

VALUE ENGINEERING REPORT

SR 204 / Abercorn Street Extension Improvements

Project No. NH000-0111-01(024)

PI No. 522870

Chatham County

April +, 2010

OWNER AND DESIGN TEAM:



Georgia Department of Transportation
600 West Peachtree Street
Atlanta, GA 30308

VALUE ENGINEERING CONSULTANT:



MACTEC Engineering and Consulting, Inc.
3200 Town Point Drive NW, Suite 100
Kennesaw, GA 30144

TABLE OF CONTENTS

VALUE ENGINEERING STUDY

SR 204 / Abercorn Street Extension Improvements

PI No. 522870

Chatham County

Executive Summary.....	1
Introduction	1
Considerations	2
Results Obtained	2
Recommendation Highlights.....	2
Summary of Potential Cost Savings.....	4
Study Identification	6
VE Team Members.....	6
Project Description	6
Project Constraints.....	7
Design Briefing	7
Project Vicinity Map – Figure 1	8
Existing Intersection – Figure 2	9
Project Limits – Figure 3	10
Project Plan – Figure 4	11
Value Engineering Recommendations	15
Appendix	
Cost Model	59
Function Analysis.....	60
Creative Ideas / Idea Evaluation.....	61
VE Study Sign-in Sheet.....	64

EXECUTIVE SUMMARY

Executive Summary

VALUE ENGINEERING STUDY SR 204 Abercorn Street Extension Improvements – Chatham County March 15-18, 2010

Introduction

This report presents the results of a value engineering (VE) study conducted on the proposed design for a new grade separated interchange at the intersection of SR 204 and Abercorn Street Extension at King George Boulevard (CR 71). This project is located approximately 250 miles southeast of Atlanta, and 12 miles southwest of downtown Savannah. It is classified as an urban principal arterial.

The project would begin just east of Pine Grove Road (CR 68) and end just west of Veterans Parkway (CR 975) and distance of 1.53 miles. SR 204 would be grade separated over King George Boulevard. The existing conditions contain four 12 foot lanes, a 20 foot median with concrete barrier and 12 foot outside shoulders, 10 foot of which is paved. Turn lanes are provided at various locations. The proposed design will maintain the four 12 foot lanes and a 20 foot median with concrete barrier. Outside shoulders would be 14 foot graded and 12 foot paved. Auxiliary lanes would be included at various locations. Provisions will be included to allow the widening of SR 204 in the future to 6 lanes. The interchange ramp configuration would include loop ramps in the northwest and southeast quadrants, along with semi-direct ramp from westbound SR 204 to northbound King George Boulevard. The elimination of the traffic signal at SR 204 and King George Boulevard will eliminate delays for through vehicles at this location and greatly reduce the number of rear end crashes. The new bridge on SR 204 over King George Boulevard will be 160 feet long and 170 feet wide.

The existing ADT (2009) is 55,700 with the design year ADT (2035) projected to be 82,700. The proposed design speed is 60 mph. Over 4000 feet of retaining walls are proposed varying in height from 2.5 feet to 27 feet.

The total estimated project cost is \$42,343,000 including \$7,500,000 in right of way, \$1,454,000 in utilities, \$26,094,000 in construction costs, \$2,686,000 in fuel and AC price adjustments, \$2,000,000 in mitigation costs and \$2,609,000 in E&I and contingencies.

The study was conducted on March 15-18, 2010, at the Georgia DOT headquarters Office in Atlanta using a four person VE team. It was conducted at the concept level design of these operation and safety related improvements.

This report presents the Team's recommendations and all back-up information, for consideration by the decision-makers. This **Executive Summary** includes a brief description of each recommendation. The **Study Identification** section contains information about the project and the team. The **Recommendations** section presents a more detailed description and support

information about each recommendation. The **Appendix** includes a complete record of the Team's activities and findings. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

Considerations

The VE team was advised of several restrictions to consider when developing their recommendations. The restrictions were: provide for future expansion and additional widening; some parcels of land have already been acquired; sound barriers will be used throughout; the bridge over the CSX will not be widened at this time; the sandy soils in this area preclude a 2:1 slope, 3:1 is minimum; be aware of the extensive wetlands in the area. The project's Draft Concept Report dated January 2010 has been submitted and was the subject of this VE effort.

Results Obtained

The VE team focused their efforts on the high cost items of the project. Through the use of functional analysis and "brain storming" techniques, the team generated 19 ideas with 17 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed 9 recommendations for consideration by the design team. Neglecting the overlapping nature of the recommendations as much as possible, the net total of all the recommendations have the potential to reduce project costs by as much as \$6,262,000 capital cost savings while continuing to provide the required functionality. This is shown in the last column of the Summary Tables that follows the summary description below.

A brief presentation of these recommendations was conducted on March 18th with the following in attendance: Lisa Myers, and Matt Sanders from GDOT Engineering Services; Tommy Crochet, Chris Marsengill and Jenny Jenkins from McGee Partners; Robert Murphy GDOT; Jennifer Tait GDOT Bridge Design; and the VE Team: Dave Wohlscheid, Alan Hunley, Greg Grant and George Obaranec as MACTEC PM. A summary of the recommendations follows.

Recommendation Highlights

B-1: Construct King George Boulevard over SR 204. This recommendation proposes to construct King George Boulevard over SR 204 in lieu of SR 204 over King George Boulevard as in the original design. This proposed change simplifies construction and SR 204 remains on grade, thus reducing wall heights, median barrier construction and paving.

The total potential savings if accepted is \$2,687,000

B-2: Use SE ramp alignment in NW quadrant. For the NW quadrant, use the ramp alignment as shown on the plans for the SE loop, 30 mph design speed. This idea is dependent on acceptance of idea B-1, constructing King George Blvd over SR 204, to eliminate the use of this ramp for mainline staging purposes.

The total potential savings if accepted is \$1,268,000

B-4: Use Shoulder pavement for ramps not required for staging. This recommendation proposes a reduced pavement thickness for ramp shoulders not required for staging operations. This will be at the ramps in the southeast quadrant.

The total potential savings if accepted is \$133,000

B-5: Use a reduced pavement section for King George Blvd. This recommendation proposes a reduced pavement thickness for King George Blvd. Existing traffic volumes (ADT's) on SR 204 are 63,000 vpd while the King George Blvd is 20,000 vpd, roughly 3 times the volume.

The total potential savings if accepted is \$173,000

C-2: Eliminate / minimize retaining wall at the sound barrier location along the NE quadrant. This recommendation eliminates the footing and retaining wall portions of the side barrier placed in front of and to protect the noise barrier, which will have post and footing elements as part of its own support.

The total potential savings if accepted is \$202,800

C-3: Eliminate / minimize retaining wall along the eastern limit of SR 204. This recommendation eliminates the footing and retaining wall portions of the side barrier placed in front of and to protect the noise barrier, which will have post and footing elements as part of its own support. This can be applied in areas where a 4:1 sideslope can be constructed, station 439+25 to 444+75.

The total potential savings if accepted is \$79,800

E-1: Use a center pier for the SR 204 bridge over King George Blvd. This recommendation proposes to use a two span bridge with a concrete intermediate bent in the middle of KGB to reduce the structure depth of the bridge and raise the profile of KGB. Jersey style side barrier will be added parallel to the intermediate pier to protect the travelling public and traffic impact attenuators will be added to the end of the piers at the side barrier ends to protect the blunt ends.

The total potential increase if accepted is (\$10,000)

G-2: Delete WB off ramp to King George Blvd and add a signal and left turn lane to the loop ramp. This recommendation would eliminate the SR204 WB ramp to NB KGB and add a left turn lane to the proposed ramp. A traffic signal is anticipated to be required.

The total potential savings if accepted is \$1,193,000

K-1: Eliminate interchange lighting. This recommendation will eliminate the high mast interchange lighting, which is adjacent to residential areas.

The total potential savings if accepted is \$630,000

Project No. NH000-0111-01(024)

**SR 204 / Abercorn Street Extension Improvements
PI No. 522870
Chatham County**

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
B	Base and Paving						
B-1	Bridge King George Boulevard over SR 204	11,660,000	8,973,000	2,687,000	-0-	2,687,000	2,687,000
B-2	Use SE ramp alignment in NW quadrant	1,268,000	-0-	1,268,000	-0-	1,268,000	1,268,000
B-4	Use shoulder pavement not full depth for ramps not required for staging	239,000	106,000	133,000	-0-	133,000	133,000
B-5	Use reduced pavement section for King George Boulevard	520,000	347,000	173,000	-0-	173,000	173,000
C	Retaining Walls						
C-2	Eliminate / minimize retaining wall at the sound barrier location along the NE quadrant	204,200	1,400	202,800	-0-	202,800	202,800
C-3	Eliminate/minimize retaining wall along the western limit of SR 204	80,300	500	79,800	-0-	79,800	79,800

Project No. NH000-0111-01(024)

**SR 204 / Abercorn Street Extension Improvements
PI No. 522870
Chatham County**

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
E	Bridges						
E-1	Use a center pier for the SR 204 bridge over King George Boulevard	2,816,000	2,826,000	(10,000)	-0-	(10,000)	-0-
G	Traffic Control and Staging						
G-2	Delete WB off ramp to King George Boulevard and add a signal and left turn lane to the loop ramp	1,317,000	124,000	1,193,000	-0-	1,193,000	1,193,000
K	Other						
K-1	Eliminate interchange lighting	630,000	-0-	630,000	-0-	630,000	525,000
	TOTAL POTENTIAL SAVINGS						6,262,000

STUDY IDENTIFICATION

Study Identification

Project: SR 204 / Abercorn ST. Ext. Improvements	Date: March 15-18, 2010
Location: Chatham County	

VE Team Members

Name:	Title:	Organization:	Telephone:
George Obaranec	Construction	MACTEC	770-421-3346
Alan Hunley	Roadway Design	Parsons	770-813-0882
Greg Grant	Structures	Wolverton Associates	678-366-9375
David Wohlscheid	VE Team Facilitator	MACTEC	571-217-0808

Project Description

This value engineering effort includes a four day study on the concept level design for these operation and safety improvements through the construction of a grade separated interchange at the intersection of SR 204 and Abercorn Street Extension at King George Boulevard (CR 71). This project is located approximately 250 miles southeast of Atlanta, and 12 miles southwest of downtown Savannah. It is classified as an urban principal arterial.

The project would begin just east of Pine Grove Road (CR 68) and end just west of Veterans Parkway (CR 975) and distance of 1.53 miles. SR 204 would be grade separated over King George Boulevard. The existing conditions contain four 12 foot lanes, a 20 foot median with concrete barrier and 12 foot outside shoulders, 10 foot of which is paved. Turn lanes are provided at various locations. The proposed design will maintain the four 12 foot lanes and a 20 foot median with concrete barrier. Outside shoulders would be 14 foot graded and 12 foot paved. Auxiliary lanes would be included at various locations. Provisions will be included to allow the widening of SR 204 in the future to 6 lanes. The interchange ramp configuration would include loop ramps in the northwest and southeast quadrants, along with semi-direct ramp from westbound SR 204 to northbound King George Boulevard. The elimination of the traffic signal at SR 204 and King George Boulevard will eliminate delays for through vehicles at this location and greatly reduce the number of rear end crashes. The new bridge on SR 204 over King George Boulevard will be 160 feet long and 170 feet wide.

The existing ADT (2009) is 55,700 with the design year ADT (2035) projected to be 82,700. The proposed design speed is 60 mph. Over 4000 feet of retaining walls are proposed varying in height from 2.5 feet to 27 feet.

The total estimated project cost is \$42,343,000 including \$7,500,000 in right of way, \$1,454,000 in utilities, \$26,094,000 in construction costs, \$2,686,000 in fuel and AC price adjustments, \$2,000,000 in mitigation costs and \$2,609,000 in E&I and contingencies.

Project Constraints:

The VE team was advised of several constraints to consider when developing their recommendations. The restrictions were:

- provide for future expansion and additional widening
- some parcels of land have already been acquired
- sound barriers will be used throughout the project
- the bridge over the CSX will not be widened at this time
- the sandy soils in this area preclude a 2:1 slope, 3:1 is minimum
- be aware of the extensive wetlands in the area

Project Briefing:

The VE team was given a design briefing on the current status of the project by Tommy Crochet of McGee Partners. The following items were discussed:

- SR 204 will remain a limited access roadway
- The area has a high accident rate mainly consisting of rear end collisions
- Many alternatives were considered as the design progressed
- The area is projected to grow, allow for future lane expansion
- Walls were used to minimize right of way for future needs
- The bridge at the intersection will be SR 204 over King George Boulevard
- Sound barriers will be used through out the project
- One additional parcel of land not shown in the documents will be taken at Mariners Way and King George Boulevard
- There are no environmental concerns except that there is a salt water marsh to the east but the project will not impact the marsh
- Additional wetlands are located in the area, but no impact identified
- There is one archeological dig in the project are that will have the artifacts removed prior to construction. Mitigation expense is included in the project costs
- No major work (widening) will take place during this phase on the bridge crossing the CSX Railroad to prevent the need to replace the bridge
- Retaining walls will be MSE walls where possible
- SWM will use ponds as shown on the plan. Outfall will be to the East on the South side of SR 204
- Soils indicate 2:1 slopes are not feasible due to the sandy nature of the material
- The existing Live Oak trees will be saved as much as practical
- Signalization will be provided at the ramp locations
- The interchange will be lit with high mast lighting

