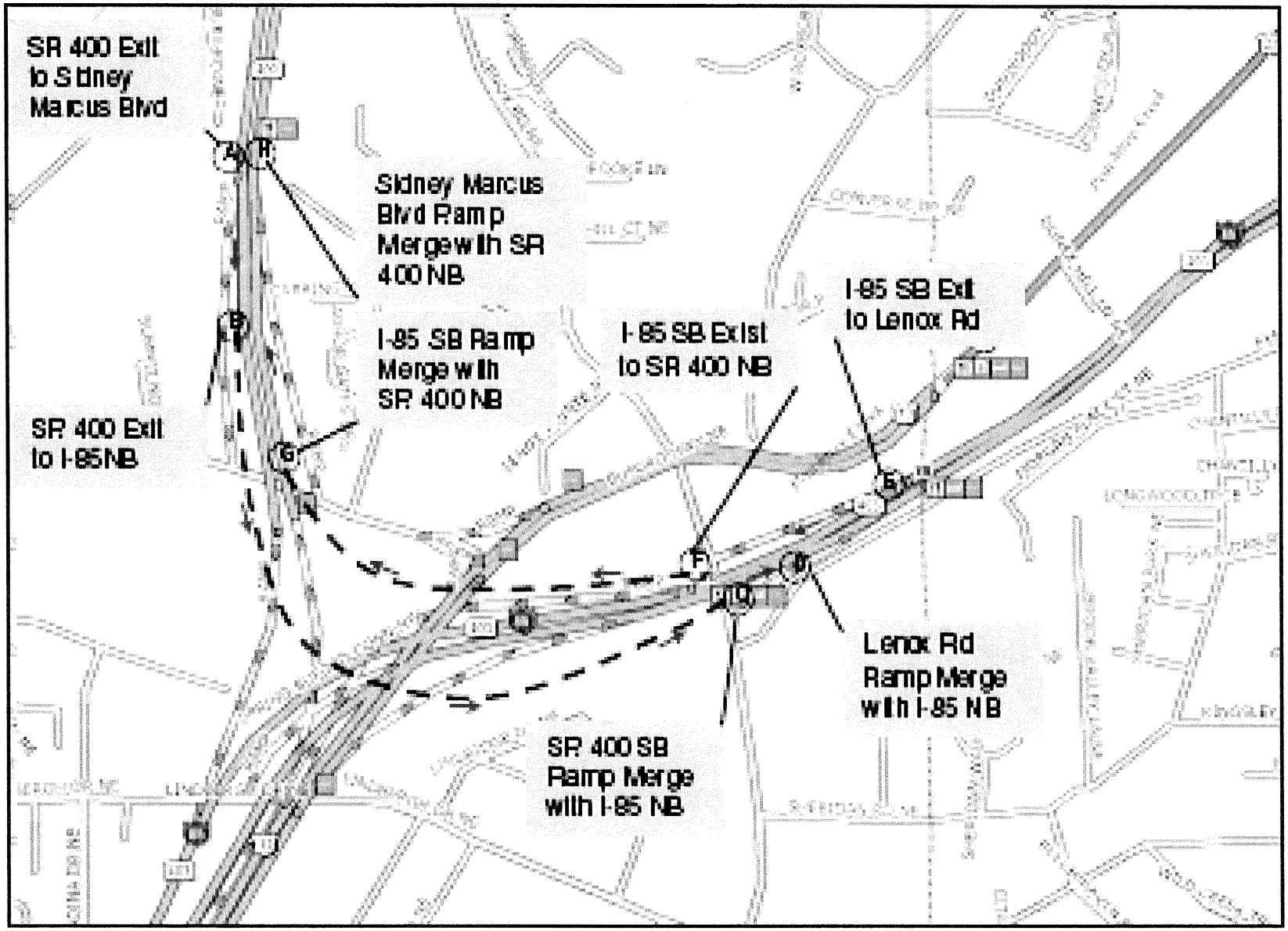
I-85 SOUTHBOUND TO SR 400 NORTHBOUND



SR 400 SOUTHBOUND TO I-85 NORTHBOUND




GA400 SB
GA400 NB
Sidney Marcus Blvd.
Buford Hwy.
Lenox Rd.
Buford Hwy.
I-85 SB
I-85 NB
North Druid Hills Rd.
N. T. S.
Chamblee Bridge Rd.
Lindbergh Dr.
I-85 SB
I-85 NB
Alternative 3A Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380
HNTB



Proposed Ramps Travel Time Paths

Estimate Report for file "762380 Separate Ramps"

Section Removal

Item Number	Quantity	Units	Unit Price	Item Description	Cost
201-1500	1	LS	75000.00	CLEARING & GRUBBING -	75000.00
				Section Sub Total:	**$75,000.00**

Section Traffic

Item Number	Quantity	Units	Unit Price	Item Description	Cost
150-1000	1	LS	150000.00	TRAFFIC CONTROL -	150000.00
500-2100	24000	LF	65.00	CONCRETE BARRIER	1560000.00
63X-XXXX	8	EA	60000.00	OVERHEAD SIGNS COMPLETE IN PLACE	480000.00
653-XXXX	1	Lump Sum	15000.00	SIGNING & PAVEMENT MARKING	15000.00
				Section Sub Total:	**$2,205,000.00**

Section Earthwork & Erosion Control

Item Number	Quantity	Units	Unit Price	Item Description	Cost
208-0100	94550	CY	10.00	IN PLACE EMBANKMENT	945500.00
700-XXXX	1	Lump Sum	15000.00	PERMANENT GRASSING	15000.00
716-XXXX	1	Lump Sum	150000.00	EROSION CONTROL	150000.00
				Section Sub Total:	**$1,110,500.00**

Section Paving

Item Number	Quantity	Units	Unit Price	Item Description	Cost
310-5120	19400	SY	25.00	GR AGGR BASE CRS, 12 INCH, INCL MATL	485000.00
400-3402	1050	TN	100.00	ASPH CONC 19 MM SMA, GP 2 ONLY, INCL POLYMER-MODIFIED BITUM MATL & H LIME	105000.00
430-0620	19400	SY	80.00	PLAIN PC CONC PVMT, CL HES CONC, 12 INCH THK	1552000.00
				Section Sub Total:	**$2,142,000.00**

Section Drainage

Item Number	Quantity	Units	Unit Price	Item Description	Cost
550-XXXX	1	Lump Sum	150000.00	DRAINAGE STRUCTURES & PIPE	150000.00
				Section Sub Total:	**$150,000.00**

Section Structures

Item Number	Quantity	Units	Unit Price	Item Description	Cost
500-3XXX	27250	SF	50.00	RETAINING WALL/MSE WALL	1362500.00
50X-XXXX	103500	SF	150.00	BRIDGE - SR 400 SB to I-85 NB	15525000.00
50X-XXXX	44500	SF	120.00	BRIDGE - I-85 SB to SR 400 NB	5340000.00
624-0400	39900	SF	25.00	SOUND BARRIER, TYPE-	997500.00
				Section Sub Total:	**$23,225,000.00**

Section Misc.

