

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENTAL CORRESPONDENCE

FILE: NHIM0-0285-01(354) DeKalb County OFFICE: Program Delivery
PI No.: 713290- DATE: November 3, 2010
I-285 at SR 155/Flat Shoals Road

FROM: Bobby K. Hilliard, P.E, State Program Delivery Engineer *B.K.H.*

TO: Ronald E. Wishon, State Project Review Engineer
Attn: Lisa Myers

SUBJECT: **Value Engineering Study-Reversal**

Reference is made to the VE Implementation letter dated February 12, 2004 for the above referenced project. Attached is a request to reverse implementation of Alternate #5. This Office concurs with the request.

If you have any questions, please contact Karyn Matthews at (404) 631-1584.

BKH: MAH: KMM
Attachments

Approved: *Ronald E. Wishon* 11/4/10
State Review Engineer Date

Approved: *James B. Baul* 11/5/10
Director of Engineering Date

Approved: *DeOMR* 11/9/10
Chief Engineer Date

Approved: *Paul J. Green* 4/27/2011
FHWA Date
** In accordance with the resubmittal approved by FHWA on 4/18/11*

Life Cycle Cost Analysis
Annual Discount Rate
PCC vs AC

7-year PCC Maintenance Cycle
4%

5-year AC Maintenance Cycle

Year	Activity	PCC		AC	
		Cost	Present Worth	Cost	Present Worth
0	Initial Construction	\$ 2,333,493.85	(\$2,333,493.85)	\$ 1,905,301.11	(\$1,905,301.11)
1	Maintenance	\$ -	\$0.00	\$ -	\$0.00
2	Maintenance	\$ -	\$0.00	\$ -	\$0.00
3	Maintenance	\$ -	\$0.00	\$ -	\$0.00
4	Maintenance	\$ -	\$0.00	\$ -	\$0.00
5	Maintenance	\$ -	\$0.00	\$ 9,607.71	(\$7,896.84)
6	Maintenance	\$ -	\$0.00	\$ -	\$0.00
7	Maintenance	\$ 169,083.60	(\$128,489.64)	\$ -	\$0.00
8	Maintenance	\$ -	\$0.00	\$ -	\$0.00
9	Maintenance	\$ -	\$0.00	\$ -	\$0.00
10	Maintenance	\$ -	\$0.00	\$ 288,231.23	(\$194,718.69)
11	Maintenance	\$ -	\$0.00	\$ -	\$0.00
12	Maintenance	\$ -	\$0.00	\$ -	\$0.00
13	Maintenance	\$ -	\$0.00	\$ -	\$0.00
14	Maintenance	\$ 169,083.60	(\$97,641.57)	\$ -	\$0.00
15	Maintenance	\$ -	\$0.00	\$ 15,769.92	(\$8,756.47)
16	Maintenance	\$ -	\$0.00	\$ -	\$0.00
17	Maintenance	\$ -	\$0.00	\$ -	\$0.00
18	Maintenance	\$ -	\$0.00	\$ -	\$0.00
19	Maintenance	\$ -	\$0.00	\$ -	\$0.00
20	Maintenance	\$ 106,579.40	(\$48,641.45)	\$ 1,236,361.44	(\$564,259.22)
21	Maintenance	\$ -	\$0.00	\$ -	\$0.00
22	Maintenance	\$ -	\$0.00	\$ -	\$0.00
23	Maintenance	\$ -	\$0.00	\$ -	\$0.00
24	Maintenance	\$ -	\$0.00	\$ -	\$0.00
25	Maintenance	\$ -	\$0.00	\$ 9,607.71	(\$3,604.01)
26	Maintenance	\$ -	\$0.00	\$ -	\$0.00
27	Maintenance	\$ 169,083.60	(\$58,640.99)	\$ -	\$0.00
28	Maintenance	\$ -	\$0.00	\$ -	\$0.00
29	Maintenance	\$ -	\$0.00	\$ -	\$0.00
30	Maintenance	\$ -	\$0.00	\$ 1,236,361.44	(\$381,193.31)
31	Maintenance	\$ -	\$0.00	\$ -	\$0.00
32	Maintenance	\$ -	\$0.00	\$ -	\$0.00
33	Maintenance	\$ -	\$0.00	\$ -	\$0.00
34	Maintenance	\$ 169,083.60	(\$44,562.34)	\$ -	\$0.00
35	Maintenance	\$ -	\$0.00	\$ 9,607.71	(\$2,434.74)
36	Maintenance	\$ -	\$0.00	\$ -	\$0.00
37	Maintenance	\$ -	\$0.00	\$ -	\$0.00
38	Maintenance	\$ -	\$0.00	\$ -	\$0.00
39	Maintenance	\$ -	\$0.00	\$ -	\$0.00
40	Maintenance	\$ 106,579.40	(\$22,199.32)	\$ 1,841,926.23	(\$383,653.05)
	Salvage	\$ 466,698.77	\$ (97,208.24)	\$ -	\$ -
	Total PW Value over 40-year lifespan		(\$2,830,877.40)		(\$3,451,817.45)
	Savings		\$620,940.05		