**Figure 1
Project Vicinity Map**

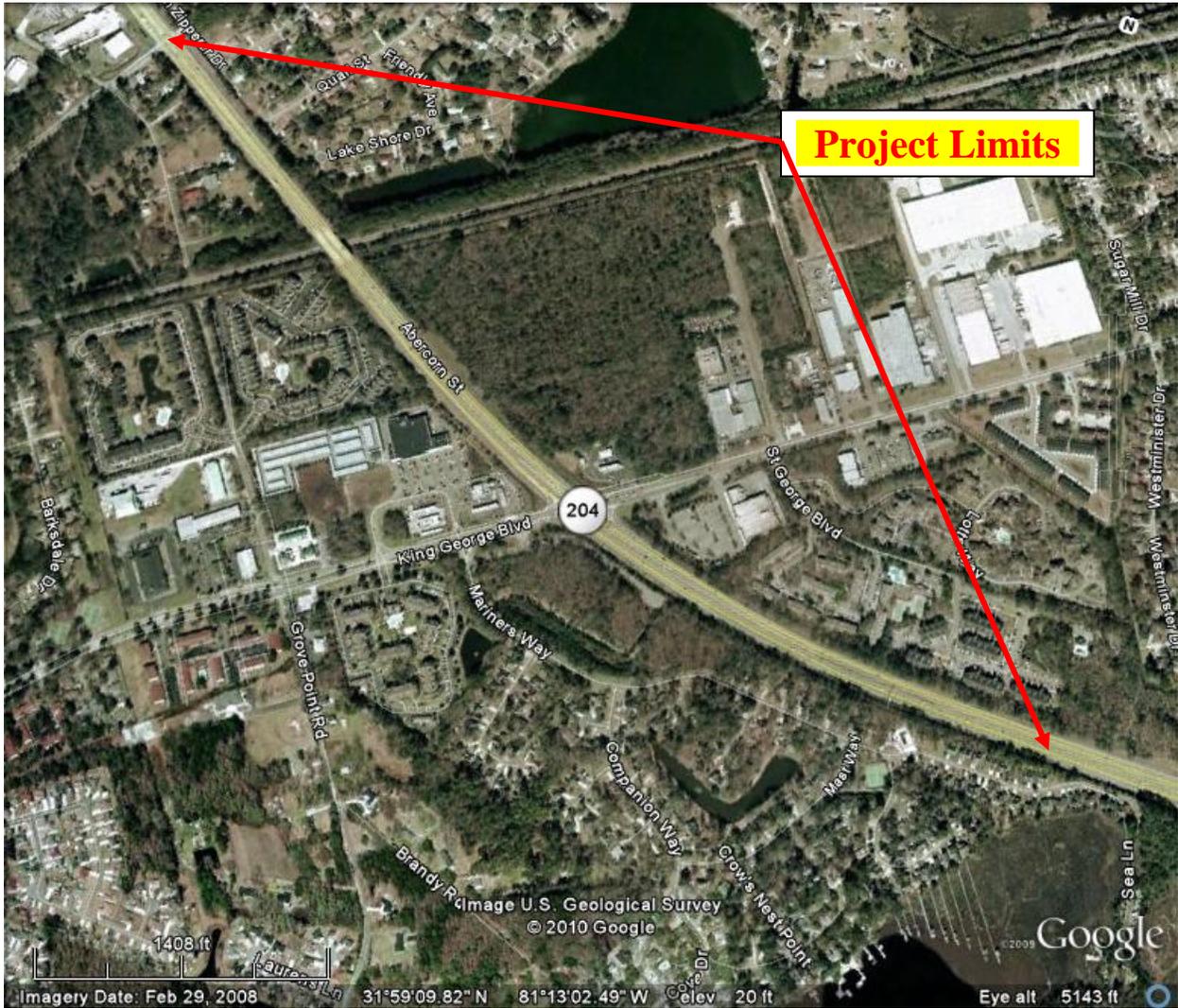


County Map of Georgia

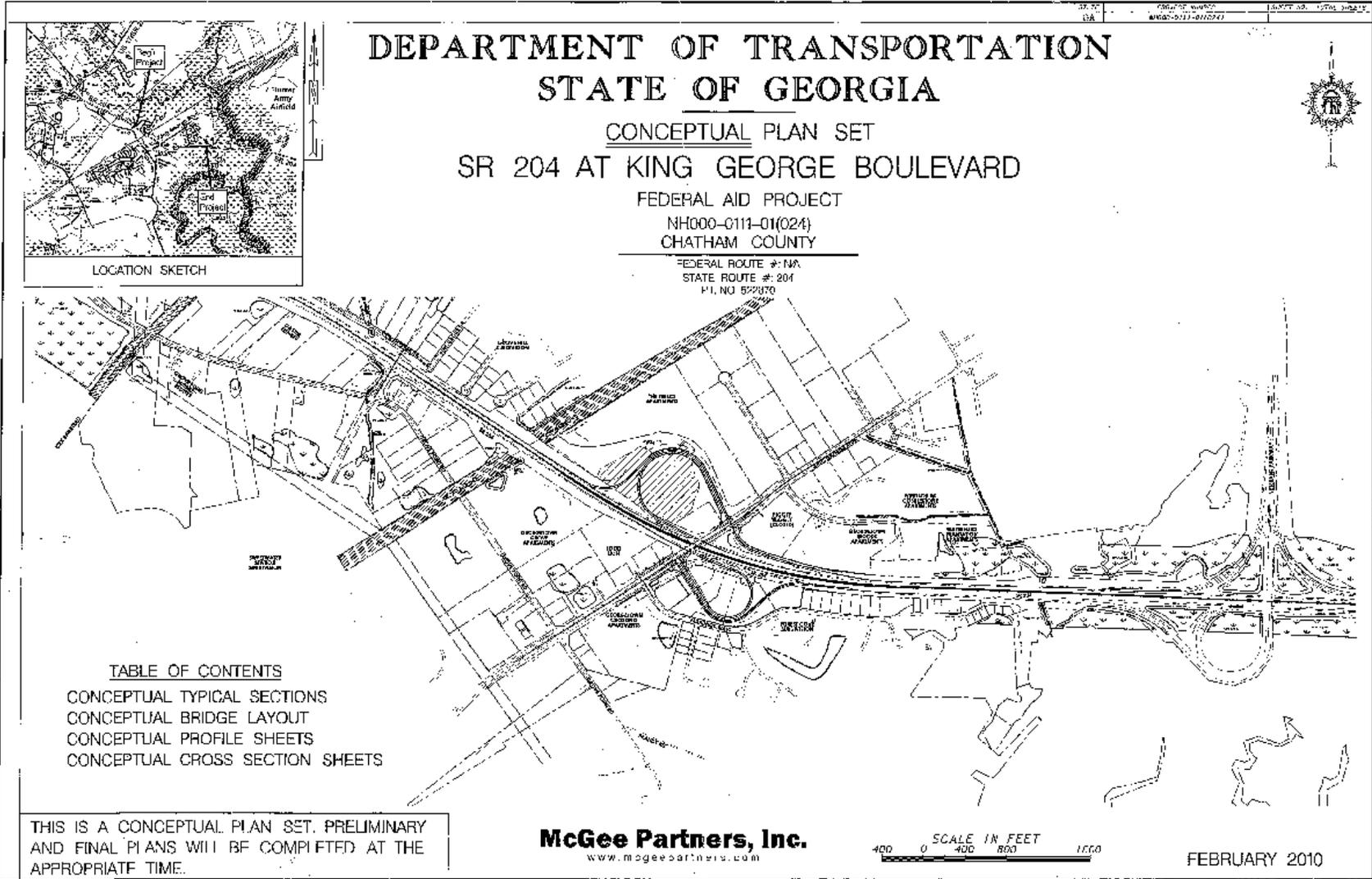
Figure 2
Existing Intersection

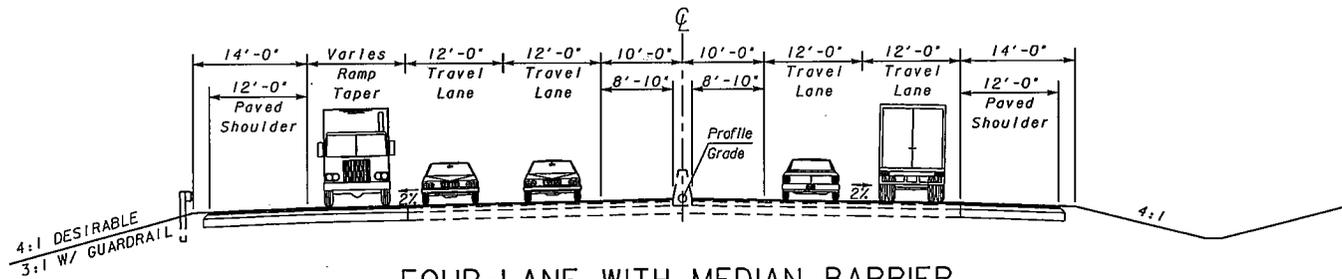


**Figure 3
Project Limits**

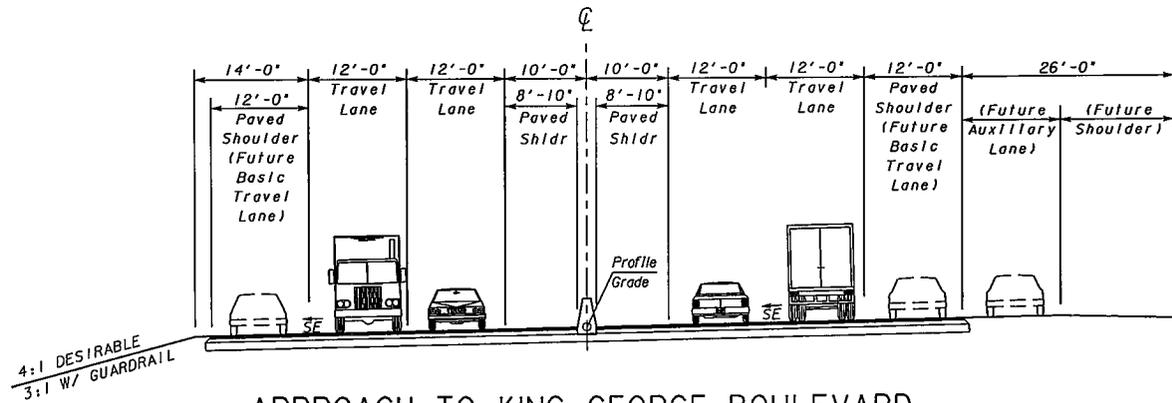


**Figure 4
Project Plan**

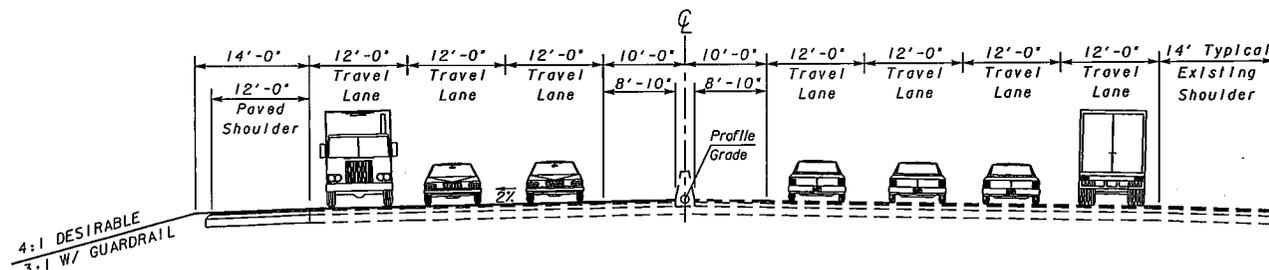




FOUR-LANE WITH MEDIAN BARRIER



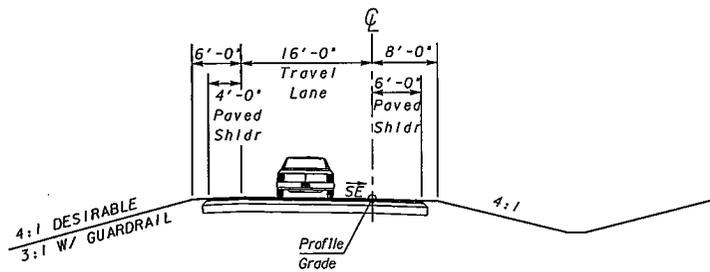
APPROACH TO KING GEORGE BOULEVARD



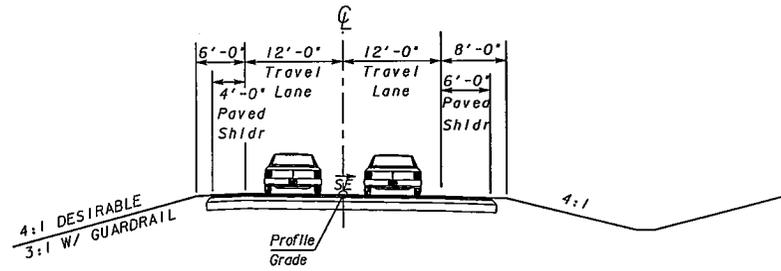
APPROACH TO VETERANS PARKWAY

CONCEPTUAL TYPICAL SECTIONS
 SR 204 AT KING GEORGE BOULEVARD
 PROJECT NO. NH000-0111-01024)
 P.I. NUMBER 522870
McGee Partners, Inc.
 SHEET 1 OF 2
 CHATHAM COUNTY
 JANUARY 2010

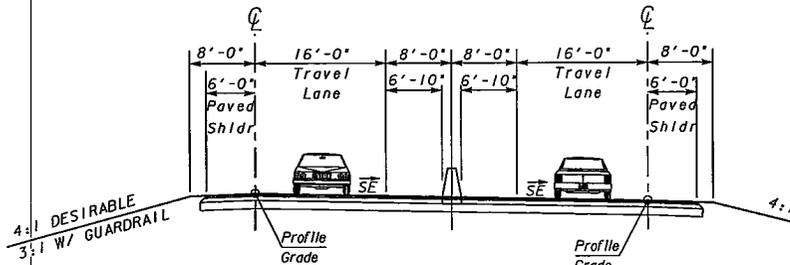
N.T.S.



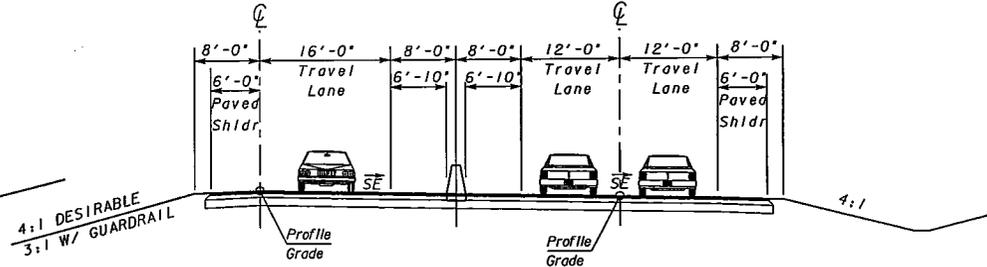
SINGLE-LANE RAMP



DUAL-LANE RAMP



RAMPS WITH MEDIAN BARRIER
(SINGLE LANE IN EACH DIRECTION)



RAMPS WITH MEDIAN BARRIER

CONCEPTUAL TYPICAL SECTIONS
 SR 204 AT KING GEORGE BOULEVARD
 PROJECT NO. NH000-0111-011024)
 P.I. NUMBER 522870
McGee Partners, Inc.
 SHEET 2 OF 2
 CHATHAM COUNTY
 JANUARY 2010

N.T.S.