Item Number	Quantity	Units	Unit Price	Item Description	Cost
XXX-XXXX	1	Lump Sum	3500000.00	CONTINGENCY	3500000.00
				Section Sub Total:	**$3,500,000.00**

Total Estimated Cost: $32,407,500.00

Subtotal Construction Cost **$32,407,500.00**

E&C Rate 12.0 % $3,888,900.00

Inflation Rate 0.0 % @ 0 Years	$0.00
Total Construction Cost	**$36,296,400.00**
Right Of Way	$1,500,000.00
ReImb. Utilities	$150,000.00
Grand Total Project Cost	**$37,946,400.00**

Project Number: NH000-0085-02(153)
P. I. No.: 762380
County: Fulton

Description of Other Alternatives Considered and Comments:

Alternative 1:

SR 400 SB to I-85 NB Ramp:

Combined with the off-ramp to Sidney Marcus Boulevard, the proposed ramp would exit from the right side of SR 400 SB mainline approximately 1500 feet north of the existing Sidney Marcus Boulevard off-ramp. After exiting as a single two-lane ramp, the ramps to I-85 NB and to Sidney Marcus Boulevard would share a two-lane section for approximately 1,000 feet before splitting. Then the proposed ramp to I-85 NB would cross over Sidney Marcus Boulevard and the existing SR 400/I-85 Interchange structures. It would join the I-85 NB mainline on the left side of Buford Highway on-ramp. With this alternative, the existing Buford Highway NB on-ramp would be shifted outside to accommodate the new ramp from SR 400 SB. In addition, the Buford Highway NB on-ramp would merge down from two lanes to one lane before joining I-85 NB mainline. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
One 16-foot wide travel lane with a 6-foot wide inside shoulder and a 10-foot wide outside shoulder.

I-85 SB to SR 400 NB Ramp

The proposed ramp would exit the existing I-85 SB mainline with the existing off-ramp to Buford Highway SB. After exiting as a single two-lane ramp, the ramps to SR 400 NB and to Buford Highway SB would share a two-lane section for approximately 1,000 feet before separating. Then the proposed ramp to SR 400 NB would turn north. From this point, the proposed ramp would cross over Sidney Marcus Boulevard and continue north. The existing Sidney Marcus Boulevard NB on-ramp would be shifted outside and merge with the proposed ramp from I-85 SB for approximate 1000 feet before merging onto the SR 400 NB mainline. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
One 16-foot wide travel lane with a 4-foot wide inside shoulder and a 12-foot wide outside shoulder.

Alternative 1A:

SR 400 SB to I-85 NB Ramp:

The proposed ramp would be similar to Alternative 1 except the area where the proposed ramp from SR 400 SB joins I-85 NB mainline. With this alternative, the proposed ramp would join on the left side of Buford Highway on-ramp to create a new I-85 NB Collector-Distributor (CD) Road. This alternative would convert the Cheshire Bridge

Road on-ramp into a loop ramp so it would merge with the new I-85 NB CD Road sooner. After the merge, the three-lane I-85 NB CD Road would continue for approximate 2500 foot before merging down to two lanes. The two-lane I-85 NB CD Road would join the five I-85 NB mainline lanes (one HOV lane and four general purpose lanes) to match the existing seven-lane section on I-85. The proposed posted speed limit for this ramp would be 45 miles per hour (mph). The proposed posted speed limit for the new I-85 NB CD Road would be 55 miles per hour (mph).

Typical Section 1:
Same as Alternative 1.

I-85 SB to SR 400 NB Ramp
Same as Alternative 1.

Typical Section 1:
Same as Alternative 1.

Alternative 1B:

SR 400 SB to I-85 NB Ramp:
The proposed ramp would be similar what was proposed in Alternative 1 except the area where the proposed ramp from SR 400 SB joins I-85 NB mainline. With this alternative, the proposed ramp would still join the I-85 NB mainline on the left side of Buford Highway on-ramp as it would in Alternative 1. However, this alternative would maintain the Buford Highway on-ramp as two-lanes to the merge with I-85 NB mainline. The outside lane from the Buford Highway on-ramp would continue for approximately 2,500 feet prior to merging into the existing seven-lane section on I-85. Similar to Alternative 1A, it would convert the Cheshire Bridge Road on-ramp into a loop ramp so it would merge with the I-85 NB mainline sooner. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
Same as Alternative 1.

I-85 SB to SR 400 NB Ramp
Same as Alternative 1.

Typical Section 1:
Same as Alternative 1.

Alternative 2:

SR 400 SB to I-85 NB Ramp:
The proposed ramp would exit from the right side of SR 400 SB mainline approximately 2,100 feet south of the SR 400 SB off-ramp to Sidney Marcus Boulevard. From this point, it would cross over Sidney Marcus Boulevard and continue southward in order to avoid crossing the existing SR 400/I-85 Interchange structures. It would cross over the

edge of the previously occupied Home Depot site. The ramp would loop around just south of Lindbergh Drive and cross over I-85 mainline. It would then turn north and cross over Lindbergh Drive again toward I-85 NB. It would merge with the outside lane of the existing Buford Highway on-ramp prior to joining I-85 NB mainline. The proposed design speed and posted speed limit for this ramp would be 40 miles per hour (mph), which is 5 mph less than the other alternatives.

Typical Section 1:
One 16-foot wide travel lane with a 12-foot wide inside shoulder and a 4-foot wide outside shoulder, which is opposite from the standard shoulder configuration.

I-85 SB to SR 400 NB Ramp
The proposed ramp would exit the existing I-85 SB mainline with the existing off-ramp to Buford Highway SB. After exiting as a single two-lane ramp, the ramps to SR 400 NB and to Buford Highway SB would share a two-lane section for approximately 1,000 feet before splitting. Then the proposed ramp to SR 400 NB would turn north. From this point, the proposed ramp would cross over Sidney Marcus Boulevard and then join SR 400 NB mainline as the third lane south of the northbound on-ramp from Sidney Marcus Boulevard. The existing SR 400 NB lane addition, which is immediately north of I-85 and widens SR 400 NB to three lanes, would be eliminated to accommodate the proposed ramp from I-85 SB. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
One 16-foot wide travel lane with a 4-foot wide inside shoulder and a 12-foot wide outside shoulder.

Alternative 3 (Preferred Alternative):

SR 400 SB to I-85 NB Ramp:
The proposed ramp would exit from the right side of SR 400 SB mainline approximately 1000 feet south of the SR 400 SB off-ramp to Sidney Marcus Boulevard. From this point, it would cross over Sidney Marcus Boulevard and the existing SR 400/I-85 Interchange structures. Continuing to I-85, it would cross over the existing Buford Highway on-ramp and then turn north to join the I-85 NB mainline on the right side of the existing Buford Highway on-ramp. The existing I-85 NB lane addition, which is immediately north of the SR 400 NB off-ramp and widens I-85 to five lanes, would be eliminated to accommodate an additional lane on I-85 NB from the SR 400 SB to I-85 NB ramp. The existing Buford Highway on-ramp would shift to the left and join with a reduced four-lane I-85 NB mainline, which opens a lane for the proposed ramp. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
One 16-foot wide travel lane with a 6-foot wide inside shoulder and a 10-foot wide outside shoulder.