Life Cycle Cost Analysis
 Annual Discount Rate
 PCC vs AC

10-year AC Maintenance Cycle
 4%

Year	Activity	PCC		AC	
		Cost	Present Worth	Cost	Present Worth
0	Initial Construction	\$ 2,333,493.85	(\$2,333,493.85)	\$ 1,905,301.11	(\$1,905,301.11)
1	Maintenance	\$ 1,000.00	(\$961.54)	\$ -	\$0.00
2	Maintenance	\$ 1,000.00	(\$924.56)	\$ -	\$0.00
3	Maintenance	\$ 1,000.00	(\$889.00)	\$ -	\$0.00
4	Maintenance	\$ 1,000.00	(\$854.80)	\$ -	\$0.00
5	Maintenance	\$ 1,000.00	(\$821.93)	\$ -	\$0.00
6	Maintenance	\$ 1,000.00	(\$790.31)	\$ -	\$0.00
7	Maintenance	\$ 1,000.00	(\$759.92)	\$ -	\$0.00
8	Maintenance	\$ 1,000.00	(\$730.69)	\$ -	\$0.00
9	Maintenance	\$ 1,000.00	(\$702.59)	\$ -	\$0.00
10	Maintenance	\$ 1,000.00	(\$675.56)	\$ -	\$0.00
11	Maintenance	\$ 1,000.00	(\$649.58)	\$ 231,269.53	(\$150,228.28)
12	Maintenance	\$ 1,000.00	(\$624.60)	\$ -	\$0.00
13	Maintenance	\$ 1,000.00	(\$600.57)	\$ -	\$0.00
14	Maintenance	\$ 1,000.00	(\$577.48)	\$ -	\$0.00
15	Maintenance	\$ 1,000.00	(\$555.26)	\$ -	\$0.00
16	Maintenance	\$ 1,000.00	(\$533.91)	\$ -	\$0.00
17	Maintenance	\$ 1,000.00	(\$513.37)	\$ -	\$0.00
18	Maintenance	\$ 1,000.00	(\$493.63)	\$ -	\$0.00
19	Maintenance	\$ 1,000.00	(\$474.64)	\$ -	\$0.00
20	Maintenance	\$ 1,000.00	(\$456.39)	\$ -	\$0.00
21	Maintenance	\$ 1,000.00	(\$438.83)	\$ 231,269.53	(\$101,488.84)
22	Maintenance	\$ 1,000.00	(\$421.96)	\$ -	\$0.00
23	Maintenance	\$ 1,000.00	(\$405.73)	\$ -	\$0.00
24	Maintenance	\$ 1,000.00	(\$390.12)	\$ -	\$0.00
25	Maintenance	\$ 1,000.00	(\$375.12)	\$ -	\$0.00
26	Maintenance	\$ 1,000.00	(\$360.69)	\$ -	\$0.00
27	Maintenance	\$ 1,000.00	(\$346.82)	\$ -	\$0.00
28	Maintenance	\$ 1,000.00	(\$333.48)	\$ -	\$0.00
29	Maintenance	\$ 1,000.00	(\$320.65)	\$ -	\$0.00
30	Maintenance	\$ 1,000.00	(\$308.32)	\$ -	\$0.00
31	Maintenance	\$ 1,000.00	(\$296.46)	\$ 231,269.53	(\$68,562.23)
32	Maintenance	\$ 1,000.00	(\$285.06)	\$ -	\$0.00
33	Maintenance	\$ 1,000.00	(\$274.09)	\$ -	\$0.00
34	Maintenance	\$ 1,000.00	(\$263.55)	\$ -	\$0.00
35	Maintenance	\$ 1,000.00	(\$253.42)	\$ -	\$0.00
36	Maintenance	\$ 1,000.00	(\$243.67)	\$ -	\$0.00
37	Maintenance	\$ 1,000.00	(\$234.30)	\$ -	\$0.00
38	Maintenance	\$ 1,000.00	(\$225.29)	\$ -	\$0.00
39	Maintenance	\$ 1,000.00	(\$216.62)	\$ -	\$0.00
40	Maintenance	\$ 1,000.00	(\$208.29)	\$ -	\$0.00
	Salvage		\$ -	\$ 1,287,153.16	(\$156,237.41)
	Total PW Value over 40-year lifespan		(\$2,353,286.62)		(\$2,381,817.86)
	Savings		\$28,531.24		