Summary of Costs

Project Name: **SR 204, US 17 to Rio Road**
 Project No.: **NH000-0111-01(024)**
 Alt: **D1e - EB Loop, WB Loop**

PI No.: **522870**
 County **Chatham**
 Date: **19-Jan-10**

A. RIGHT OF WAY

1. Property (Land & Easement)	\$	2,500,000	
2. Displacements	\$	550,000	
3. Other Costs (Scheduling/Administration)	\$	4,450,000	
		SUBTOTAL: A. RIGHT OF WAY	\$ 7,500,000

B. UTILITIES

1. Railroad (Trackwork Etc.)			
2. Transmission Lines			
3. Other Services (Gas, Telephone, Water, Sewer)	\$	1,118,800	
		SUBTOTAL	\$ 1,118,800
Utilities Contingency: 30%		\$ 335,640	
		SUBTOTAL: B. UTILITIES	\$ 1,454,440

C. CONSTRUCTION

1. Traffic Control & Staging (Incl. Temp. Pavement, Bridges, Barriers)	\$	1,549,916	
2. Miscellaneous (Field Office, Training, R/W Markers)	\$	77,505	
3. Temporary Erosion Control & Grassing	\$	271,444	
4. Clearing & Grubbing	\$	728,000	
5. Earthwork	\$	1,386,528	
6. Base & Paving	\$	4,610,646	
7. Sidewalk, Curb & Gutter, Concrete Median	\$	198,896	
8. Driveways	\$	49,804	
9. Bridges (Incl. Approach Slabs, Slope Paving)	\$	3,230,766	
10. Retaining Walls	\$	4,173,956	
11. Box Culverts	\$	-	
12. Drainage	\$	863,597	
13. Permanent Erosion Control & Grassing	\$	205,199	
14. Removal	\$	400,193	
15. Permanent Concrete Barrier	\$	1,323,631	
16. Sound Barriers	\$	3,392,025	
17. Signing	\$	618,454	
18. Guardrail	\$	113,104	
19. Fencing	\$	44,213	
20. Traffic Signals	\$	214,000	
21. Marking	\$	41,725	
22. Sanitary Sewer	\$	-	
23. Water Distribution	\$	-	
24. Lighting	\$	870,000	
25. Landscaping	\$	200,000	
26. ATMS	\$	1,530,000	
		SUBTOTAL	\$ 26,093,602
Engineering & Inspection: 5%	\$	1,304,680	
Construction Contingency: 5%	\$	1,304,680	
Total Fuel Adjustment:	\$	1,254,863	
Total Liquid AC Adjustment:	\$	1,430,724	
INFLATION: @ 5% PER YEAR	\$	-	
NUMBER OF YEARS: 0			
		SUBTOTAL: C. CONSTRUCTION	\$ 31,388,549

D. MITIGATION

1. Wetlands & Streams n/a	\$	-	
2. Archaeological Mitigation	\$	2,000,000	
		SUBTOTAL: D. MITIGATION	\$ 2,000,000

TOTAL PROJECT COST \$ 42,342,989

VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-1	1 of 11	Bridge King George Boulevard over SR 204

Comp By:	GCG & AEH	Date: 3/15/10	Checked By:	GCG & AEH	Date: 3/15/10
-------------	--------------	---------------	----------------	--------------	---------------

Original Concept:

The original concept for carrying SR 204 over King George Boulevard (KGB) is a 160', single span bridge comprised of 74" prestressed concrete beams with a cast-in-place concrete deck. The superstructure is supported by pile supported concrete end bent caps with mechanically stabilized embankment (MSE) wall abutments. The proposed concrete raised median on KGB is 12 feet and outside clear distance is 16 feet minimum.

Proposed Change:

Use a two span bridge with a concrete intermediate bent in the middle of SR 204 to leave SR 204 on its current profile, KGB will require MSE retaining walls much like those proposed for SR 204.

Justification:

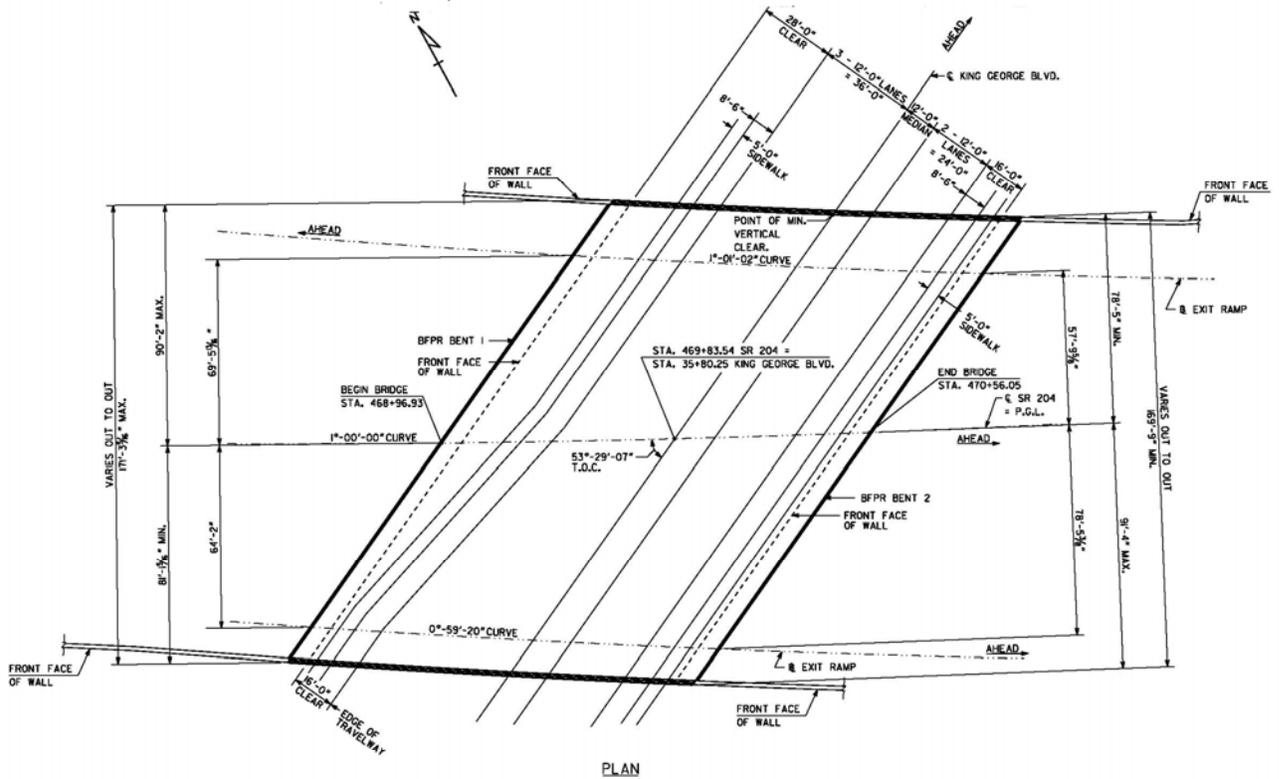
Construction of King George Blvd over SR 204:

- Retains SR 204 at existing grade. Pavement report indicates existing pavement is in good condition.
- Main line (SR 204) traffic can be maintained on existing roadway without detours throughout construction, simplifying MOT.
- Overall paving, median barriers, and walls can be reduced by leaving SR 204 on existing grade.
- King George Blvd. traffic can shift to temporary pavement southeast of existing King George Blvd., and excavating (lowering) KGB as proposed in original plans will not be required.
- King George Blvd. on site detour utilizes a portion of Credit Union property. No right of way costs are included for this scheme, since it is understood that the parcel will be acquired as a part of the project anyway.
- Sound barrier costs can likely be reduced as a result of having a lower grade on SR 204, but cost savings cannot be quantified at this stage of design and are not included in this estimate.

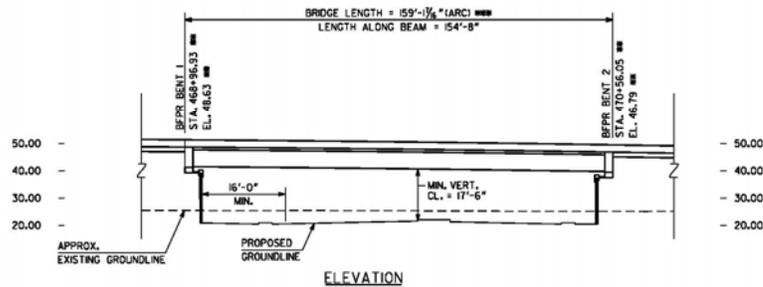
LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	\$11,660,000		
- Proposed	\$8,973,000		
- Savings	\$2,687,000		\$2,687,000
FUTURE COST - Savings		\$0	\$0
TOTAL PRESENT WORTH SAVINGS			\$2,687,000