I-85 SB to SR 400 NB Ramp

The proposed ramp would exit the existing I-85 SB mainline with the existing off-ramp to Buford Highway SB. After exiting as a single two-lane ramp, the ramps to SR 400 NB and to Buford Highway SB would share a two-lane section for approximately 1,000 feet before splitting. Then the proposed ramp to SR 400 NB would turn north. From this point, the proposed ramp would cross over Sidney Marcus Boulevard and then join SR 400 NB mainline as the third lane south of the northbound on-ramp from Sidney Marcus Boulevard. The existing SR 400 NB lane addition, which is immediately north of I-85 and widens SR 400 NB to three lanes, would be eliminated to accommodate the proposed ramp from I-85 SB. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
One 16-foot wide travel lane with a 4-foot wide inside shoulder and a 12-foot wide outside shoulder.

Alternative 3A:

SR 400 SB to I-85 NB Ramp:
Similar to Alternative 3, the proposed ramp would exit from the right side of SR 400 SB mainline approximately 1000 feet south of the SR 400 SB off-ramp to Sidney Marcus Boulevard. From this point, it would cross over Sidney Marcus Boulevard and the existing SR 400/I-85 Interchange structures. It would join the I-85 NB mainline on the left side of Buford Highway on-ramp. With this alternative, the Buford Highway Ramp would be shifted outside to accommodate the ramp from SR 400 SB. Similar to Alternative 3, the existing I-85 NB lane addition, which is immediately north of the SR 400 NB off-ramp and widens I-85 to five lanes, would be eliminated to accommodate an additional lane on I-85 NB from the SR 400 SB to I-85 NB ramp. It would differ from Alternative 3 since the proposed ramp from SR 400 SB would join the I-85 NB mainline at the existing abandoned lane instead of the Buford Highway ramp shifting left to use this lane. The proposed posted speed limit for this ramp would be 45 miles per hour (mph).

Typical Section 1:
Same as Alternative 3.

I-85 SB to SR 400 NB Ramp
Same as Alternative 3.

Typical Section 1:
Same as Alternative 3.

Comments:

Alternative 3 is recommended.

Alternative 3 would have no impact to any the historical properties in the area. It also would have the least impact to existing structures, thus it would significantly reduce construction cost.

Alternative 1 was eliminated.

Alternative 1 would have significant negative impacts on Buford Highway NB by merging the Buford Highway ramp to I-85 NB to one lane prior to the merge with I-85. The combination of SR 400 SB off-ramps to Sidney Marcus Boulevard and I-85 NB would mix system-to-system interchange traffic with local interchange traffic and would require additional cost to reconstruct the existing Sidney Marcus Boulevard off-ramp.

Alternative 1A was eliminated.

Similar to Alternative 1, this alternative would have the same negative feature related to the SR 400/Sidney Marcus Boulevard interchange. The widening along I-85 NB would require the relocation of the adjacent surface street, Chantilly Drive, and numerous commercial displacements. Even though the problem with the Buford Highway lane drop in Alternative 1 would be eliminated in Alternative 1A, another operational problem would be created by this alternative. With the new I-85 NB CD Road joining the I-85 mainline much farther north than the other alternatives, there would be inadequate weaving distance between the I-85 NB CD Road and the off-ramp to North Druid Hills Road to adequately accommodate the project traffic.

Alternative 1B was eliminated.

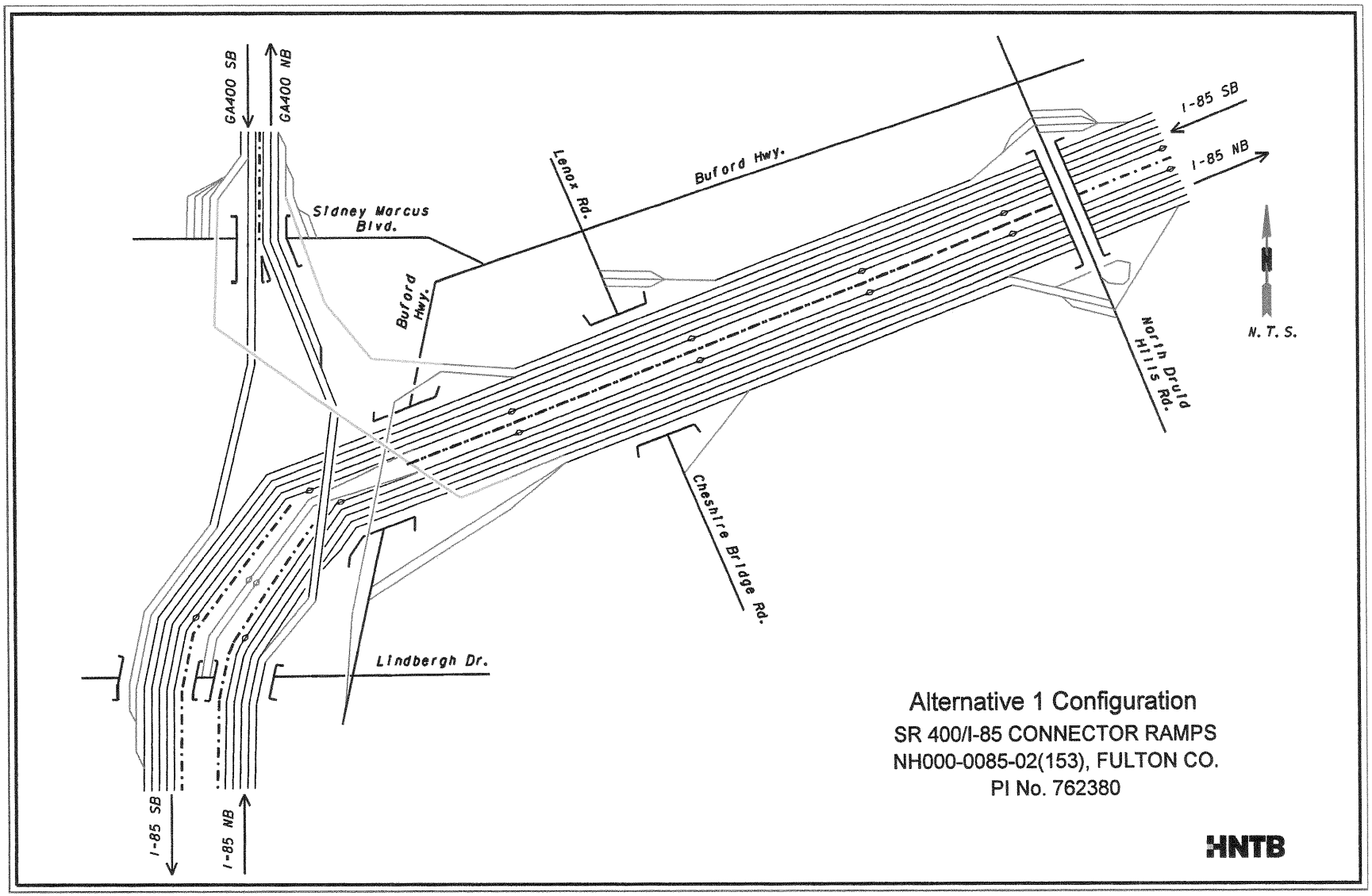
Similar to Alternatives 1 and 1A, this alternative would have the same negative feature related to the SR 400/Sidney Marcus Boulevard interchange. Similar to Alternative 1A, the widening along I-85 NB would require the relocation of the adjacent surface street, Chantilly Drive, and numerous commercial displacements. This widening would be slightly reduced from Alternative 1A since SR 400 SB and Buford Highway NB to I-85 NB ramps would merge with the I-85 NB mainline and not require the additional shoulders and concrete barrier that the new CD Road would need.