PCC Rehabilitation Schedule and Costs

Year	Activity	Cost per LF of Joint	Ramp A		Ramp B		Ramp C		Ramp D		Total PCC Rehab Cost per Activity
			Ramp LF	Shoulder LF	Ramp LF	Shoulder LF	Ramp LF	Shoulder LF	Ramp LF	Shoulder LF	
7	Silicone Joint Seal/ Rubberized Asphalt Joint	\$ 2.10	\$ 43,169.70	\$ 7,933.80	\$ 21,865.20	\$ 17,740.80	\$ 4,399.50	\$ 24,223.50	\$ 4,890.90	\$ 128,895.90	
14	Silicone Joint Seal/ Rubberized Asphalt Joint	\$ 2.10	\$ 43,169.70	\$ 7,933.80	\$ 21,865.20	\$ 17,740.80	\$ 4,399.50	\$ 24,223.50	\$ 4,890.90	\$ 128,895.90	
27	Silicone Joint Seal/ Rubberized Asphalt Joint	\$ 2.10	\$ 43,169.70	\$ 7,933.80	\$ 21,865.20	\$ 17,740.80	\$ 4,399.50	\$ 24,223.50	\$ 4,890.90	\$ 128,895.90	
34	Silicone Joint Seal/ Rubberized Asphalt Joint	\$ 2.10	\$ 43,169.70	\$ 7,933.80	\$ 21,865.20	\$ 17,740.80	\$ 4,399.50	\$ 24,223.50	\$ 4,890.90	\$ 128,895.90	
			Ramp SY	Shoulder SY	Ramp SY	Shoulder SY	Ramp SY	Shoulder SY	Ramp SY	Shoulder SY	Total PCC Rehab Cost per Activity
20	Grind PCC Pavement	\$ 2.40	\$ 26,517.07	\$ 15,074.13	\$ 10,223.82	\$ 8,878.71	\$ 8,383.96	\$ 17,102.13	\$ 9,309.87	\$ 106,579.40	
40	Grind PCC Pavement	\$ 2.40	\$ 26,517.07	\$ 15,074.13	\$ 10,223.82	\$ 8,878.71	\$ 8,383.96	\$ 17,102.13	\$ 9,309.87	\$ 106,579.40	