Abercorn Street Extension Improvements

ITEM NO: B-1
 CLIENT: GDOT
 Sheet 2 of 11



PLAN

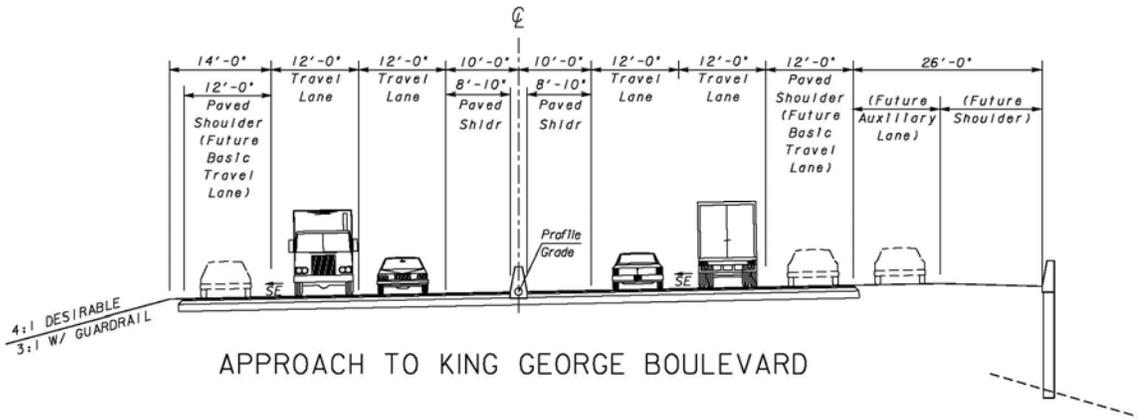


ELEVATION

ORIGINAL DESIGN

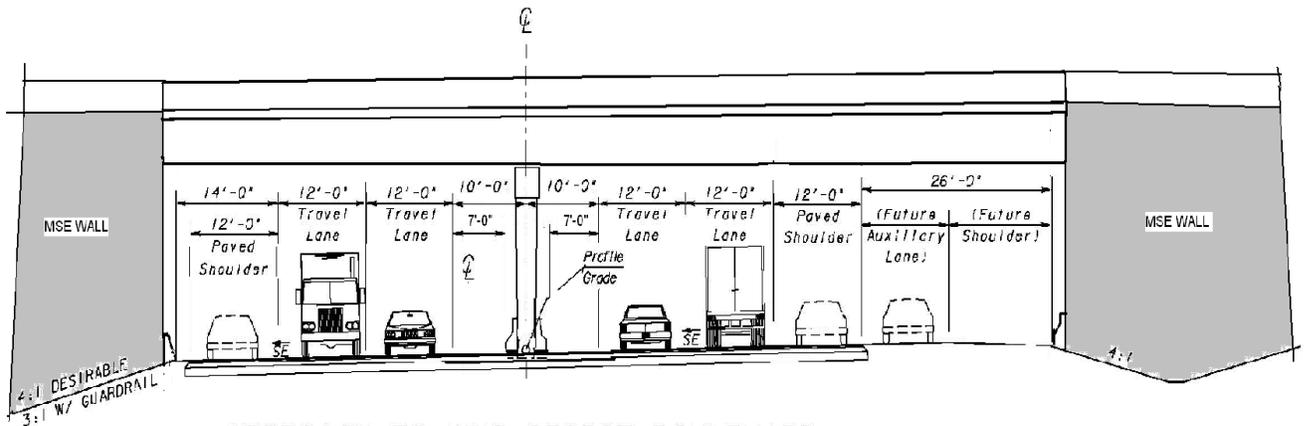
Abercorn Street Extension Improvements

ITEM N^o: B-1
 CLIENT: GDOT
 Sheet 3 of 11



APPROACH TO KING GEORGE BOULEVARD

ORIGINAL DESIGN

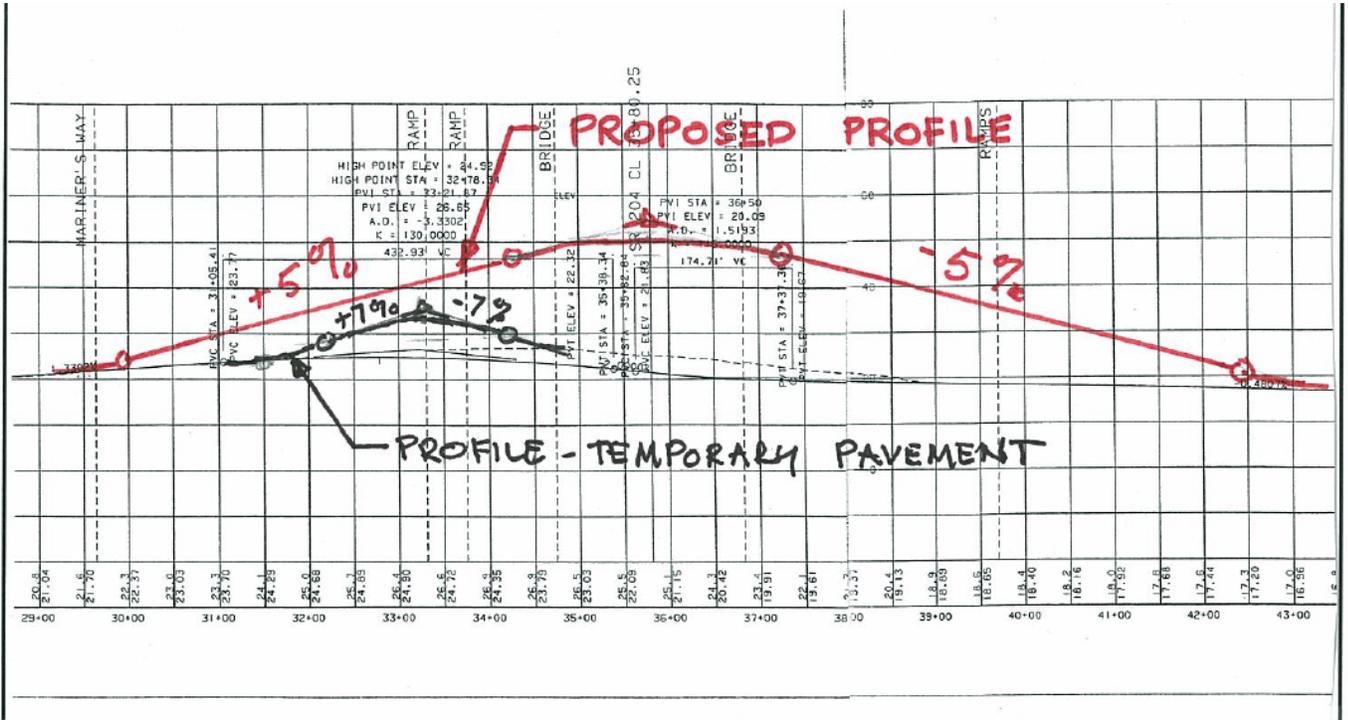


APPROACH TO KING GEORGE BOULEVARD

PROPOSED DESIGN

Abercorn Street Extension Improvements

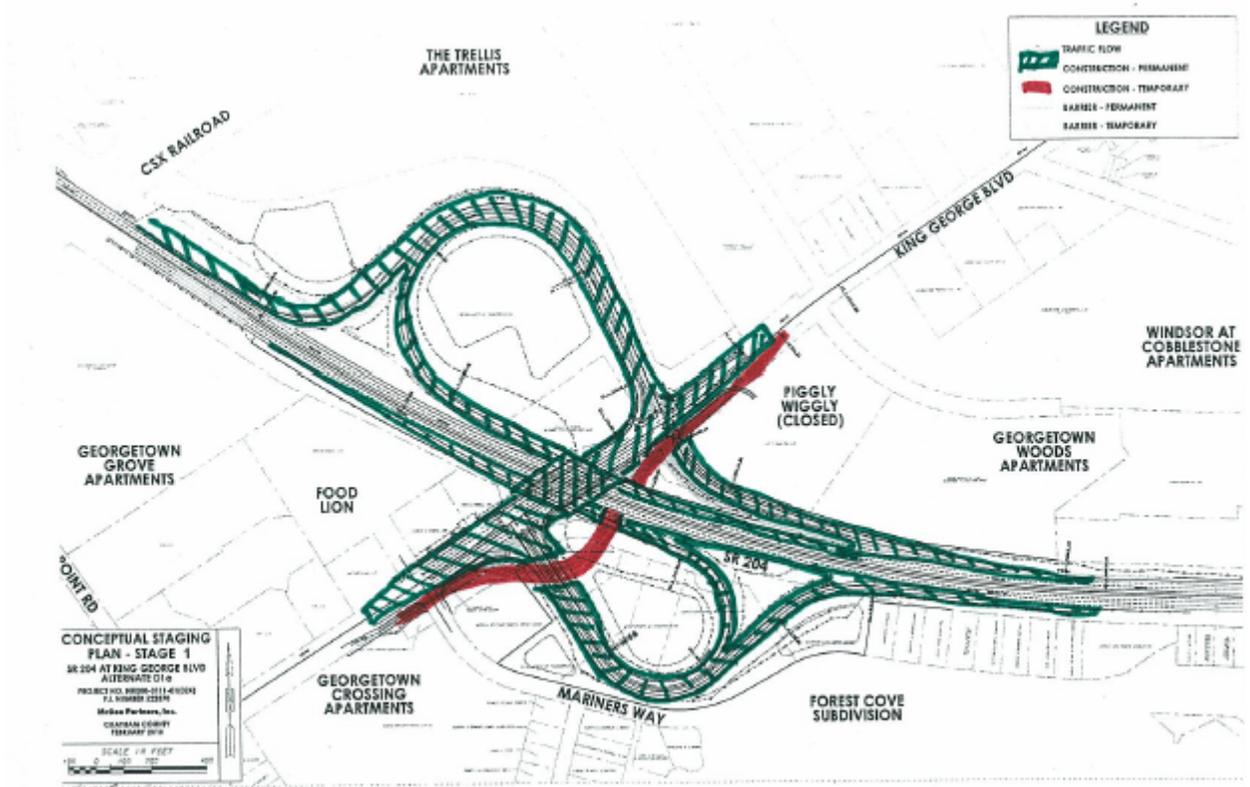
ITEM N^o: B-1
 CLIENT: GDOT
 Sheet 4 of 11



PROPOSED DESIGN

Abercorn Street Extension Improvements

ITEM N^o: B-1
CLIENT: GDOT
Sheet 5 of 11



PROPOSED DESIGN

CALCULATIONS - ROADWAY**Abercorn Street Extension Improvements**ITEM N^o: B-1
CLIENT: GDOT
Sheet 7 of 11Maintain SR 204 on Existing GradeMSE Walls

Current design shows all MSE walls associated with the embankment for raising SR 204 to cross over King George Blvd. Eliminate all walls associated with raising the grade of the existing pavement:

Eliminate:

627-9520 Retaining Wall – MSE 10-20 ft. high – SF 35,185 x \$53.00 = \$1,864,805

627-9530 Retaining Wall – MSE 20-30 ft high – SF 4,389 x \$55.00 = \$241,395Subtotal: \$2,106,200

Add:

627-9510 Retaining Wall – MSE 0 – 10 ft. high - \$50/SF

EB Sta. 458+00 to 468+00 – 1000 ft x 7 ft. high (avg.) = 7000 SF

7000 SF x \$50/SF = \$350,000Net Savings for MSE Walls \$2,106,200 - \$350,000 = \$1,756,200 USE: \$1,750,000Concrete Median Barrier – delete removal and reinstallation

610-0716 Remove Conc. Median Barrier – LF 3,400 x \$104.87/LF = \$356,558

621-6002 Concrete Barrier S-2- LF 3,300 x \$90.69/LF = \$299,277\$356,558 + \$299,277 = \$664,835 USE \$660,000Full Depth Pavement

Eliminate full depth pavement on existing SR 204 through lanes and inside shoulder:

EB: Station 458+00 to 468+97 and 470+56 to 479+00

1097 + 844 = 1941 LF x 33' (2 lanes + 9 ft shldr) = 64,053 SF

WB: same limits 64,053 SF

Total 128,106 SF

Pavement: 9 ¼ " asphalt/ 12 inch GAB

(9.25/12 ft) (150 #/CF) (1 ton/2000 #) = 0.0578 ton/SF

(12/12 ft) (135 #/CF) (1 ton/2000#) = 0.0675 ton/SF

Cost per SY

(0.0578 ton/sf x 9 sf/sy x \$65/ton) + (0.0675 ton/sf x 9 sf/sy x \$18.20/ton)=

\$33.81 + 11.06 = \$44.87/SY USE: \$45/SY

128,106 SF x 1 SY/9 SF = 14,234 SY x \$45/SY = \$640,530 USE \$640,000

CALCULATIONS - ROADWAY

Abercorn Street Extension Improvements

ITEM N^o: B-1
CLIENT: GDOT
Sheet 8 of 11

Earthwork

Eliminate earthwork associated with raising the grade on SR 204:

EB: Station 458+00 to 468+97 = 1097 ft., fill varies 0 to 23 ft., width = 73 ft (avg.)	
Fill = [1097 ft. x ½ (0 + 23) x 73] / 27 CF/CY =	34,109 CY
EB: Station 470+56 to 475+50 = 494 ft., fill varies 22 ft. to 8 ft., width = 90 ft. (avg.)	
Fill = [494 ft. x ½ (22 + 8) x 90] / 27 CF/CY =	24,700 CY
Station 475+50 to 479+00 = 350 ft., fill varies 8 ft. to 0 ft., width = 60 ft. (avg.)	
Fill = [350 ft. x ½ (8 + 0) x 60] / 27 CF/CY =	3,111 CY
WB Station 458+00 to 468+97 = 1097 ft., fill varies 0 to 23 ft., width = 90 ft (avg.)	
Fill = [1097 ft. x ½ (0 + 23) x 90] / 27 CF/CY =	42,052 CY
WB: Station 470+56 to 479+00 = 844 ft., fill varies 18 ft. to 0 ft., width = 75 ft. (avg.)	
Fill = [844 ft. x ½ (18 + 0) x 75] / 27 CF/CY =	<u>21,100 CY</u>
Total Fill (raw)	125,072 CY

Shrinkage, per Soil Report, is 25%; Borrow = 125,072/(1 - 0.25) = 166,762 CY
USE 165,000 CY x \$4.00/CY = \$660,000

Traffic Control and Staging

Stage 1

Build temporary pavement for King George Blvd. to SE of existing roadway. Run King George Blvd on temp pavement and SR 204 on existing pavement. Temporary pavement required is equivalent to temporary pavement in original design Stage 1. Build entire project (except final surface and islands) with the exception of leaving a 'gap' for where the ramps intersect the temporary pavement for King George Blvd.

Stage 2 to begin on a Friday Night

Shift traffic to new King George Blvd. Open all westbound loop ramps. Construct fill in the eastbound ramps and temporary ramp pavement to open the ramps on Saturday morning.

Stage 3

Complete westbound semi-direct ramp and open to traffic. Complete final paving and islands.

150-1000 Traffic Control LS original estimate: \$990,000

Assume 50% savings by using simplified traffic control

\$990,000 x 0.5 = \$495,000

USE \$500,000

CALCULATIONS - ROADWAY

Abercorn Street Extension Improvements

ITEM N^o: B-1
CLIENT: GDOT
Sheet 9 of 11

Construct King George Blvd. over SR 204

MSE Walls

Construct MSE Wall on NW side of King George Blvd. between station 30+50 and 34+50.

Add:

627-9520 Retaining Wall – MSE 10-20 ft. high:

Assume 15' high by 200' long: $15 \times 200 = 3,000 \text{ SF} @ \$53.00/\text{SF} = \$159,000$

627-9530 Retaining Wall – MSE 20-30 ft high:

Assume 25' high by 200' long: $25 \times 200 = 5,000 \text{ SF} @ \$55.00/\text{SF} = \$250,000$

Construct MSE Bridge Abutments

627-9530 Retaining Wall – MSE 20-30 ft. high:

South Abutment: Assume 25' high by (110 ft. face + 75 ft runoff)

$25 \times (110 + 75) = 25 \times 185 = 4625 \text{ SF} \times \$55.00/\text{SF} = \$254,375$

North Abutment: Assume 25' high by (110 ft face + 150 ft runoff)

$25 \times (110 + 150) = 25 \times 260 = 6500 \text{ SF} \times \$55.00/\text{SF} = \$357,500$

Total Additional Cost for MSE Walls: $\$159,000 + \$250,000 + \$254,375 + \$357,500 =$
 $\$1,020,875$ USE \$1,000,000

Unclass Excav.

Eliminate item. All roadway construction will be on embankment.

205-0001 Unclass Excav. $\text{CY } 12,540 \times \$3.20 = \$40,128$ USE \$40,000

Full Depth Pavement

Provide full depth pavement from station 27+00 to 44+00, less the length of the bridge (184').

Length = $(4400 - 2700) - 184 = 1700 - 184 = 1,516 \text{ LF}$

Width = 100' avg from Sta 27+00 to 34+50 = $100 \times (3450 - 2700) = 100 \times 750 = 75,000 \text{ SF}$

Width = 60' avg. from Sta 36+75 to 44+00 = $60 \times (4400 - 3675) = 60 \times 725 = 43,500 \text{ SF}$

Total Full Depth Pavement Required:

$(75,000 + 43,500) \times 1 \text{ SY}/9\text{SF} = 118,500/9 = 13,167 \text{ SY}$

Pavement: 9 ¼ "asphalt/ 12 inch GAB

CALCULATIONS - ROADWAY

Abercorn Street Extension Improvements

ITEM N^o: B-1
CLIENT: GDOT
Sheet 10 of 11

$(9.25/12 \text{ ft}) (150 \text{ \#/CF}) (1 \text{ ton}/2000 \text{ \#}) = 0.0578 \text{ ton/SF}$

$(12/12 \text{ ft}) (135 \text{ \#/CF}) (1 \text{ ton}/2000\text{\#}) = 0.0675 \text{ ton/SF}$

Cost per SY

$(0.0578 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65/\text{ton}) + (0.0675 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18.20/\text{ton}) =$

$\$33.81 + 11.06 = \$44.87/\text{SY}$ USE: $\$45/\text{SY}$

$13,167 \text{ SY} \times \$45/\text{SY} = \$592,500$

USE $\$600,000$

Earthwork

$L \times w \times 1/2 \text{ h (avg.)} \times 1 \text{ CY}/27 \text{ CF} = \text{raw fill}$

$(750' \text{ long} \times 120' \text{ wide} \times 24/2')/27 = 1,080,000/27 = 40,000 \text{ CY}$

$(725' \text{ long} \times 80' \text{ wide} \times 24/2')/27 = 696,000/27 = 25,778 \text{ CY}$

Raw fill = $40,000 + 25,778 = 65,778 \text{ CY}$

Shrinkage, per Soil Report, is 25%; Borrow = $65,778/(1 - 0.25) = 87,704 \text{ CY}$

$87,704 \text{ CY} \times \$4.00/\text{CY} = \$350,816$ USE $\$350,000$

Effect on Ramps

Assume additional embankment required for ramps requires overall grading approximately equal to current design. Assume no changes to paving or other permanent items.

Net assumption is no change in costs due to ramps.

CALCULATIONS - BRIDGE

Abercorn Street Extension Improvements

ITEM N^o: B-1
CLIENT: GDOT
Sheet 11 of 11

Scaled from H&L layout along centerline of KGB

Say Span over WB SR 204 = 110 feet (119 max, 105 min)

Say Span over EB SR 204= 114 feet (121 max, 108 min)

Bridge Width of King George would be:

Looking ahead station: 1'-2 1/2" parapet + 5.5 ft side walk + 4 x 12 ft lanes (Southbound) + 12 foot median + 2 x 12 ft lanes (Northbound) + 5.5 ft sidewalk + 1'-2 1/2" Parapet = 97'-5"

Say 98 ft wide bridge for round numbers

Structure Depth Determination:

Spans are 114 feet max.