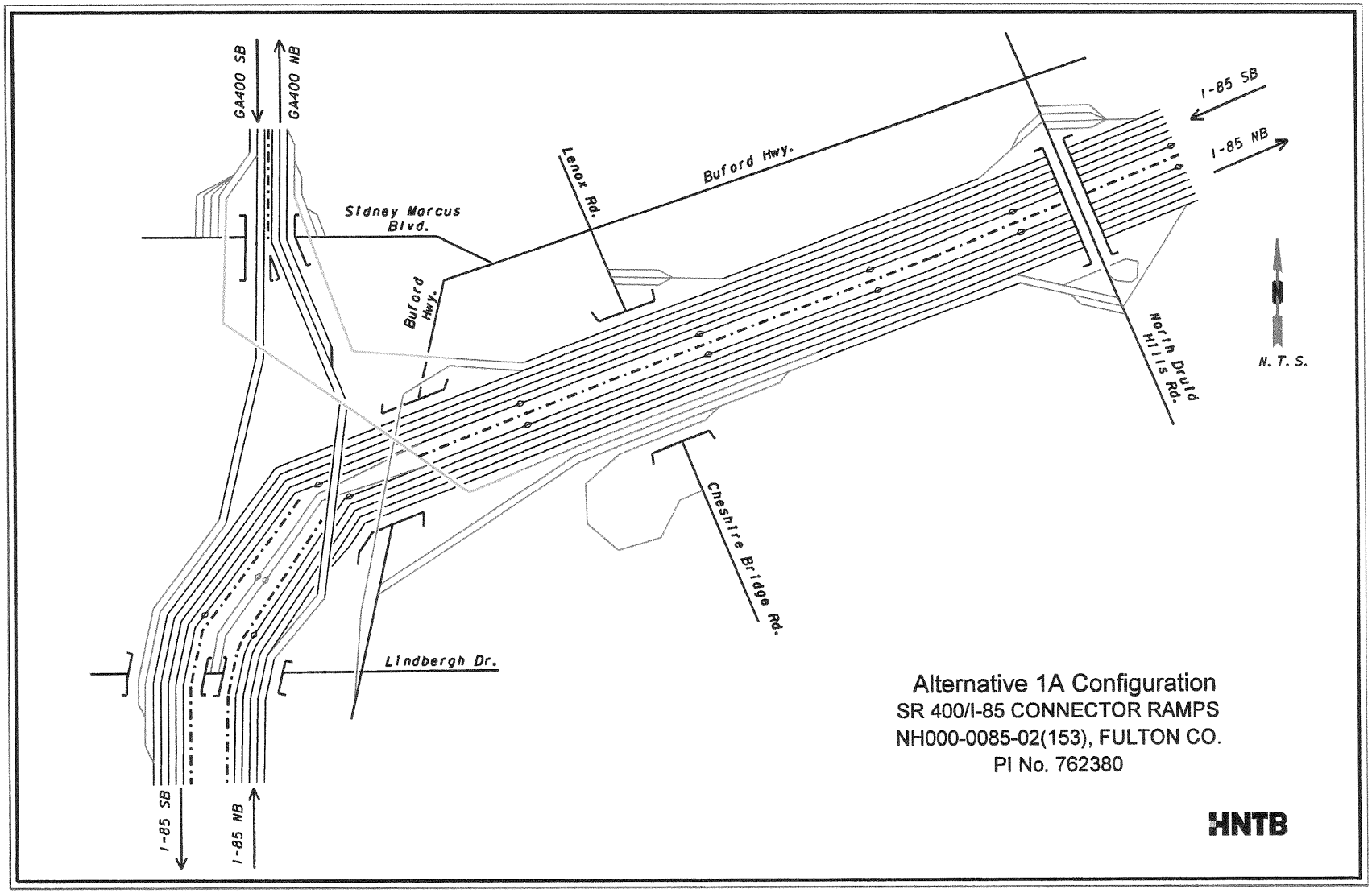
Alternative 2 was eliminated.

This alternative would have impacts to commercial and residential properties west side of the SR 400/I-85 Interchange or the potential historic district on the east side of the SR 400/I-85 Interchange. It would also have higher construction cost due to its longer alignment.

Alternative 3A was eliminated.

This alternative would require the reconstruction of the existing Buford Highway NB to I-85 NB Ramp structure to make space for the SR 400 SB to I-85 NB ramp, which would increase the construction cost significantly.