AC Rehabilitation Schedule and Costs

Year	Activity	Cost per SF	Ramp A		Ramp B		Ramp C		Ramp D		Total AC Rehab Cost per Activity
			Ramp SF	Shoulder SF							
5	Crack Seal	\$ 0.04	\$ 99439.00	\$ 56528.00	\$ 38339.31	\$ 33295.18	\$ 41586.43	\$ 31439.84	\$ 64133.00	\$ 34912.00	\$ 9,607.71
10	Micromill	\$ 1.18	\$ 117,707.15		\$ 45,382.71		\$ 49,226.36		\$ 75,915.01		\$ 288,231.23
15	Crack Seal Including Shoulders	\$ 0.04	\$ 3,923.57	\$ 2,230.43	\$ 1,512.76	\$ 1,313.73	\$ 1,640.88	\$ 1,240.52	\$ 2,530.50	\$ 1,377.53	\$ 15,769.92
20	Mill/Inlay Including Shoulders	\$ 3.09	\$ 307,608.02	\$ 174,865.66	\$ 118,600.14	\$ 102,996.45	\$ 128,644.89	\$ 97,257.08	\$ 198,391.22	\$ 107,997.98	\$ 1,236,361.44
25	Crack Seal	\$ 0.04	\$ 3,923.57		\$ 1,512.76		\$ 1,640.88		\$ 2,530.50		\$ 9,607.71
30	Mill/Inlay Including Shoulders	\$ 3.09	\$ 307,608.02	\$ 174,865.66	\$ 118,600.14	\$ 102,996.45	\$ 128,644.89	\$ 97,257.08	\$ 198,391.22	\$ 107,997.98	\$ 1,236,361.44
35	Crack Seal	\$ 0.04	\$ 3,923.57		\$ 1,512.76		\$ 1,640.88		\$ 2,530.50		\$ 9,607.71
40	Deep Mill/Inlay Incl Shoulders	\$ 4.61	\$ 458,273.17	\$ 260,514.14	\$ 176,690.00	\$ 153,443.70	\$ 191,654.63	\$ 144,893.20	\$ 295,562.44	\$ 160,894.95	\$ 1,841,926.23

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

INTERDEPARTMENT CORRESPONDENCE

FILE: NH-IM-285-1(354) DeKalb
P.I. No. 713290
I-285 @ Flat Shoals Road

OFFICE: Engineering Services

DATE: February 12, 2004

FROM:  David Mulling, Project Review Engineer

FEB 18 2004

TO: Brent Story, State Consultant Design Engineer

**SUBJECT: IMPLEMENTATION OF VALUE ENGINEERING STUDY
ALTERNATIVES**

Recommendations for implementation of Value Engineering Study Alternatives are indicated in the table below. Incorporate the VE alternatives recommended for implementation to the extent reasonable in the design of the project.

ALT #	Description	Potential Savings/LCC	Implement	Comments
1-1A	This VE alternative uses bulb T beams continuous under live load in lieu of continuous steel plate girders on the Flat Shoals Road Bridge.	\$1,940,733	No	GDOT does not design PSC beam bridges continuous for live load. Also, the span is greater than Bridge Office recommends at this time.
1-2B	This VE alternative reduces the typical section on the Flat Shoals Road Bridge by eliminating both outside lanes on the bridge between the ramp terminals and uses bulb T beams.	\$2,291,317	No	Eliminating the outside lanes on the bridge results in a lower Level of Service (LOS) for the through movements across the bridge which is not "equal or better".
2-1A	This VE alternative uses a two span bulb T beam bridge rather than a four span bulb T beam bridge on Panthersville Road.	\$2,798,667	No	Does not adequately address future HOV/C-D Road needs. Also, introduces a dual parallel type exit ramp design in the future in lieu of the GDOT Standard tapered exit ramp design.

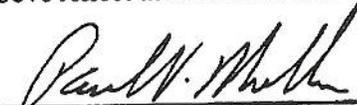
NH-IM-285-1(354) DeKalb, P.I. No. 713290
 Implementation of Value Engineering Study Alternatives
 Page 2

ALT #	Description	Potential Savings/LCC	Implement	Comments
3	This VE alternative eliminates the widening of the Shoal Creek bridge on both sides of I-285.	\$963,635	No	Not widening the Shoal Creek bridge in each direction on I-285 does not provide the total "Desirable" Ramp "C" & "D" lengths. Does not provide an "equal or better" situation.
4	This VE alternative uses Modular Block pre-cast walls for both the cut and fills Walls.	\$1,855,047	No*	Modular Block walls are not allowed for heights over 20 feet, where traffic railing is required at the top of the wall or beneath bridge end bents.
5	This VE alternative uses asphalt pavement on the ramps rather than concrete.	\$2,491,950	Yes	Grade change at ramp intersections make asphalt more desirable for ease of construction and minimized construction time.
6	This VE alternative uses a single point urban interchange (SPUI) rather than a diamond interchange.	\$763,684	No	Cost savings may not be realistic because of Staging and Maintenance of Traffic issues that were not addressed as part of this VE alternative.