114 feet span controls.

Use Span Charts from the GDOT Bridge Design Policy Manual as a Guide.

For 114 foot span, the most appropriate beam is a 54" bulb T prestressed beam.

Structure depth would be 54" +8" slab + 4" coping allowance = 5.5 feet of structure depth

The original design bridge cost was based on square foot costs.

28,160 sq ft x \$100 per square foot = \$2,816,000

The proposed design bridge would be

(110 ft +114 ft) x 98 ft wide = 21,952 sq ft

21,952 sq ft x \$100/sq ft = \$2,195,200

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-2	1 of 4	Use SE ramp alignment in NW quadrant
Comp By: GAO	Date: 3-16-10	Checked By: DCW Date: 3-17-10

Original Concept:

Use current ramp alignments. The NW loop ramp has a larger radius design for a 35 mph design speed. This ramp will be used for SR204 mainline traffic during the staged construction. The SE loop uses a design speed of 30 mph.

Proposed Change:

For the NW quadrant, use the ramp alignment as shown on the plans for the SE loop, 30 mph design speed. This idea is dependent on acceptance of idea B-1, constructing King George Blvd over SR 204, to eliminate the use of this ramp for mainline staging purposes.

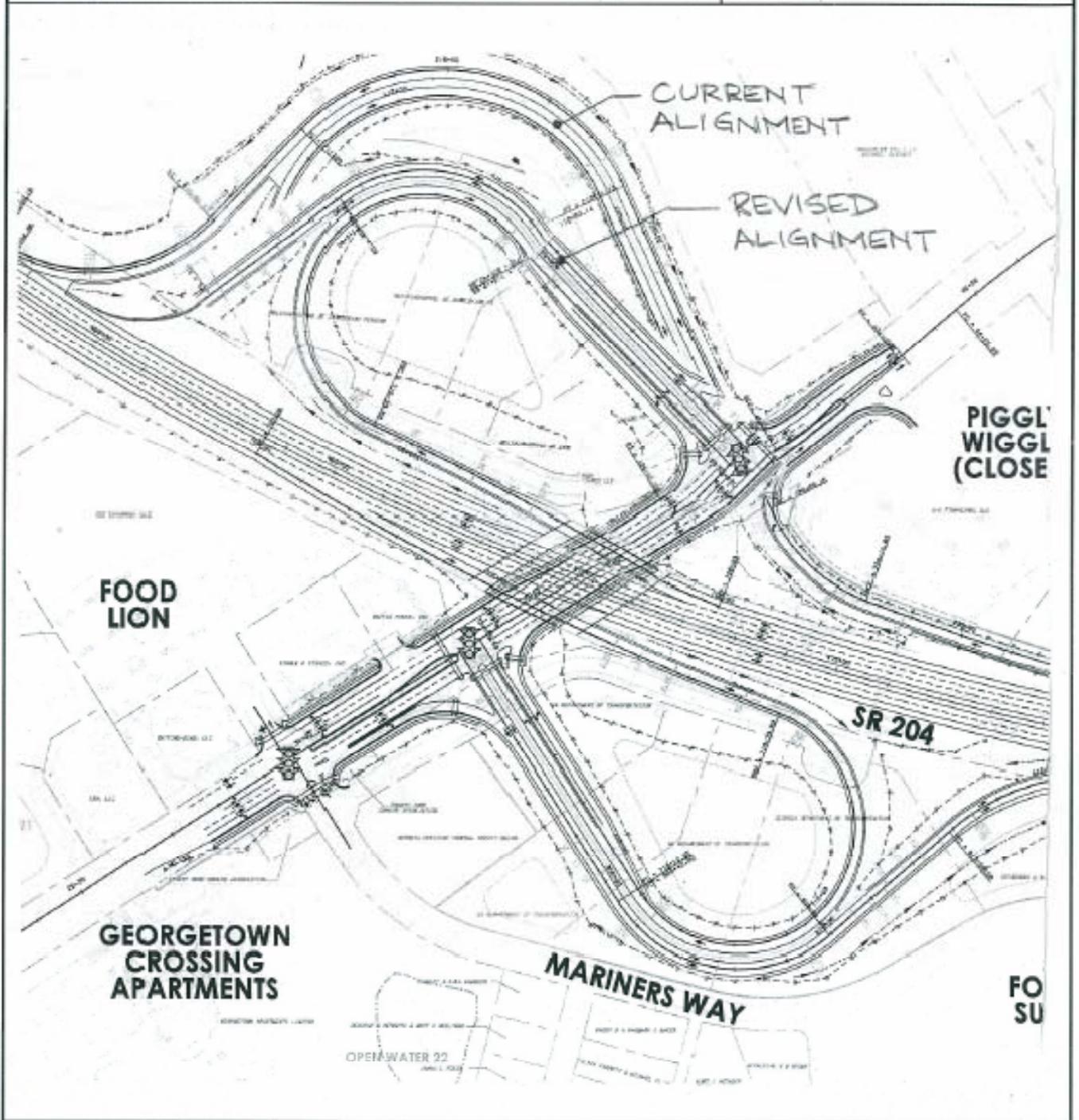
Justification:

Using the lower design speed will allow a tighter radius and shorter ramp alignment, reducing construction costs while providing the required project function. It will also provide an additional 150 – 200 feet visual approach to the existing railroad bridge as vehicles are travelling westbound, merging with mainline traffic. This location was described as a design constraint during the presentation. Providing an additional 200 feet of acceleration lane on SR 204, allows the total length to be about 750 – 800 feet which will allow a full length acceleration lane and taper of 720 feet, tying in before the CSX railroad bridge. This will eliminate the railroad bridge reconstruction and the mainline work, milling, inlay and restriping, on SR 204 west of the RR bridge. It will also not require any retaining wall or noise barriers in this area.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	1,268,000		
- Proposed	0		
- Savings	1,268,000		1,268,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			1,268,000

Abercorn Street Extension Improvements

ITEM NO: B-2
CLIENT: GDOT
Sheet 2 of 4



CALCULATIONS**Abercorn Street Extension Improvements**

ITEM N^o: B-2
 CLIENT: GDOT
 Sheet 4 of 4

Asphalt pavement; SR 204: 9.25 in asphalt / 12 inch GAB

$$(9.25/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.0578 \text{ ton/sf}$$

$$(12/12 \text{ ft}) (135 \text{ \#/cf}) (1 \text{ ton} / 2000\text{\#}) = 0.0675 \text{ ton/sf}$$

Cost per SY

$$(0.0578 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) + (0.0675 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18 / \text{ton}) =$$

$$\$33.81 + 10.94 = \$44.75 / \text{SY} \quad \text{USE: } \$45 \text{ per SY}$$

Reduced ramp length: 300 ft

$$(300 \times 68) = 20,400 \text{ sq ft} = 2,268 \text{ sq yd}$$

Area west of RR bridge – 1,400 lf

Average widths; mill and resurface – 32 ft; new full depth pavement - 22 ft

$$32 \times 1,400 = 44,800 \text{ sq ft} = 4,978 \text{ sq yd}$$

$$22 \times 1,400 = 30,800 \text{ sq ft} = 3,422 \text{ sq yd}$$

Retaining Walls; 1,000 ft long; 5 ft avg height

$$1,000 \times 5 = 5,000 \text{ sq ft}$$

Noise Barrier; average height – 15 ft

$$1,000 \text{ ft} \times 15 = 15,000$$

Asphalt resurfacing; SR 204: 2.25 in asphalt

$$(2.25/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.0141 \text{ ton/sf}$$

Cost per SY

$$(0.0141 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) = \$8.25 \text{ per SY}$$

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-4	1 of 3	Use shoulder pavement for ramps not required for staging

Comp By: GAO Date: 3-16-10 Checked By: DCW Date: 3/17/10

Original Concept:

Use full depth pavement thickness for all areas, as currently shown on the plans.

Proposed Change:

Use a reduced pavement thickness for ramp shoulders not required for staging operations. This will be at the ramps in the southeast quadrant

Justification:

Typically, due to the decreased loads on the shoulders, the shoulder pavement is a reduced section. For many areas of this project, full depth shoulders are being provided to accommodate staging operations and future widening and improvements. In areas where this is not required, the SE quadrant, reduced pavement thickness for the ramp shoulders can be incorporated.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	239,000		
- Proposed	106,000		
- Savings	133,000		133,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			133,000

CALCULATIONS**Abercorn Street Extension Improvements**ITEM N^o: B-4
CLIENT: GDOT
Sheet 3 of 3Asphalt pavement; SR 204: 9.25 in asphalt / 12 inch GAB

$$(9.25/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.0578 \text{ ton/sf}$$

$$(12/12 \text{ ft}) (135 \text{ \#/cf}) (1 \text{ ton} / 2000\text{\#}) = 0.0675 \text{ ton/sf}$$

Cost per SY

$$(0.0578 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) + (0.0675 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18 / \text{ton}) = \\ \$ 33.81 + 10.94 = \$44.75 / \text{SY} \quad \text{USE: } \$45 \text{ per SY}$$

Asphalt pavement; shoulders: 4 in asphalt / 6 inch GAB

$$(4/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.025 \text{ ton/sf}$$

$$(6/12 \text{ ft}) (135 \text{ \#/cf}) (1 \text{ ton} / 2000\text{\#}) = 0.03375 \text{ ton/sf}$$

Cost per SY

$$(0.025 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) + (0.03375 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18 / \text{ton}) = \\ \$ 14.63 + 5.47 = \$20.10 / \text{SY} \quad \text{USE: } \$20 \text{ per SY}$$

Ramp shoulder lengths:

801+00 to 811+00; 1,000 ft, 28 ft

811+00 to 816+00; 500 ft, 14 ft

708+00 to 715+50; 750 ft, 14 ft

$$(1,000 \times 28) + (500 \times 14) + (750 \times 14) = 45,500 \text{ sq ft} = 5056 \text{ sq yd}$$

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-5	1 of 3	Use a reduced pavement section for King George Blvd

Comp By: GAO Date: 3-16-10 Checked By: DCW Date: 3-17-10

Original Concept:

Use full depth pavement thickness for all areas, as currently shown on the plans.

Proposed Change:

Use a reduced pavement thickness for King George Blvd. Existing traffic volumes (ADT's) on SR 204 are 63,000 vpd while the King George Blvd is 20,000 vpd, roughly 3 times the volume.

Justification:

Develop an appropriate pavement design for King George Blvd rather than using the same section required for SR 204, where traffic volumes are 2 – 3 times greater. The thinner section will have a similar life span, usually 20 years and provide cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	520,000		
- Proposed	347,000		
- Savings	173,000		173,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			173,000

CALCULATIONS

Abercorn Street Extension Improvements

ITEM N^o: B-5
CLIENT: GDOT
Sheet 3 of 3

Asphalt pavement; SR 204: 9.25 in asphalt / 12 inch GAB

$$(9.25/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.0578 \text{ ton/sf}$$

$$(12/12 \text{ ft}) (135 \text{ \#/cf}) (1 \text{ ton} / 2000\text{\#}) = 0.0675 \text{ ton/sf}$$

Cost per SY

$$(0.0578 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) + (0.0675 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18 / \text{ton}) = \\ \$ 33.81 + 10.94 = \$44.75 / \text{SY} \quad \text{USE: } \$45 \text{ per SY}$$

Asphalt pavement; King George Blvd: use 6 in asphalt / 8 inch GAB

$$(6/12 \text{ ft}) (150 \text{ \#/cf}) (1 \text{ ton} / 2000 \text{ \#}) = 0.0375 \text{ ton/sf}$$

$$(8/12 \text{ ft}) (135 \text{ \#/cf}) (1 \text{ ton} / 2000\text{\#}) = 0.045 \text{ ton/sf}$$

Cost per SY

$$(0.0375 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$65 / \text{ton}) + (0.045 \text{ ton/sf} \times 9 \text{ sf/sy} \times \$18 / \text{ton}) = \\ \$ 21.94 + 7.29 = \$29.23 / \text{SY} \quad \text{USE: } \$30 \text{ per SY}$$

King George Blvd area:

27+50 to 44+00; 1,650 ft, 60 ft, avg width, 5 lanes

$$(1,650 \times 60) = 99,000 \text{ sq ft} = 11,000 \text{ sq yd}$$

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.: C-2	PAGE No.: 1 of 4	CREATIVE IDEA: Eliminate / minimize retaining wall at the sound barrier location along the NE quadrant
-------------------------	----------------------------	--

Comp By: GAO Date: 3-16-10 Checked By: DCW Date: 3-17-10

Original Concept:

Construct side barrier with retaining wall and foundation and sound barrier on footings along the proposed ramp at the NE quadrant.

Proposed Change:

Eliminate the footing and retaining wall portions of the side barrier placed in front of and to protect the noise barrier, which will have post and footing elements as part of its own support.