GA400 SB
GA400 NB
Sidney Marcus Blvd.
Buford Hwy.
Lenox Rd.
Buford Hwy.
I-85 SB
I-85 NB
N. T. S.
North Druid Hills Rd.
Cheshire Bridge Rd.
Lindbergh Dr.
I-85 SB
I-85 NB
Alternative 1 Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380
HNTB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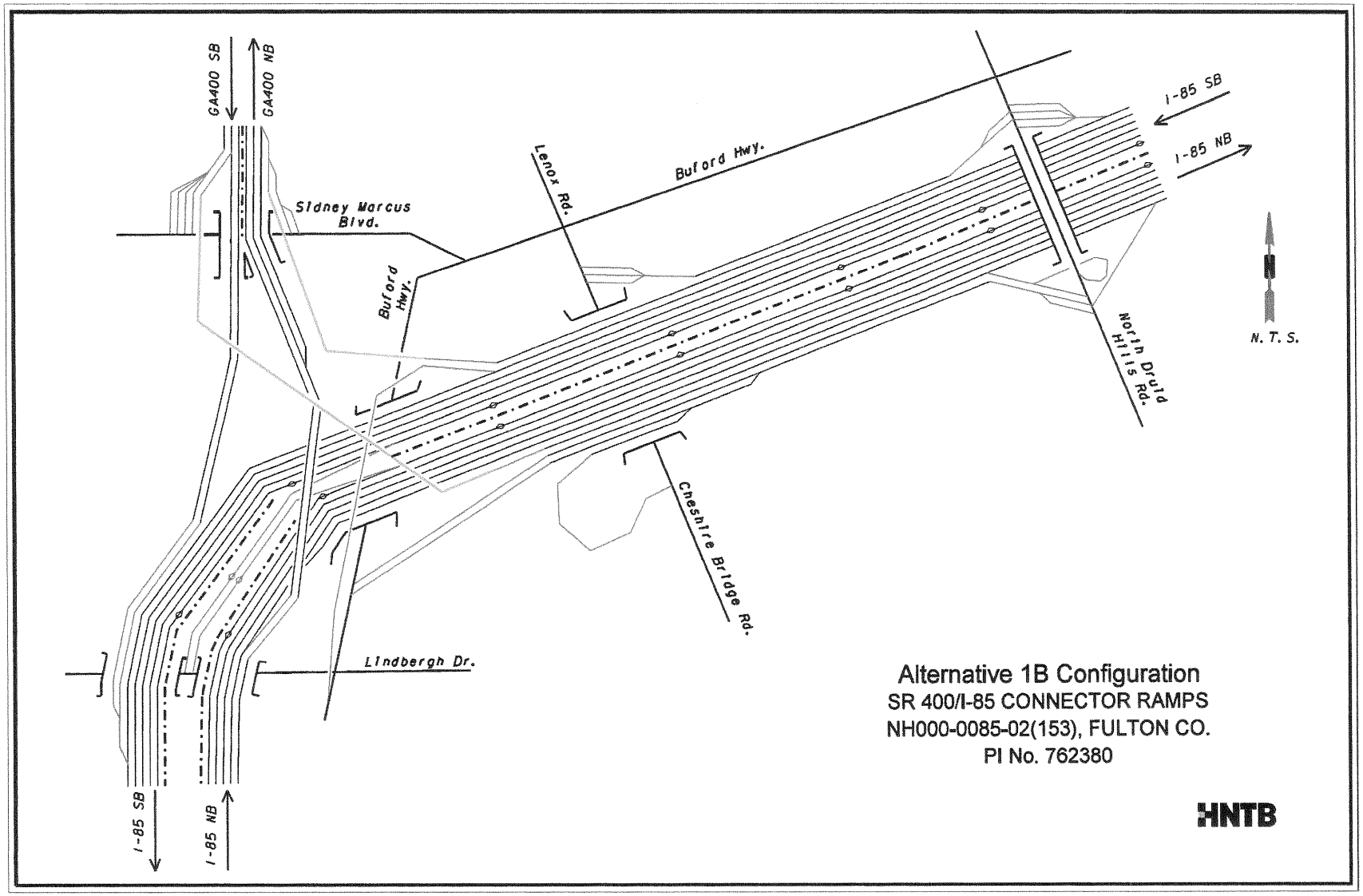
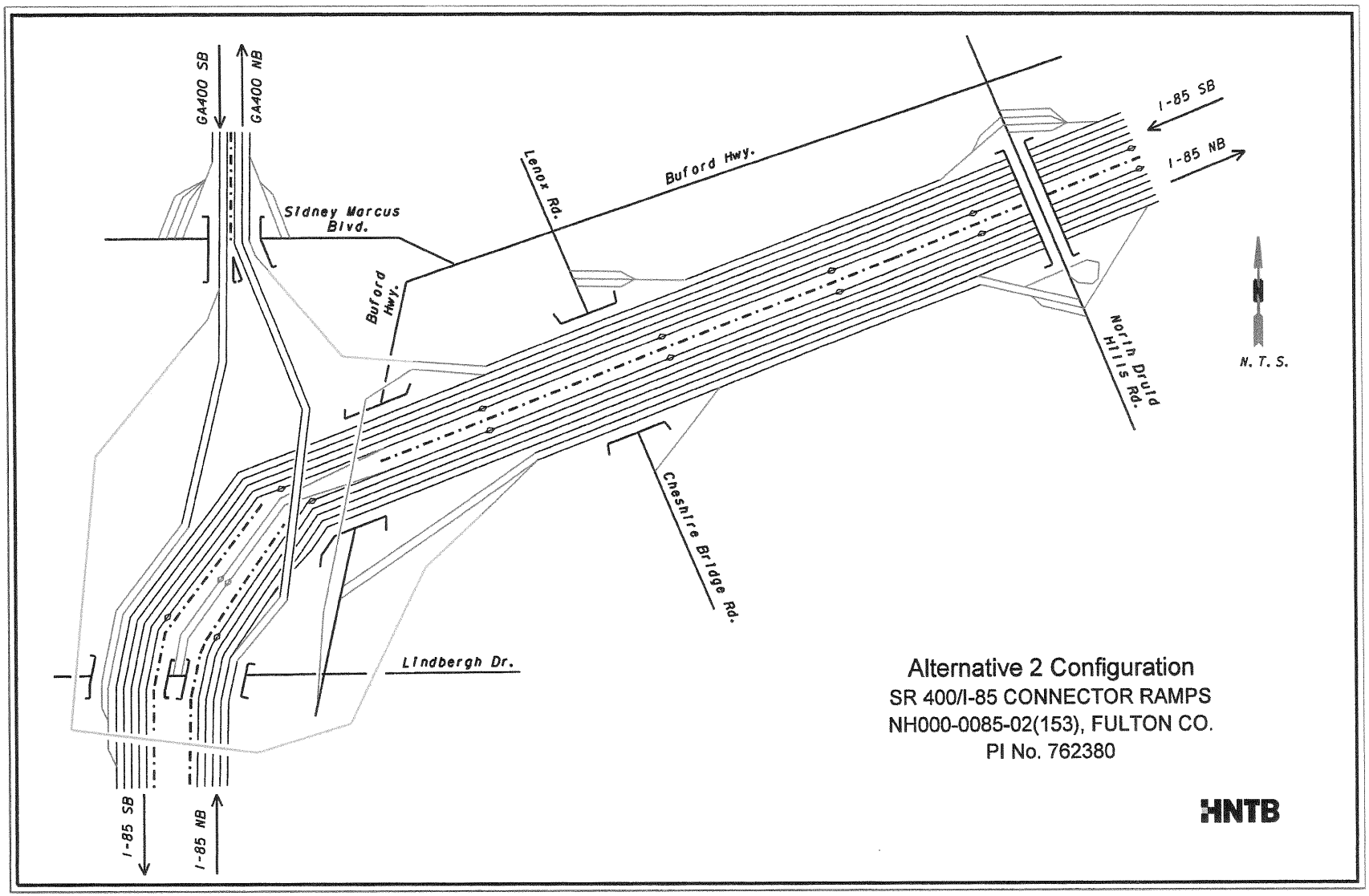
I-85 SB
I-85 NB
North Druid Hills Rd.
N
N. T. S.
Cheshire Bridge Rd.
Lindbergh Dr.
I-85 SB
I-85 NB
Alternative 1A Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380
HNTB