* When the specifications for Modular Block Walls have been approved, it will be possible to allow the Contractor to bid on "Alternate" Wall Systems in the Contracts. This would have to be approved on a project by project basis by OMR and the Bridge Office.

A meeting was held on February 5, 2004 to discuss the above recommendations. Walter Boyd of the FHWA, Joe Wheeler of the Office of Consultant Design, Jim Kennerly, Al Bowman, and David Henry of the LPA Group and Ron Wishon of the Office of Engineering Services were in attendance. In addition, John Tiernan of the Bridge Office provided recommendations/comments for the meeting.

The results above reflect the consensus of all who provided input.

Approved:  Date: 2/17/04
 Paul V. Mullins, P. E., Chief Engineer

Approved:  Date: 2/17/04
 Robert Callan, P. E., FHWA Division Administrator

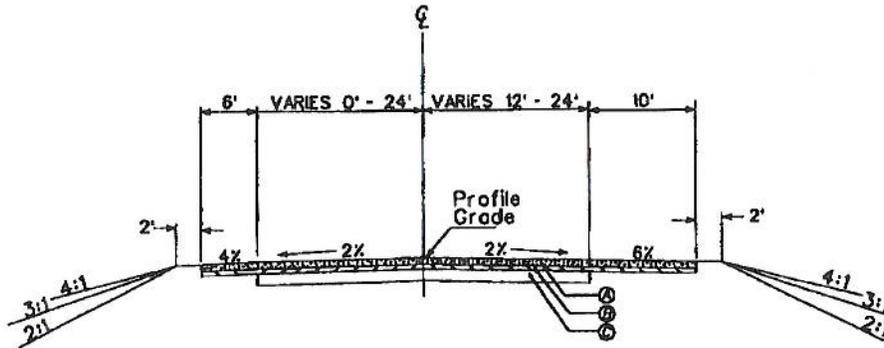
NH-IM-285-1(354) DeKalb, P.I. No. 713290
Implementation of Value Engineering Study Alternatives
Page 3

DTM/REW

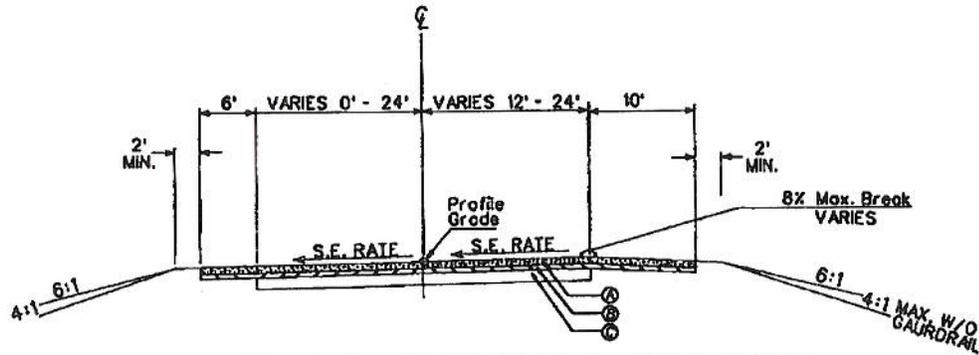
Attachments

c: Walter Boyd, FHWA
Gus Shanine, FHWA
Jim Kennerly, Al Bowman, and David Henry, The LPA Group
Lyn Clements, Bridge Design, G. O.
Joe Wheeler, Consultant Design, G. O.
Randy Hart, Construction, G.O.
Shun Pringle, District 7 Construction, Chamblee
Persephone Goodwin, District 7 Construction, Chamblee
Christa Wilkinson, Environmental/Location
Jerry Milligan, Right of Way, G. O.
Lisa Myers, Engineering Services, G. O.
General Files