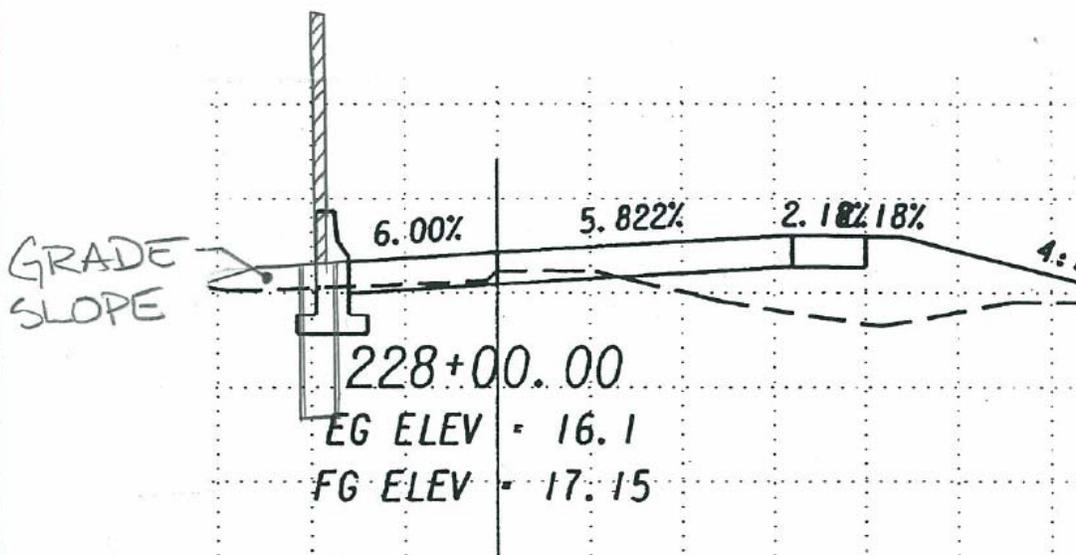
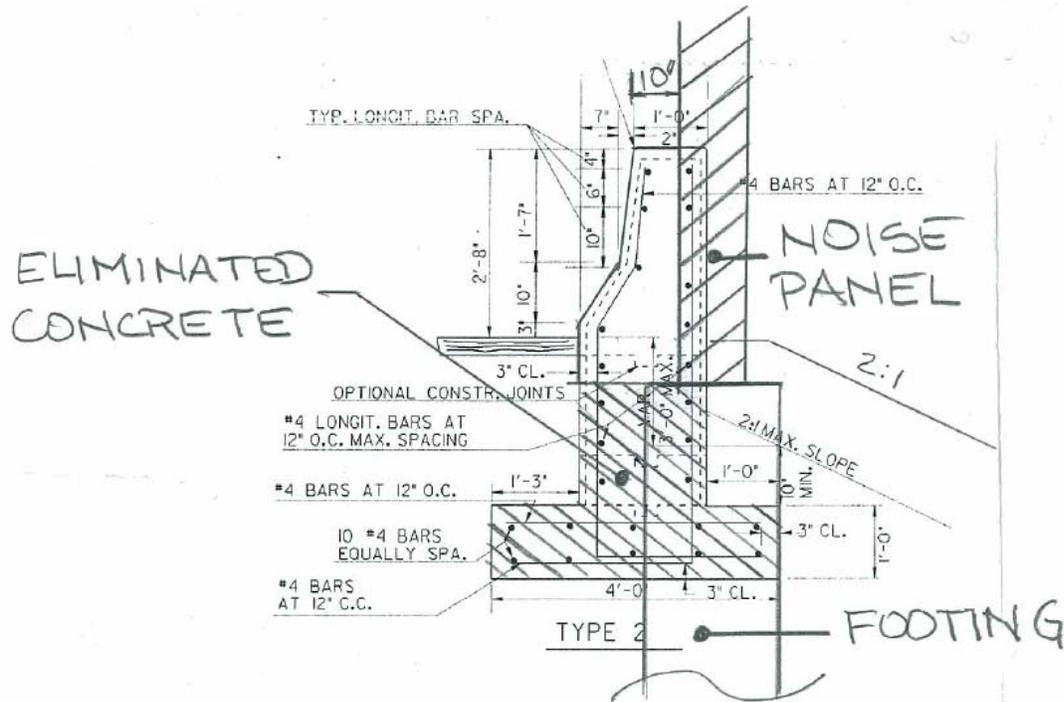
Justification:

The sound barrier has designed footings for adequate support. Constructing the side barrier on a retaining wall with footings in front of the noise wall is redundant and not required. Also, in many areas, the height of fill is minimal, 2 – 4 feet and can be graded within the limits of the existing or required right of way. The standard details show a safety shape barrier in front of bridge pier locations which can be applied to areas with proposed sound barrier. We calculated the savings at one location but this can be applied to other areas where this arrangement will be proposed. At this stage of the plan development, it is not certain where other similar situations can apply.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	204,200		
- Proposed	1,400		
- Savings	202,800		
FUTURE COST - Savings			202,800
TOTAL PRESENT WORTH SAVINGS			202,800

Abercorn Street Extension Improvements

ITEM N^o: C-2
 CLIENT: GDOT
 Sheet 2 of 4



CALCULATIONS

Abercorn Street Extension Improvements

ITEM N^o: C-2
CLIENT: GDOT
Sheet 4 of 4

Reduction in concrete footing / wall; station 226+00 to 240+00; 1,400 ft

$$[1.75 \text{ ft} \times 2 \text{ ft}(\text{avg ht}) + 4 \text{ ft} \times 1 \text{ ft}] 1,400 = 10,500 \text{ cu ft} = 389 \text{ cu yd}$$

Average additional fill required – 2 ft height; 4:1 sideslope

$$1,400 \text{ ft} \times 0.5(2 \times 8) = 11,200 \text{ cu ft} = 415 \text{ cu ft}$$

No additional right of way required; plans show adequate R/W

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.: C-3	PAGE No.: 1 of 4	CREATIVE IDEA: Eliminate / minimize retaining wall along the western limit of SR 204
-------------------------	----------------------------	--

Comp By: GAO Date: 3-17-10 Checked By: DCW Date: 3-17-10

Original Concept:

Construct side barrier with retaining wall and foundation and sound barrier on footings where required.

Proposed Change:

Eliminate the footing and retaining wall portions of the side barrier placed in front of and to protect the noise barrier, which will have post and footing elements as part of its own support. This can be applied in areas where a 4:1 sideslope can be constructed, station 439+25 to 444+75.

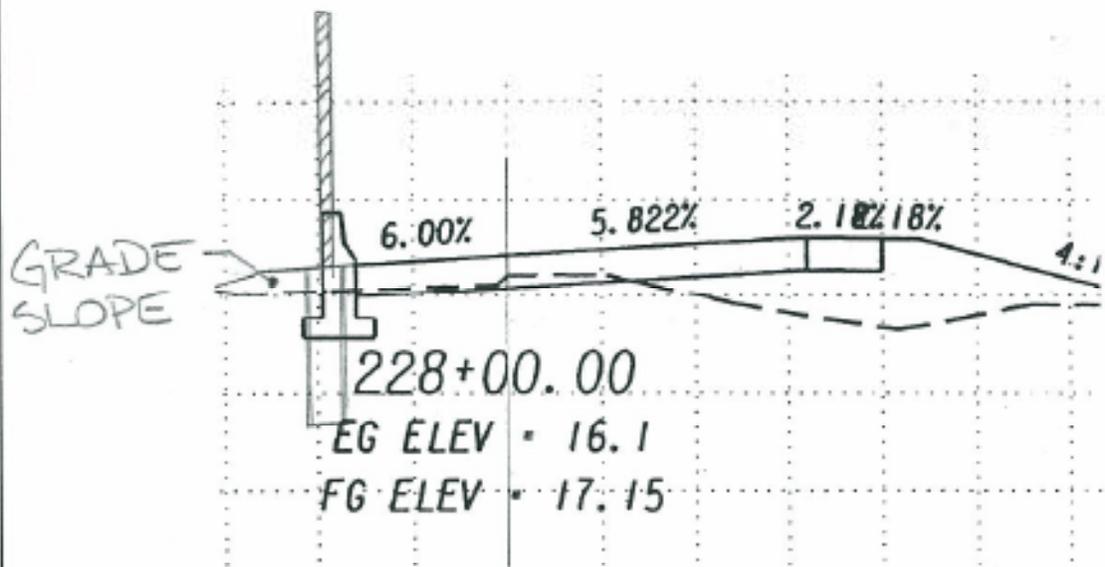
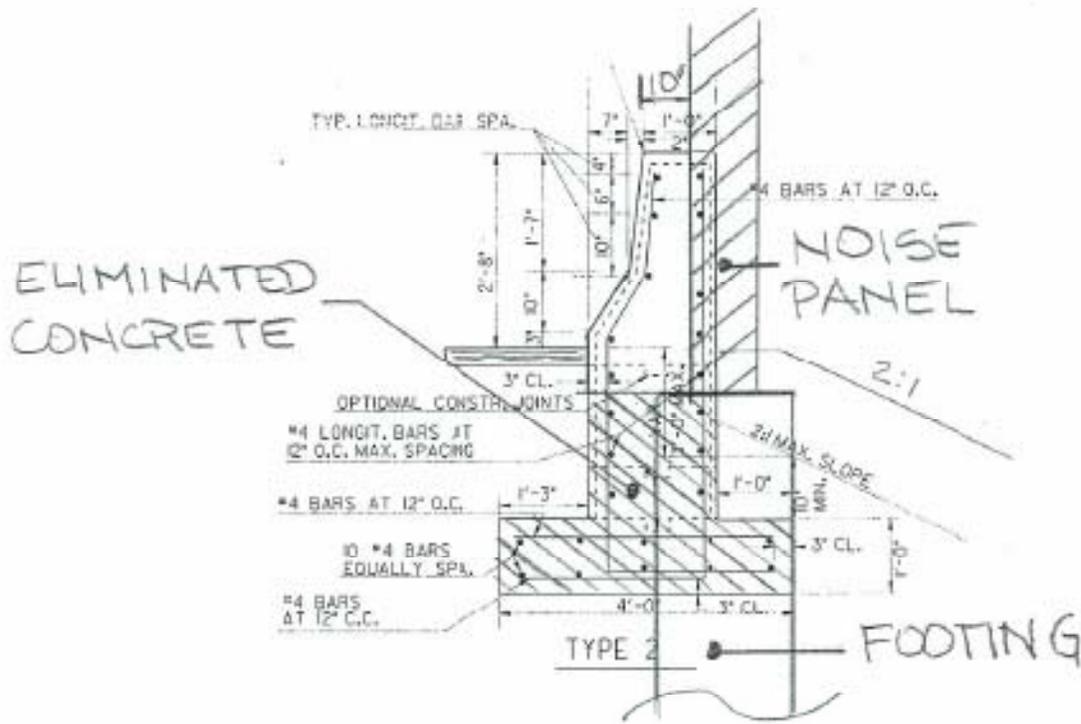
Justification:

The sound barrier has designed footings for adequate support. Constructing the side barrier on a retaining wall with footings in front of the noise wall is redundant and not required. Also, in many areas, the height of fill is minimal, 2 – 4 feet and can be graded within the limits of the existing or required right of way. The standard details show a safety shape barrier in front of bridge pier locations which can be applied to areas with proposed sound barrier.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	80,300		
- Proposed	500		
- Savings	79,800		79,800
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			79,800

Abercorn Street Extension Improvements

ITEM NO: C-3
CLIENT: GDOT
Sheet 2 of 4



CALCULATIONS

Abercorn Street Extension Improvements

ITEM N^o: C-3
CLIENT: GDOT
Sheet 4 of 4

Reduction in concrete footing / wall; station 439+25 to 444+75; 550 ft

$$[1.75 \text{ ft} \times 2 \text{ ft}(\text{avg ht}) + 4 \text{ ft} \times 1 \text{ ft}] 550 = 4,125 \text{ cu ft} = 153 \text{ cu yd}$$

Average additional fill required – 2 ft height; 4:1 sideslope

$$550 \text{ ft} \times 0.5(2 \times 8) = 4,400 \text{ cu ft} = 163 \text{ cu ft}$$

No additional right of way required; plans show adequate R/W

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:
E-1	1 of 6	Use a center pier for the SR204 bridge over King George Boulevard

Comp By: GCG Date: 3/15/10 Checked By: GCG Date: 3/15/10

Original Concept:

The original concept for carrying SR 204 over King George Boulevard (KGB) is a single span bridge comprised of 74" prestressed concrete beams with a cast-in-place concrete deck. The superstructure is supported by pile supported concrete end bent caps with mechanically stabilized embankment (MSE) wall abutments.

The proposed concrete raised median on KGB is 12 feet and outside clear distance is 16 feet minimum.

Proposed Change:

Use a two span bridge with a concrete intermediate bent in the middle of KGB to reduce the structure depth of the bridge and raise the profile of KGB.

Jersey style side barrier will be added parallel to the intermediate pier to protect the travelling public and traffic impact attenuators will be added to the end of the piers at the side barrier ends to protect the blunt ends.

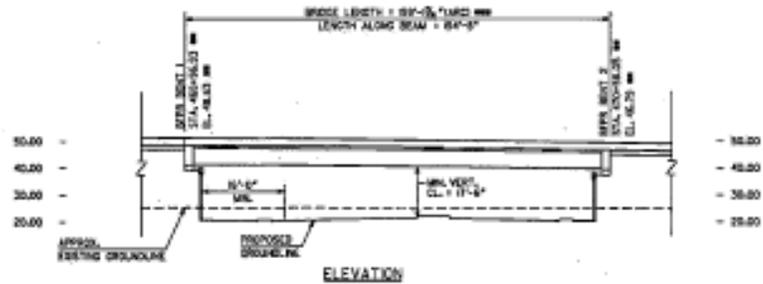
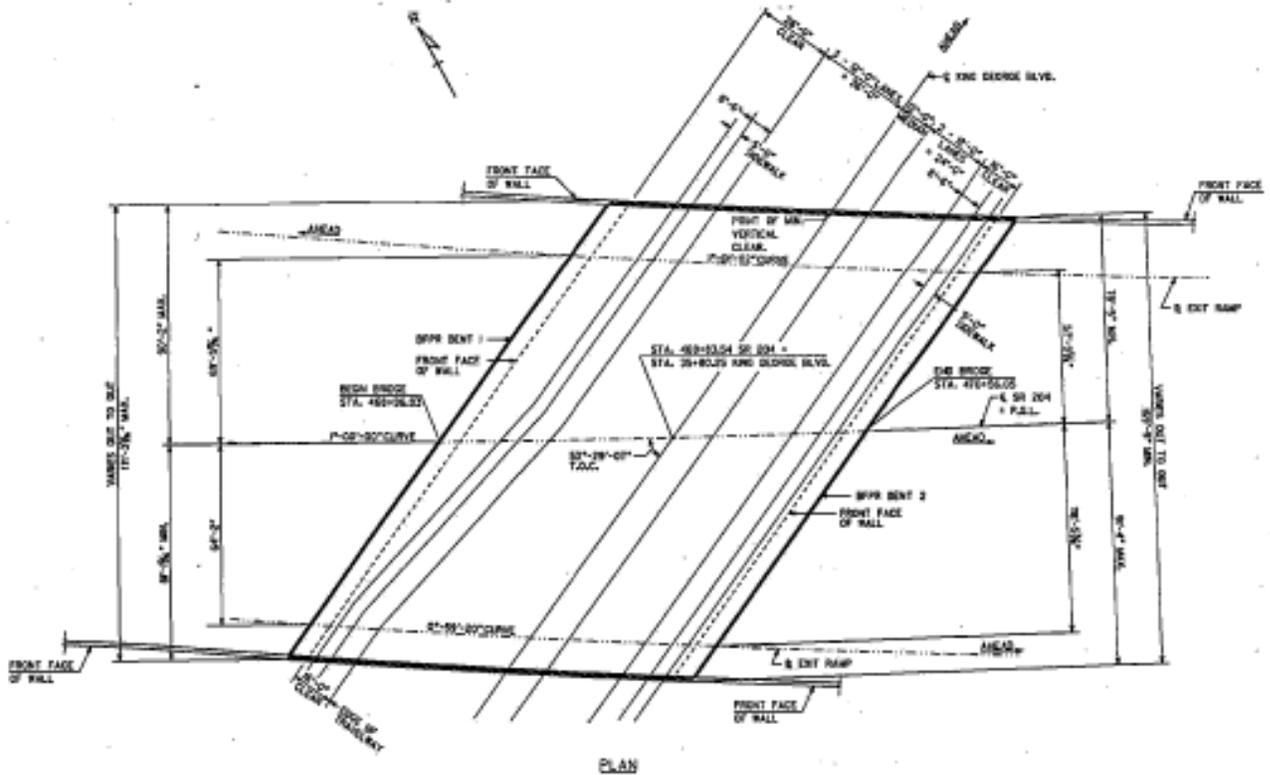
Justification:

KGB is a low speed urban street with a design speed of 35 mph. The minimum horizontal clearance required from back of curb is 6 feet. [GDOT Policy Manual page 6-2]

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	2,816,000		
- Proposed	2,826,000		
- Savings	(10,000)		(10,000)
FUTURE COST - Savings		-0-	-0-
TOTAL PRESENT WORTH SAVINGS			(10,000)

Abercorn Street Extension Improvements

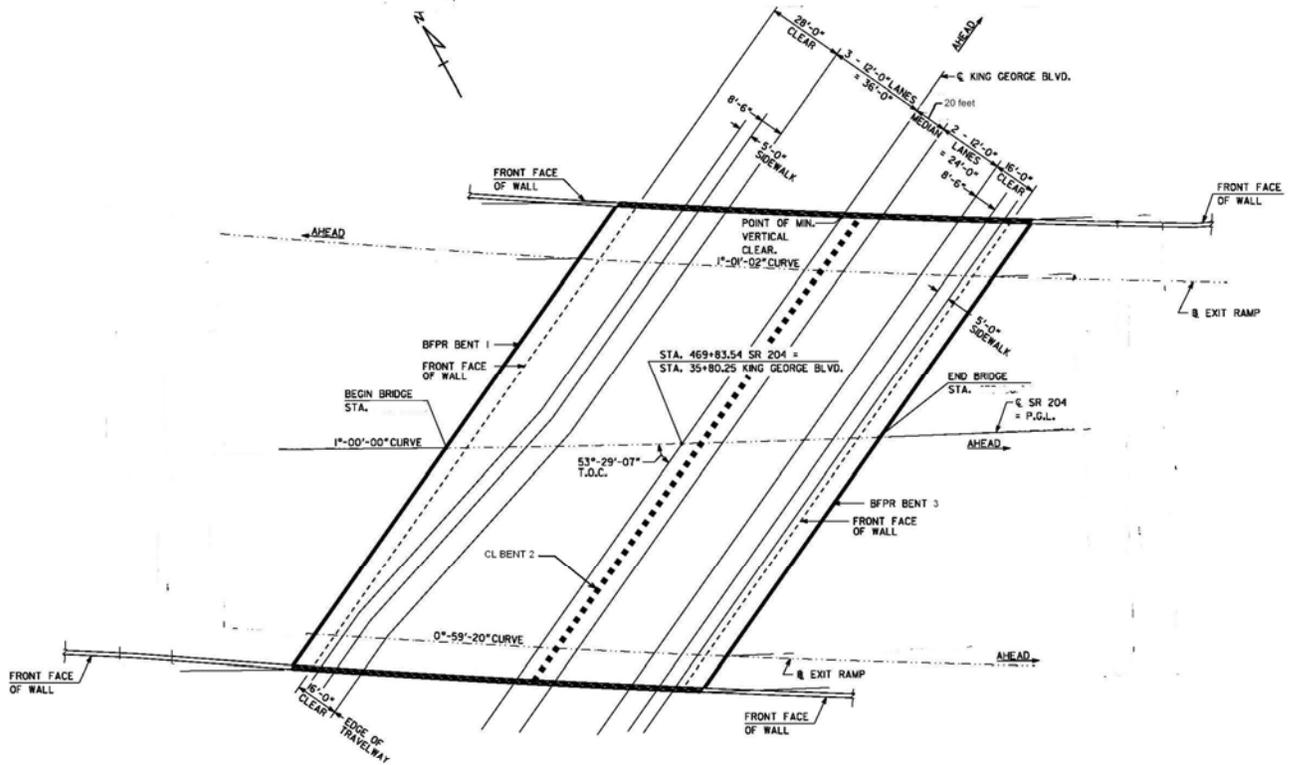
ITEM NO: E-1
 CLIENT: GDOT
 Sheet 2 of 6



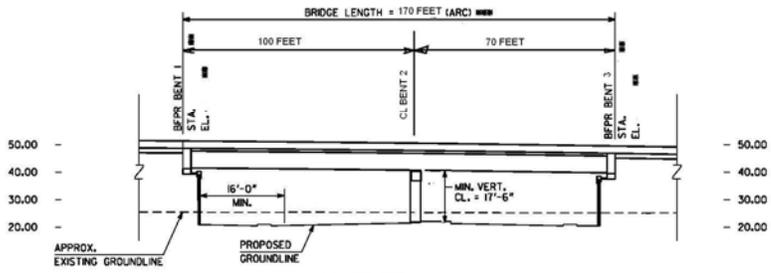
ORIGINAL DESIGN

Abercorn Street Extension Improvements

ITEM NO: E-1
 CLIENT: GDOT
 Sheet 3 of 6



PLAN



ELEVATION

PROPOSED DESIGN

CALCULATIONS**Abercorn Street Extension Improvements**

ITEM N^o: E-1
 CLIENT: GDOT
 Sheet 4 of 6

Minimum Horizontal Distance from back of curb to centerline of pier

Use 6 feet

Side barrier width [type 7C Ga DOT Standard 4948A] = 1'-7"

Say 1.75 feet

Say a 3.5 foot x 3.5 foot intermediate pier column

Use 1.75 feet

Distance from face of curb to centerline of column = 6 + 1.75 + 1.75 = 9.5 feet

So median must be 2 x 9.5 = 19 feet

Say 20 foot median

Length of span over WB KGB

Bridge span = 20 foot median /2 + 4x12 feet lanes + 16 ft clear outside + 6 ft offset to BFPR
 Bridge span = 80 feet

Adjust for Skew: $\text{COS}(90-53.4853) = 80 \text{ feet} / X = 99.58 \text{ feet}$

Say Span over EB KGB = 100 feet

Where: Skew angle = 53.4853 degrees and X = span length

Span over EB EGB

Bridge span = 20 foot median /2 + 2x12 feet lanes + 16 ft clear outside + 6 ft offset to BFPR
 Bridge span = 56 feet

Adjust for Skew: $\text{COS}(90-53.4853) = 56 \text{ feet} / x = 69.68 \text{ feet}$

Say Span over EB KGB = 70 feet

Abercorn Street Extension Improvements

ITEM N^o: E-1
 CLIENT: GDOT
 Sheet 5 of 6

Structure Depth Determination:

Spans are 100 feet and 70 feet.

100 feet span controls.

Use Span Charts from the GDOT Bridge Design Policy Manual as a Guide.

For 100 foot span, the most appropriate beam is a 54" bulb T prestressed beam.

For the 70 foot span, a Type III AASHTO beam with fascia beams would be appropriate.

Structure depth would be 54" +8" slab + 4" coping allowance = 5.5 feet of structure depth

Original design calls for 74" beams.

Add 12" of slab & coping would result in a structure depth of 7 feet.

Net difference = 7 - 5.5 = 1.5 feet difference in structure

The original design bridge cost was passed on square foot costs.

28160 sq ft x \$100 per square foot = \$2,816,000

The proposed design bridge would have a slightly larger foot print
 (170 ft long x approx. 170 ft wide =28,900 sq ft)

Advantages and disadvantages:

- Linear foot and cost of beams/ft is reduced in the proposed design
- Intermediate bent increases the cost of the proposed design
- Deck is only slightly larger in the proposed design (<3% larger)

CALCULATIONS

Abercorn Street Extension Improvements

ITEM NO: E-1
CLIENT: GDOT
Sheet 6 of 6

Original Design																	Mean
Pay Item	Comment	Length	Width	Height	Number	Volume	Total	Area	Area	#/yd3	Total	Length Ea	Number	Total	Total	\$/Unit	
		Ft	Ft	Ft	Each	Ft3	Yd3	Sq ft	Sq Yd	LB	LB						
End Bents 1																	
Concrete	500-3101	Class A	212	3.50	2.00	1	1484	55						55	\$621.35	\$ 34,151	
Piles	520-1147	HP14x73										60	24	1440	\$ 65.44	\$ 94,234	
Rebar	511-1000						55			225	12367			12367	\$ 1.01	\$ 12,490	
Load Test	520-4147	HP14x73													\$ 0.86	\$ 0.86	
End Bents 2																	
Concrete	500-3101	Class A	214	3.50	2.00	1	1498	55						55	\$621.35	\$ 34,473	
Piles	520-1147	HP14x73										60	24	1440	\$ 65.44	\$ 94,234	
Rebar	511-1000						55			225	12483			12483	\$ 1.01	\$ 12,608	
Beams																	
74 in Bulb T	507-9033	7.5 ft spacing										156	24	3744	233.36	\$ 873,700	
Superstructure																	
Deck	500-1006	Superstructure Class AA	160	170.00	0.67	1	18142	672						672	\$767.78	\$ 515,903	
Coping	500-1006	Superstructure Class AA	160	3.50	0.33	24	4476	166						166	\$767.78	\$ 127,267	
Endwall Bt 1	500-1006	Superstructure Class AA	212	1.50	4.50	1	1431	53						53	\$767.78	\$ 40,692	
Endwall Bt 2	500-1007	Superstructure Class AA	214	1.50	4.50	1	1445	54						54	\$768.78	\$ 41,130	
Diaphragms	500-1006	Superstructure Class AA	178	0.83	3.00	1	445	16						16	\$767.78	\$ 12,654	
Median	500-1006	Superstructure Class AA	0	0.00	0.00	0	0	0						0	\$767.78	\$ -	
Rebar	511-3000							961		225	216153			216153	\$ 1.07	\$ 231,284	
Grooving	500-0100		160	164.75					26360	2929				2929	\$ 5.68	\$ 16,636	
Barrier																	
	500-2100											160	2	320	\$ 44.65	\$ 14,288	
															Total	\$ 2,155,745	
															Factor to make cost equal cost estimate	1.306	
																\$ 2,816,000	
Proposed Design																	
Pay Item	Comment	Length	Width	Height	Number	Volume	Total	Area	Area	#/yd3	Total	Length Ea	Number	Total	Total	\$/Unit	
		Ft	Ft	Ft	Each	Ft3	Yd3	Sq ft	Sq Yd	LB	LB						
End Bents 1																	
Concrete	500-3101	Class A	214	3.50	2.00	1	1498	55						55	\$621.35	\$ 34,473	
Piles	520-1147	HP14x73										60	21	1260	\$ 65.44	\$ 82,454	
Rebar	511-1000						55			225	12483			12483	\$ 1.01	\$ 12,608	
Load Test	520-4147	HP14x73													\$ 0.86	\$ 0.86	
End Bents 2																	
Concrete	500-3101	Class A	216	3.50	2.00	1	1512	56						56	\$621.35	\$ 34,796	
Piles	520-1147	HP14x73										60	21	1260	\$ 65.44	\$ 82,454	
Rebar	511-1000						56			225	12600			12600	\$ 1.01	\$ 12,726	
End Bents 2																	
Concrete	500-3101	Class A - Caps	216	3.50	3.50	1	2646	98						98	\$621.35	\$ 60,892	
Concrete	500-3101	Class A - Columns	15	3.50	3.50	10	1838	68						68	\$621.35	\$ 42,286	
Concrete	500-3101	Class A - Footings	8	8.00	3.50	10	2240	83						83	\$622.35	\$ 51,632	
Piles	520-1147	HP14x73										40	40	1600	\$ 65.44	\$ 104,704	
Rebar	511-1000						98			225	22050			22050	\$ 1.01	\$ 22,271	
Beams																	
54 in Bulb T	507-9030	8.5 ft spacing										98	21	2058	\$169.40	\$ 348,625	
54 in Bulb T	507-9030	8.5 ft spacing										68	21	1428	\$169.40	\$ 241,903	
Superstructure																	
Deck	500-1006	Superstructure Class AA	170	170.00	0.67	1	19276	714						714	\$767.78	\$ 548,147	
Coping	500-1006	Superstructure Class AA	170	3.50	0.33	21	4161	154						154	\$767.78	\$ 118,319	
Endwall Bt 1	500-1006	Superstructure Class AA	214	1.50	4.50	1	1445	54						54	\$767.78	\$ 41,076	
Endwall Bt 2	500-1007	Superstructure Class AA	216	1.50	4.50	1	1458	54						54	\$768.78	\$ 41,514	
Diaphragms	500-1006	Superstructure Class AA	178	0.83	3.00	1	445	16						16	\$767.78	\$ 12,654	
Median	500-1006	Superstructure Class AA	0	0.00	0.00	0	0	0						0	\$767.78	\$ -	
Rebar	511-3000							992		225	223205			223205	\$ 1.07	\$ 238,830	
Grooving	500-0100		160	164.75					26360	2929				2929	\$ 5.68	\$ 16,636	
Barrier																	
	500-2100											160	2	320	\$ 44.65	\$ 14,288	
															Total	\$ 2,163,289	
															Factor to make cost equal cost estimate	1.306	
																\$ 2,825,855	
															Savings (Additional Cost) of Proposed verses Original Design	\$ (9,855)	

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.: G-2	PAGE No.: 1 of 6	CREATIVE IDEA: Delete WB off ramp to King George Boulevard and add a signal and left turn lane to the loop ramp
-------------------------	----------------------------	---

Comp By: GCG Date: 3/16/10 Checked By: DCW Date: 3/16/10

Original Concept:

The original concept shows a west bound SR 204 exit ramp to north bound King George Boulevard (KGB) that is a right only exit. A loop ramp past this exist provides Westbound SR204 Exit to Southbound KGB as well as access to Westbound SR 204 from KGB.

This concept required right of way at the intersection of SR 204 and KGB at the North east corner (Property owner of the Piggly Wiggly, which is not open for business).