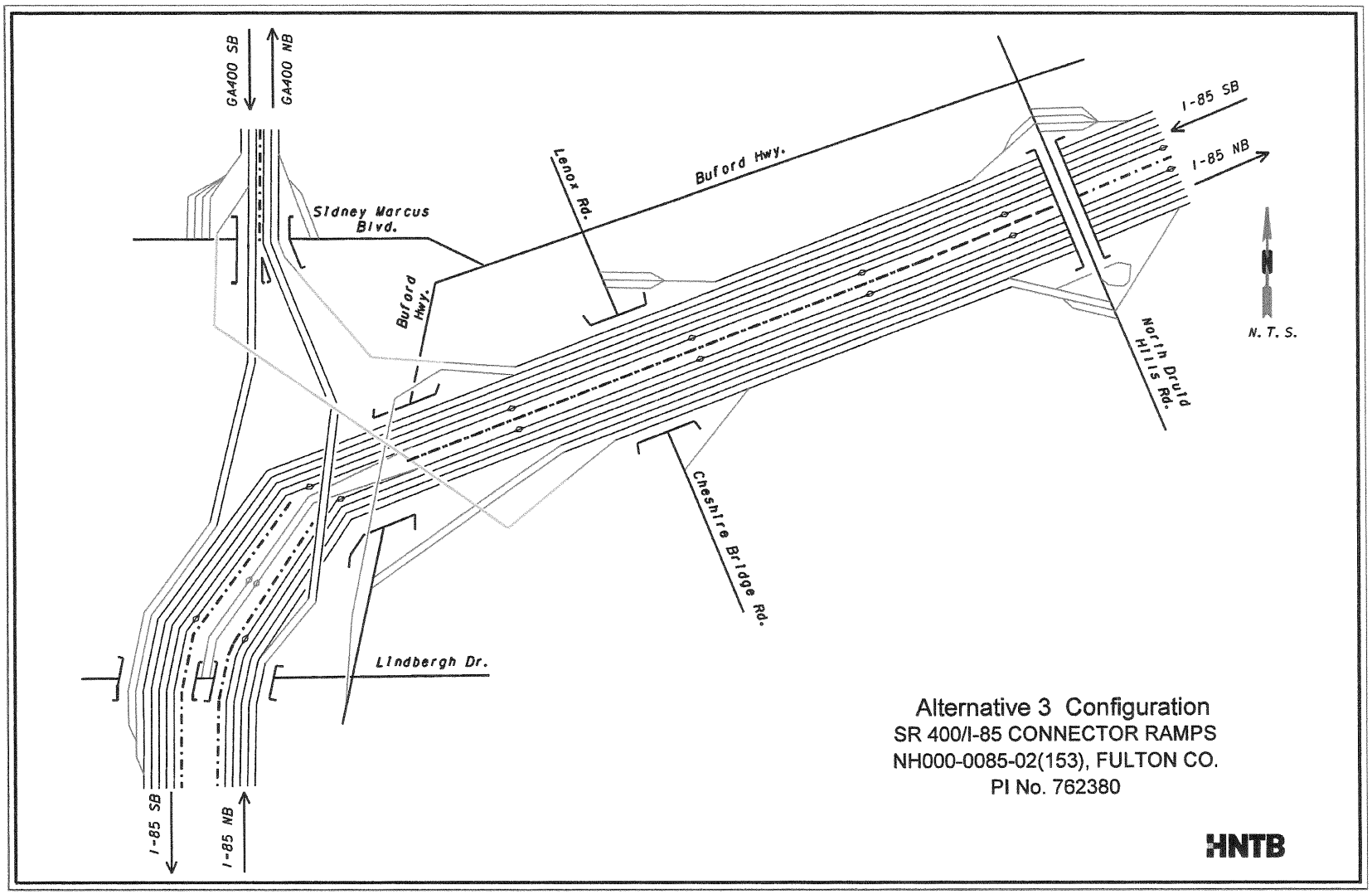
Alternative 1B Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380

HNTB



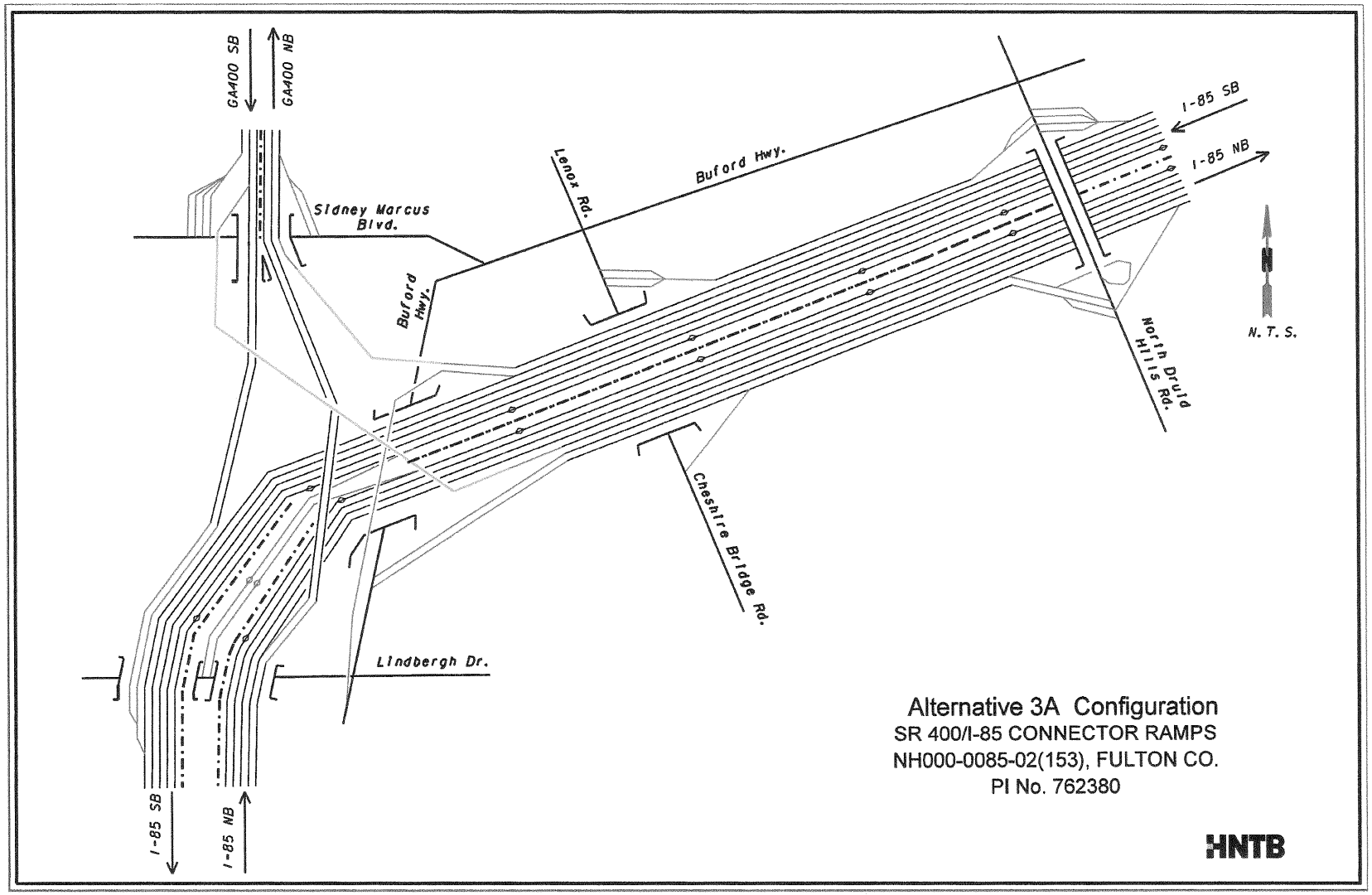
Alternative 2 Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380