CONC. TYPICAL



TYPICAL SECTION - ENTRANCE & EXIT RAMP
TANGENT SECTION



TYPICAL SECTION - ENTRANCE & EXIT RAMP
SUPERELEVATED SECTION

"AS PROPOSED"

REQUIRED PAYEMENT

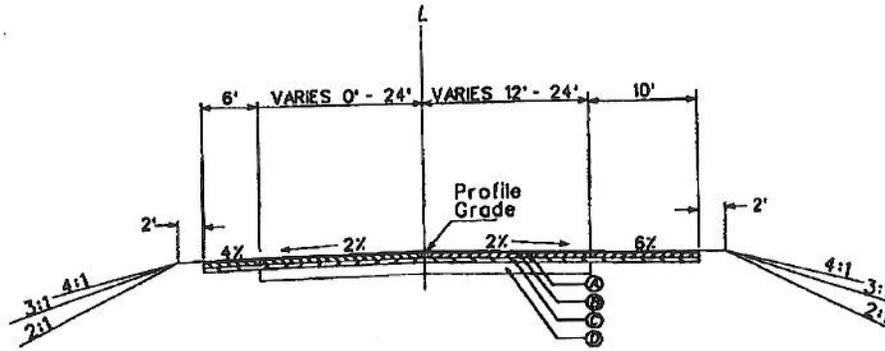
- Ⓐ 10' OF PORTLAND CONCRETE CEMENT
- Ⓑ RECYCLED ASPH CONC 19 mm SUPERPAVE 3'
- Ⓒ 12 INCHES GRADED AGGREGATE BASE

Value Engineering Alternative

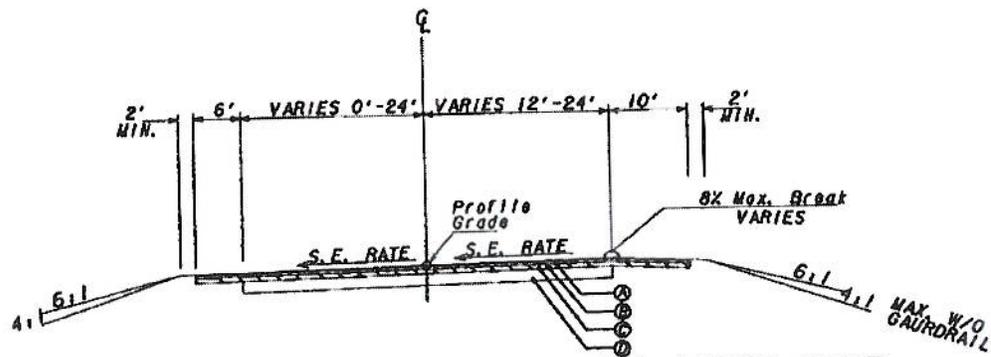
The value engineering team recommends the use of conventional asphalt paving on the ramps in lieu of the proposed concrete pavement. By using asphalt paving, this means that the same type of paving will be used throughout the project and will improve the staging, traffic impacts, and time of construction.

A life cycle cost analysis was performed in comparing the concrete paving with the asphalt paving. Some of the criteria used included a 40-year life of concrete, a 4% discount rate, resurfacing the asphalt every 13 years, etc as shown on the a following chart. The potential life cycle cost savings of using asphalt over concrete was \$793,689.