HNTB



Alternative 3 Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380

HNTB


GA400 SB
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Sidney Marcus Blvd.
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Lenox Rd.
Buford Hwy.
I-85 SB
I-85 NB
N
N. T. S.
North Druid Hills Rd.
Cheshire Bridge Rd.
Lindbergh Dr.
I-85 SB
I-85 NB
Alternative 3A Configuration
SR 400/I-85 CONNECTOR RAMPS
NH000-0085-02(153), FULTON CO.
PI No. 762380
HNTB

VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis (VA) procedure used during the VE study conducted for the SR 400/Interstate 85 Connector Ramps project by Lewis & Zimmerman Associates, Inc. The workshop was performed January 12 – 15, 2009 at the concept report stage of completion. GDOT and HNTB, the design consultant provided information for the VE team to use as the basis of this study.

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

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

- VE workshop agenda
- 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 Concept Report, dated December 30, 2008, prepared by HNTB
- Project Cost Estimate, dated December 30, 2008, prepared by HNTB
- Concept Layout and Sections, dated December 30, 2008, prepared by HNTB

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 HNTB to develop cost models for the project. The models were 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 January 12, 2009 and concluding with the final VE presentation on Thursday January 15, 2009. 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 GDOT and the HNTB 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 this 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 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 HNTB design team and Central Office staff. The presentation was held on January 15, 2009 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 GDOT and the HNTB 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.

VALUE ENGINEERING STUDY AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will facilitate a 30-hour value engineering (VE) study on the Concept Report Submittal of the **SR 400/Interstate 85 Connector Ramps**, NH000-0085-02(153), P.I. No. 762380, Fulton 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 January 12 – 15, 2009 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, January 12, 2009

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

9:00 am – 11:00 am **Owner's/Designer's Presentation**

GDOT and the HNTB 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, January 13, 2009

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, January 14, 2009

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 HNTB design team representatives. The team will review all documentation and prepare for the presentation.

Thursday, January 15, 2009

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
Mike Moilanen, PE	Bridge Engineer	ARCADIS
Paresh Parikh, PE	Construction 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 SR 400/Interstate 85 Connector Ramps Project. The multidisciplinary team was comprised of the following 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
Mike Moilanen, PE	Bridge Engineer	ARCADIS
Paresh Parikh, PE	Construction Engineer	Delon Hampton & Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, January 12th by representatives from the GDOT and the HNTB 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.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Thursday January 15, 2009 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.

VE STUDY SIGN-IN SHEET

Project No.: NH000-0085-02(153) County: Fulton PI No.: 762380 Date: January 12-15, 2009

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
James K. Magnus	00208161	Construction	404-631-1971	jmagnus@dot.ga.gov
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VE WORKSHOP PARTICIPANTS

PROJECT: **SR 400/INTERSTATE I-85 CONNECTOR RAMPS**
Fulton County, Georgia
Concept Report Submittal – Value Engineering Study

DATE: **15 JANUARY 2009**

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ECONOMIC DATA

The comparisons of life cycle costs between the VE alternatives and the current design solutions were performed on the basis of discounted present worth. To accomplish this, the VE team developed economic criteria to use in its calculations based on information gathered from GDOT and the HNTB design team. The following parameters were used when calculating discounted present worth:

Year of Analysis:	2009
Construction Start Date:	2011
Construction Completion Date:	2013
Planning Period (n):	30 years starting in 2009
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 12% that includes:

Construction Administration & Engineering	12%

COST MODEL

The SR 400/Interstate 85 Connector Ramps Project will greatly improve safety and Level of Service along the alignment in this busy of area of Fulton County while reducing accidents caused by slow traffic in the corridor. To achieve these benefits, a considerable investment in the infrastructure is required, including construction of new ramps, signage, structures, and acquisition of the needed right of way. The total construction cost of the project is estimated at approximately $33.4M, plus engineering, right of way, and utilities totaling $5.5M. Since the structure cost is a substantial portion of the cost of the required construction, the total width of the section, profile, and alignment must be reviewed carefully to ensure proper investments are made.

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.

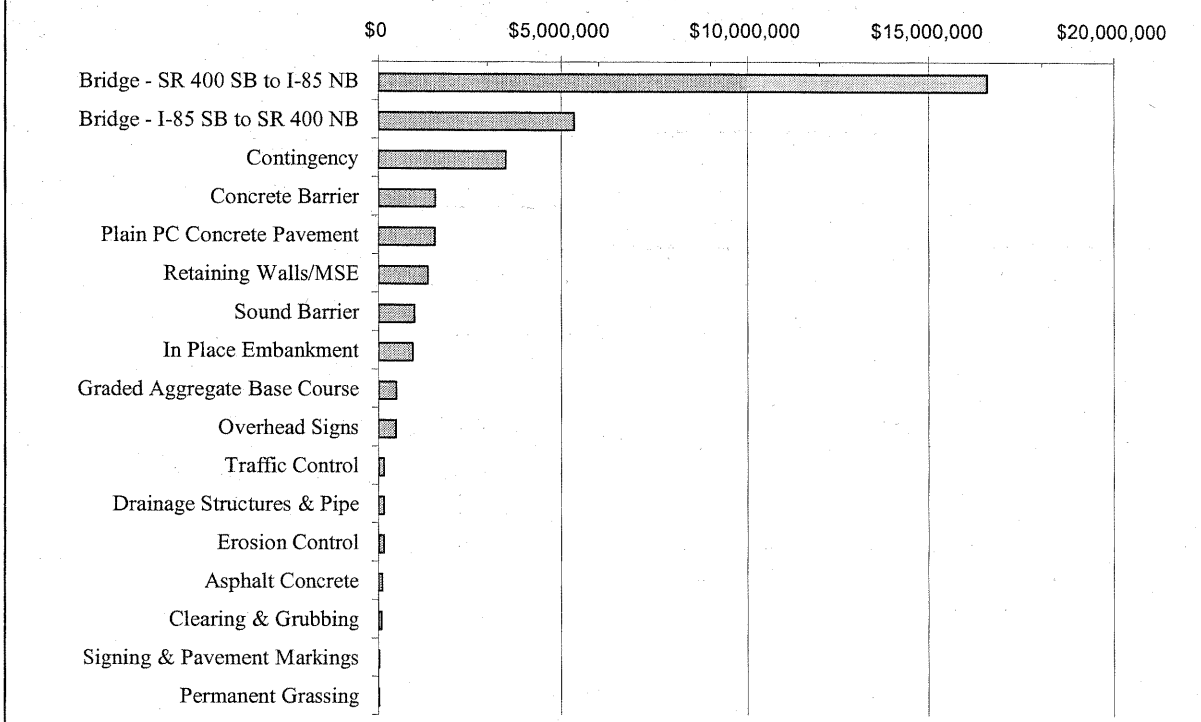
From this analysis, it can be seen that the bridge structures are a major component of the overall project cost and appears to be driven by the pavement area and total length of the roadway. Other cost components such as base, paving, and embankment appear prudent for a road widening project, but optimization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