ASPHALT TYPICAL



TYPICAL SECTION - ENTRANCE & EXIT RAMP
TANGENT SECTION



TYPICAL SECTION - ENTRANCE & EXIT RAMP
SUPERELEVATED SECTION

VALUE ENGINEERING
ALTERNATIVE

REQUIRED PAVEMENT

- ① RECYCLED ASPH CONC 12.5 mm SUPERPAVE 1.5"
- ② RECYCLED ASPH CONC 19 mm SUPERPAVE 2"
- ③ RECYCLED ASPH CONC 25 mm SUPERPAVE 4"
- ④ 12 INCHES GRADED AGGREGATE BASE

**VALUE ENGINEERING ALTERNATIVE
INTERCHANGE RAMP PAVING
COST COMPARISON**

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
GRADED AGGREGATE BASE - 12"	SY	\$12.00	31000.0	\$372,000	31000.0	\$372,000
PORTAND CEMENT CONCRETE - 10"	SY	\$51.00	31000.0	\$1,581,000	0.0	\$0
ASPHALT CONCRETE, 4" SUPERPAVE BASE	TN	\$38.00		\$0	6820.0	\$259,160
ASPHALT CONCRETE, 3" SUPERPAVE BASE	TN	\$38.00	5115.0	\$194,370		\$0
ASPHALT CONCRETE, 2" SUPERPAVE BINDER	TN	\$42.00		\$0	3410.0	\$143,220
ASPHALT CONCRETE, 1 1/2" SUPERPAVE SURFACE	TN	\$42.00		\$0	2560.0	\$107,520
SUBTOTAL				\$2,147,370		\$881,900
INFLATION (5%, 4YRS)				\$472,421	0.0%	\$194,018
SUBTOTAL				\$2,619,791	0.0%	\$1,075,918
E & C			10.0%	\$261,979	10.0%	\$107,592
GRAND TOTAL				\$2,881,771	0.0%	\$1,183,510

**POSSIBLE SAVINGS
\$1,698,261**

INTERCHANGE RAMP PAVING

COMPARISON

40 Year Life Cycle Cost Comparison

Enter the Interest Rate = 4%

Year		AS PROPOSED		ALT 1	
0	INITIAL COST	\$1,581,000	-\$1,581,000	\$509,000	-\$509,000
1	MAINTENANCE	\$1,000	-\$962		\$0
2	MAINTENANCE	\$1,000	-\$925		\$0
3	MAINTENANCE	\$1,000	-\$889		\$0
4	MAINTENANCE	\$1,000	-\$855		\$0
5	MAINTENANCE	\$1,000	-\$822		\$0
6	MAINTENANCE	\$1,000	-\$790		\$0
7	MAINTENANCE	\$1,000	-\$760		\$0
8	MAINTENANCE	\$1,000	-\$731		\$0
9	MAINTENANCE	\$1,000	-\$703		\$0
10	MAINTENANCE	\$1,000	-\$676		\$0
11	MAINTENANCE	\$1,000	-\$650		\$0
12	MAINTENANCE	\$1,000	-\$625		\$0
13	MAINTENANCE	\$1,000	-\$601	\$170,000	-\$102,098
14	MAINTENANCE	\$1,000	-\$577		\$0
15	MAINTENANCE	\$1,000	-\$555		\$0
16	MAINTENANCE	\$1,000	-\$534		\$0
17	MAINTENANCE	\$1,000	-\$513		\$0
18	MAINTENANCE	\$1,000	-\$494		\$0
19	MAINTENANCE	\$1,000	-\$475		\$0
20	MAINTENANCE	\$1,000	-\$456		\$0
21	MAINTENANCE	\$1,000	-\$439		\$0
22	MAINTENANCE	\$1,000	-\$422		\$0
23	MAINTENANCE	\$1,000	-\$406		\$0
24	MAINTENANCE	\$1,000	-\$390		\$0
25	MAINTENANCE	\$1,000	-\$375		\$0
26	MAINTENANCE	\$1,000	-\$361	\$170,000	-\$61,317
27	MAINTENANCE	\$1,000	-\$347		\$0
28	MAINTENANCE	\$1,000	-\$333		\$0
29	MAINTENANCE	\$1,000	-\$321		\$0
30	MAINTENANCE	\$1,000	-\$308		\$0
31	MAINTENANCE	\$1,000	-\$296		\$0
32	MAINTENANCE	\$1,000	-\$285		\$0
33	MAINTENANCE	\$1,000	-\$274		\$0
34	MAINTENANCE	\$1,000	-\$264		\$0
35	MAINTENANCE	\$1,000	-\$253		\$0
36	MAINTENANCE	\$1,000	-\$244		\$0
37	MAINTENANCE	\$1,000	-\$234		\$0
38	MAINTENANCE	\$1,000	-\$225		\$0
39	MAINTENANCE	\$1,000	-\$217	\$170,000	-\$36,826
40	MAINTENANCE	\$1,000	-\$208		\$0
	SALVAGE		\$0	\$469,846	-\$97,864

-\$1,600,793

-\$807,104

SAVINGS \$793,689

Rigid Pavement Design Analysis
Based on AASHO Interim Guide for Design of Pavement Structures

P.I. No.	713290	Project No.	NHIMO-0285-01(354)	County	DeKalb
Description	I-285 at Flat Shoals Rd Ramps	Location	-	Type Section	JPCP
Begin Project	-	End Project	-	Project Length	-

Traffic Data

Begin Design Year	2017	Begin one way AADT, VPD	11000
End Design Year	2037	Ending one way AADT, VPD	15450
Total Truck %	5	Mean one way AADT, VPD	13225

Design Loading

Mean one way AADT		LDF		Volume, %			ESAL Factor	
13225	*	100	*	95	Vehicles	*	0.004	51
13225	*	100	*	2	SU	*	0.500	133
13225	*	100	*	3	MU	*	2.680	1,064
Total Daily ESAL's								1,248
Total Design Period ESALs				=	9,110,400			

Design Data

Terminal Serviceability, (Pt)	2.5	Working Stress	450 psi	Soil Support Value	2
Subgrade Modulus, k	110	Subbase Modulus, k ₁	210	Subbase Modulus, k ₂	265
Trial Depth of PCC Pavement, inches	10.00	Calculated Stress from Equation, psi			433.5
% Understressed	3.7	% Overdesigned	3.8	Balanced Thickness	9.8

Recommended Rigid Pavement Structure

10 inches Plain Portland Cement with 1.5 inch diameter dowel bars
 3 inches of 18 mm Superpave Asphaltic Concrete Interlayer
 12 inches Graded Aggregate Base

Prepared By A J Jubran Date 10/14/2010
 Recommended By _____ Date _____
 Approved By Office Head Date _____

 State Pavement Engineer

	Cost/Unit	Unit	Spread Rate	Amount	Unit Area
	\$ 31.00	SY		SY	
	\$ 63.29	TN	110#/SY/in	330	#/SY
	\$ 16.45	TN	150#/CF	1350	#/SY
	\$ 62.17	TN	110#/SY/in	165	#/SY
	\$ 63.29	TN	110#/SY/in	220	#/SY
	\$ 59.01	TN	110#/SY/in	660	#/SY
	\$ 16.45	TN	150#/CF	1350	#/SY
	\$ 1.97	GAL	0.04GAL/SY	0.04	GAL/SY

PCC Section

- Plain PC Conc Pvmt, Cl 1 Conc, 10-in thick
- 3-in 19mm Superpave, GP 1 or 2, Incl Bitum Mat'l and H. Lime
- 12-in Graded Aggregate Base

AC Ramp Pavement Section

- 1.5-in 12.5 mm Superpave, GP 2 only, Incl Bitum Mat'l and H. Lime
- 2-in 19 mm Superpave, GP 1 or 2, Incl Bitum Mat'l and H. Lime
- 6-in 25 mm Superpave, GP 1 or 2, Incl Bitum Mat'l and H. Lime
- 12-in Graded Aggregate Base
- Bituminous Tack Coat

Ramp A - Eastbound Exit Ramp	SF	SY
Ramp Pavement Area	99439.00	11048.78
Shoulder Pavement Area	56528.00	6280.89
Ramp B - Eastbound Entrance Ramp		
Ramp Pavement Area	38339.31	4259.92
Shoulder Pavement Area	33295.18	3699.46
Ramp C - Westbound Exit Ramp		
Ramp Pavement Area	41586.43	4620.71
Shoulder Pavement Area	31439.84	3493.32
Ramp D - Westbound Entrance Ramp		
Ramp Pavement Area	64133.00	7125.89
Shoulder Pavement Area	34912.00	3879.11