COST HISTOGRAM

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project NH000-0085-02(153)

TOTAL PROJECT	COST	PERCENT	CUM. PERCENT
Bridge - SR 400 SB to I-85 NB	16,560,000	49.52%	49.52%
Bridge - I-85 SB to SR 400 NB	5,340,000	15.97%	65.49%
Contingency	3,500,000	10.47%	75.95%
Concrete Barrier	1,560,000	4.66%	80.62%
Plain PC Concrete Pavement	1,552,000	4.64%	85.26%
Retaining Walls/MSE	1,362,500	4.07%	89.33%
Sound Barrier	997,500	2.98%	92.31%
In Place Embankment	945,500	2.83%	95.14%
Graded Aggregate Base Course	485,000	1.45%	96.59%
Overhead Signs	480,000	1.44%	98.03%
Traffic Control	150,000	0.45%	98.47%
Drainage Structures & Pipe	150,000	0.45%	98.92%
Erosion Control	150,000	0.45%	99.37%
Asphalt Concrete	105,000	0.31%	99.69%
Clearing & Grubbing	75,000	0.22%	99.91%
Signing & Pavement Markings	15,000	0.04%	99.96%
Permanent Grassing	15,000	0.04%	100.00%
Construction Subtotal	***33,442,500***	100.00%	
Engineering and Construction Inspection 12.00%	4,013,100		
Right of Way	1,500,000		
Reimbursable Utilities	150,000		
TOTAL CONSTRUCTION & RIGHT OF WAY	**$ 39,105,600**	Comp Markup:	21.28%

80%



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 "Connect Movements" and "Improve Level of Service." However, "Reduce Accidents" and "Improve Access" 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 dedicated ramp will improve conditions, smf reduce traffic on local roads; and
- The relatively high travel times to make these movements appear to justify the new ramps.

RANDOM FUNCTION ANALYSIS

PROJECT: **SR 400/INTERSTATE 85 CONNECTOR RAMPS** SHEET NO.: **1 of 1**
Project No. NH000-0085-02(153) - Fulton County, Georgia

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Total Project Purpose and Need	***Reduce***	***Time***	***B***
	Connect	***Movements***	***B***
	Improve	***LOS***	***B***
	Maximize	Safety	G
	Save	Time	G
	Reduce	Accidents	G
	Improve	Access	G
	Satisfy	Drivers	G
	Minimize	ROW	G
	Manage	Drainage	RS
	Span	Facilities	RS
	Inform	Drivers	RS
	Minimize	Noise	RS
	Separate	Facilities	RS
	Control	Budget	G
	Manage	Schedule	G
	Control	Traffic	G
	Protect	Environment	G
	Improve	Travel	HO
	Construct	Facilities	LO

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 SR 400/Interstate 85 Connector Ramps 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 VE 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.

CATEGORY	PREFIX
General	G
(SB I-85 to NB SR 400 Ramp)	
Alignment	AS
Section	SS
Bridge	BS
(SB SR 400 to NB I-85 Ramp)	
Alignment	AN
Section	SN
Bridge	BN

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 be optimized through durable design features

After discussing each idea, the team evaluated the ideas by consensus. This produced 27 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: **SR 400/INTERSTATE 85 CONNECTOR RAMPS**
Project No. NH000-0085-02(153) - Fulton County, Georgia

SHEET NO.: **1 of 2**

NO.	IDEA DESCRIPTION	RATING
GENERAL (G)		
G-1	Add a ramp from NB I-85 to Lindbergh Drive and from Lindbergh to NB I-85. Cost Add.	3
G-2	Provide new entry ramp from Canterbury Road to NB SR 400.	2
	SB SR 400 TO NB I-85 Ramp	
ALIGNMENT (AS)		
AS-1	Extend Sidney Marcus to SB I-85 with a new ramp, but close Pine Tree Road.	4
AS-2	Add an exit ramp from SB SR 400 to Lindbergh Drive and allow traffic to enter NB I-85 on the existing NB I-85 HOV ramp.	4
AS-3	Reduce the ramp speed from 45mph to 35mph and reduce the curve radius.	5
AS-4	Use 35mph ramp; shorten the ramp, tighten radius to NB SR 400 before Sidney Marcus; save whole lane.	5
AS-5	See AS-2, plus, add entry ramp from Lindbergh to NB I-85 and synchronize signals.	4
SECTION (SS)		
SS-1	Use narrower lanes. 4ft shoulder + 14ft lane + 12ft shoulder = 30ft total	4
SS-2	Get a design variance on section width. 4ft shoulder + 14ft lane + 10ft shoulder = 28ft total.	4
SS-3	Narrower shoulders. 4 ft shoulder + 12 ft lane + 10ft shoulder = 26ft total.	4
BRIDGE (BS)		
BS-1	Lower the profile to meet 17.5ft clear on Buford Highway and Sidney Marcus Blvd.	4
BS-2	Shorten the bridge length over Buford Highway to 170ft and use bulb-T girders.	4
	SB I-85 to NB SR 400 Ramp	
ALIGNMENT (AN)		
AN-1	Extend the road from Sidney Marcus to an entry ramp at Lenox Road. Goes under I-85.	4
AN-2	Reduce the design speed from 45mph to 35mph and reduce the radius of the curve.	3
SECTION (SN)		
SN-1	Use narrower lane. 6ft shoulder + 14ft lane + 10ft shoulder = 30ft total.	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

CREATIVE IDEA LISTING

PROJECT:	**SR 400/INTERSTATE 85 CONNECTOR RAMPS** *Project No. NH000-0085-02(153) - Fulton County, Georgia*	SHEET NO.:	**2 of 2**

NO.	IDEA DESCRIPTION	RATING
	SB I-85 to NB SR 400 Ramp	
SECTION (SN) (cont.)		
SN-2	Get a design variance on section width. 4ft shoulder + 14 ft lane + 10ft shoulder = 28ft total.	4
SN-3	Narrower shoulders. 4ft shoulders + 12ft lane + 10ft shoulder = 26ft total.	4
SN-4	Use 35 mph design speed in lieu of 45mph.	5
BRIDGE (BN)		
BN-1	Reduce the profile if possible.	4
BN-2	Increase the slope from 3% to 6% from STA 323 to STA 330.	4
BN-3	Reduce the clear height at STA 335 from 30ft to 17.5ft.	4
BN-4	Revise the total profile per BN-2 & BN-3 and assume a concrete structure.	4
BN-5	Use radially oriented piers and eliminate the skew.	DS
BN-6	Reduce the column spacing on the steel option to less than 325ft.	DS
BN-7	Consider steel box girders.	DS
BN-8	Add an off ramp to SB Lenox Road/Cheshire Bridge.	4
BN-9	Use concrete bulb girders everywhere, except for steel members spanning over I-85.	5

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