Proposed Change:

The proposed change would eliminate the SR204 WB ramp to NB KGB and add a left turn lane to the proposed ramp. A traffic signal is anticipated to be required.

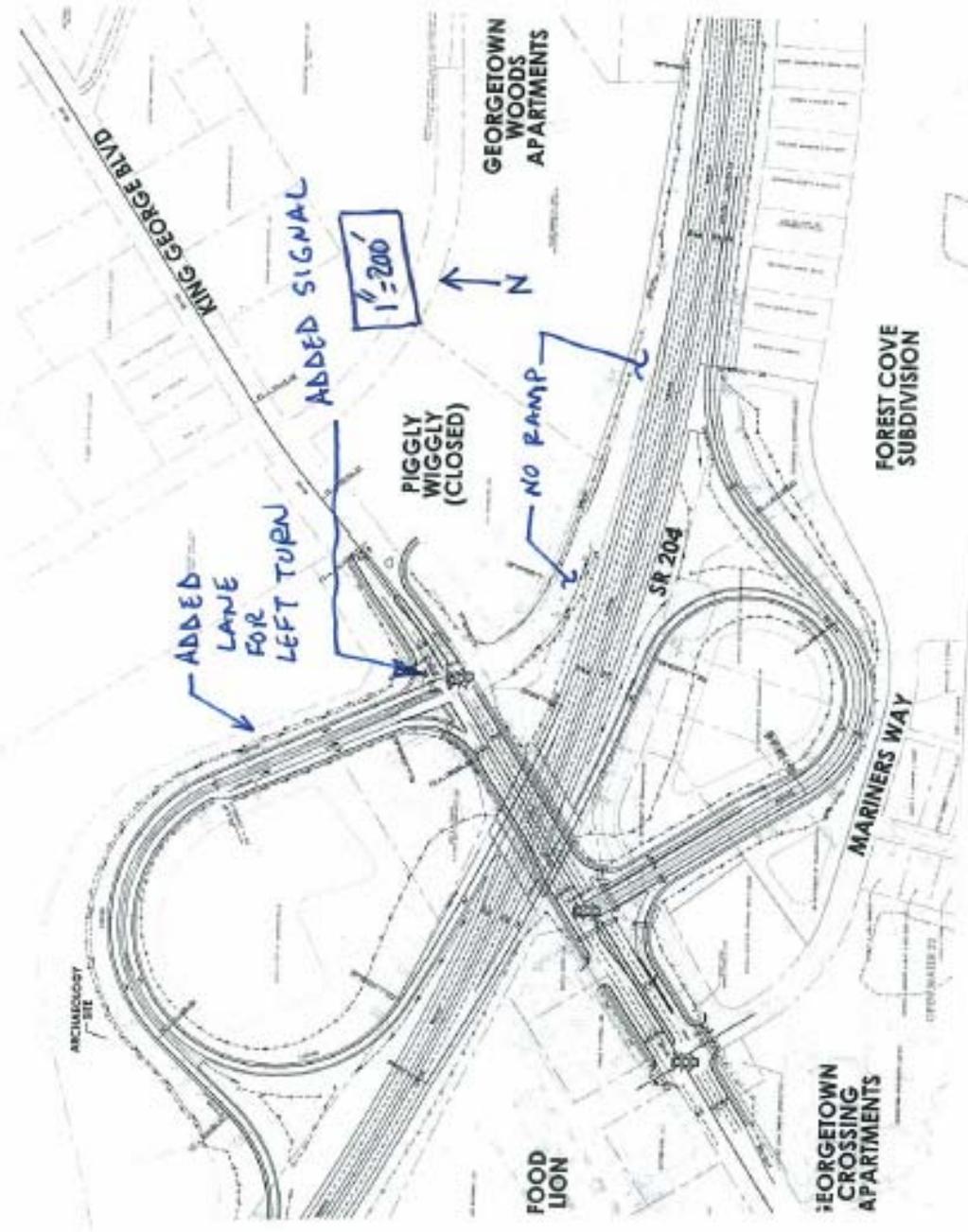
Justification:

- Reduction in right of way cost.
- Less potential for driver confusion.
- Eliminates retaining wall need at the base of slope but sound wall will probably still be required.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	1,317,000		
- Proposed	124,000		
- Savings	1,193,000		1,193,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			1,193,000

Abercorn Street Extension Improvements

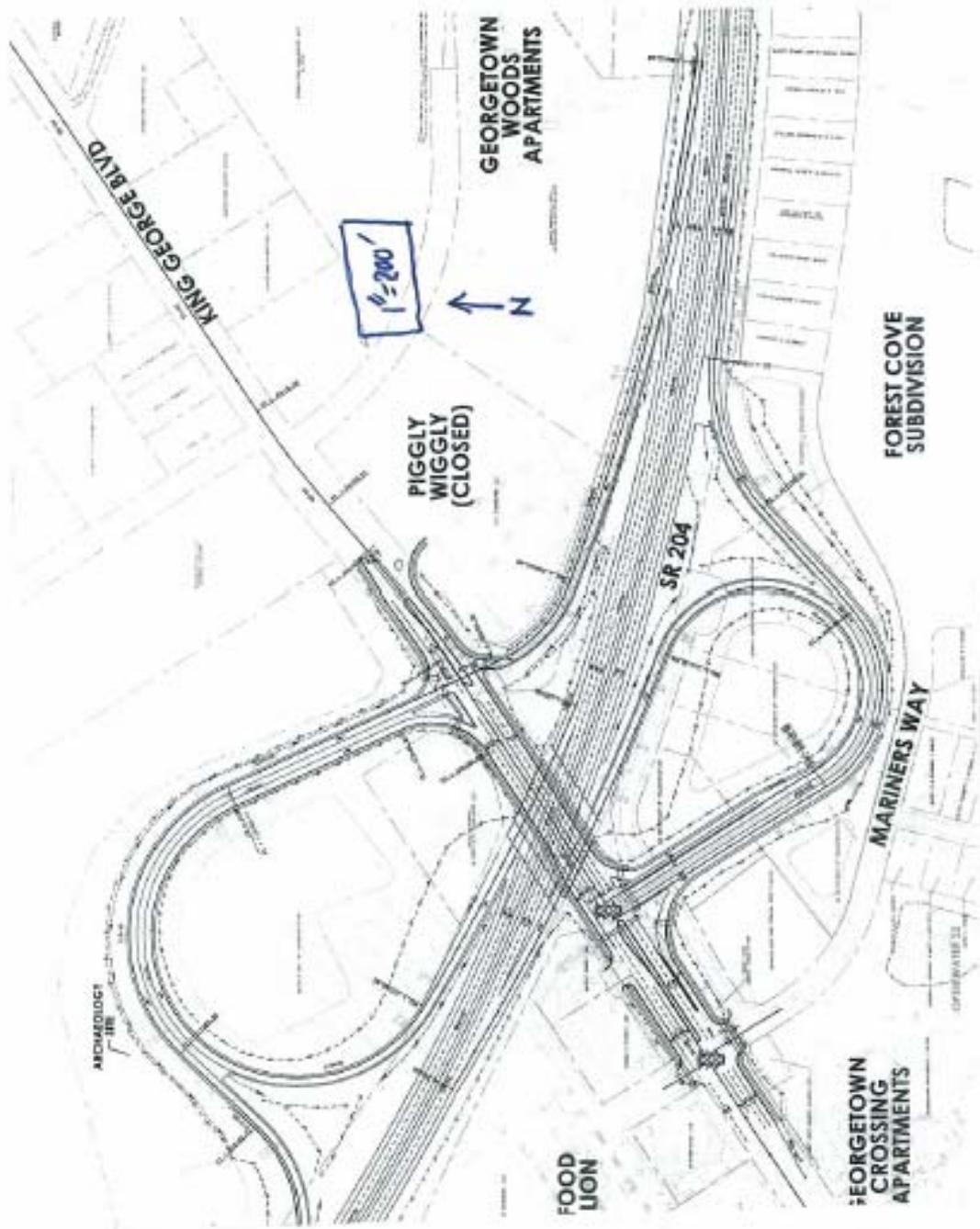
ITEM N^o: G-2
CLIENT: GDOT
Sheet 2 of 6



PROPOSED CHANGE

Abercorn Street Extension Improvements

ITEM N^o: G-2
CLIENT: GDOT
Sheet 3 of 6



ORIGINAL CONCEPT

CALCULATIONS**Abercorn Street Extension Improvements**

ITEM N^o: G-2
 CLIENT: GDOT
 Sheet 5 of 6

For Pricing, hold Original Alternate as baseline cost and Proposed Alternate is comprised of Additions or Subtractions to Original cost.

SUBTRACT SR 204 WB ramp to NB KGB

Length of Ramp eliminated = 750 feet
 Width of Ramp 20 feet of pavement.

Pavement: 9 ¼ “ asphalt/ 12 inch GAB

(9.25/12 ft) (150 #/CF) (1 ton/2000 #) = 0.0578 ton/SF
 (12/12 ft) (135 #/CF) (1 ton/2000#) = 0.0675 ton/SF

Cost per SY

(0.0578 ton/SF x 9 SF/SY x \$65/ton) + (0.0675 ton/SF x 9 SF/SY x \$18.20/ton)=
 \$33.81 + 11.06 = \$44.87/SY USE: \$45/SY

750 feet x 20 ft wide / 9 sq ft/ sq yd x \$45/sq yd = \$75,000 Savings

Earthwork: Say 5000 cy x \$4/ cy = \$20,000

Eliminate Retaining wall: 750 feet x \$75/ft = \$56,250

Total savings for eliminating ramp = 75,000 + 20,000 + 56,250 = \$ 151,250

ADD Additional signal at intersection of SR 204 WB to KGB SB

Cost of Additional signal = \$100,000 Additional Cost (\$100k each in cost estimate)

ADD Additional signal at intersection of SR 204 WB to KGB SB

Length of 12 foot lane added to proposed loop ramp = 300 feet

Pavement: 9 ¼ “ asphalt/ 12 inch GAB

(9.25/12 ft) (150 #/CF) (1 ton/2000 #) = 0.0578 ton/SF
 (12/12 ft) (135 #/CF) (1 ton/2000#) = 0.0675 ton/SF

Cost per SY

(0.0578 ton/SF x 9 SF/SY x \$65/ton) + (0.0675 ton/SF x 9 SF/SY x \$18.20/ton)=
 \$33.81 + 11.06 = \$44.87/SY USE: \$45/SY

300 feet x 12 feet = 3600 sq ft

3600 sq ft/9 sq ft/sq yard = 400 sq yards

400 sq yards x \$45/sq yard = \$18,000 Additional Cost

CALCULATIONS

Abercorn Street Extension Improvements

ITEM N^o: G-2
 CLIENT: GDOT
 Sheet 6 of 6

SUBTRACT Amount of Right of Way Eliminated

Parcel Designation	Description	Cost
G01	Closed Piggly Wiggly	\$ 989,088.98
H05	Georgetown Woods Apartments	\$ 14,121.32
	Total ROW eliminated (Savings)	\$ 1,003,210.30

SUBTRACT A portion of the interchange lighting

Eliminating the ramp will eliminate the need for any interchange lighting on the northeast quadrant of the interchange. The detailed cost estimate does not break down the cost per quadrant.

It seems reasonable that the bulk of the expense for interchange lighting will be on the northwest quadrant of the interchange around the large loop ramp and of the remainder, the bulk of the cost will be for the southeast look ramp.

The following cost was shown in the cost estimate for interchange lighting.

Interchange Lighting Complete		
Item Number	Description	Cost
683-0001	Interchange Lighting Complete	\$ 600,000
	Total	\$ 600,000

So, consider this distribution:

Cost Distribution of Interchange Lighting Complete		
Quadrant	Description	Cost
Northwest	SR 204 WB to KGB	\$ 300,000
Southeast	SR 204 EB to KGB	\$ 200,000
Northeast	SR 204 WB to KGB NB	\$ 100,000
	Total	\$ 600,000

So, with this cost distribution, eliminating the SR204 WB to KGB NB ramp would result in a \$100,000 savings.

DEVELOPMENT AND RECOMMENDATION PHASE

Abercorn Street Extension Improvements

IDEA No.:	PAGE No.:	CREATIVE IDEA:	
K-1	1 of 2	Eliminate Interchange Lighting	
Comp By: AEH		Date: 3/18/10	Checked By: DCW
		Date: 3/18/10	

Original Concept:

Original concept includes both Street Lighting Complete and Interchange Lighting Complete.

Proposed Change:

Proposed change includes Street Lighting Complete only.

Justification:

All interchange ramps are adjacent to residential areas. Eliminating the high mast interchange lighting will eliminate distractions in neighborhoods resulting from lighting encroaching into residential areas.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	630,000		
- Proposed	0		
- Savings	630,000		630,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			630,000

APPENDIX

COST MODEL

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By
Decreasing Item

Project No. NH000-0111-01(024)
SR 204/Abercorn Street Extension Improvements
PI No. 522870
Chatham County

March 2010

Element ID.	Item Description	Cost x \$1,000	%
A	Right of Way	7,500	20
B	Base and Paving	4,611	12
C	Retaining Walls	4,174	11
D	Sound Barriers	3,392	9
E	Bridges	3,231	9
F	Mitigation	2,000	5
G	Traffic Control and Staging	1,550	4
H	ATMS	1,530	4
I	Utilities	1,454	4
J	Earthwork	1,387	4
82% Cost Line			
K	Permanent Concrete Barrier	1,324	4
L	Lighting	870	2
M	Drainage	864	2
N	Clearing and Grubbing	728	2
O	Signing	618	2
P	Removal	400	1
Q	Temporary Erosion Control and Grassing	271	1
R	Traffic Signals	214	1
S	Permanent Erosion Control	206	1
T	Landscaping	200	1
U	Sidewalk, Curb and Gutter, Concrete Median	199	1
V	Guardrail	113	< 1
W	Field Office, Training, R/W Markers	78	< 1
X	Driveways	50	< 1
Y	Fencing	44	< 1
Z	Marking	41	< 1
TOTAL		\$37,048	100%

INFORMATION PHASE ----- FUNCTION ANALYSIS

SR 204 / Abercorn Street Extension Improvements

System: Improve Interchange
Function: Reduce Congestion

ITEM No.	DESCRIPTION	FUNCTION			INITIAL DOLLARS (x 1,000)		
		Verb	Noun	Kind*	Cost	% of Total	Worth
A	Right of Way	Contain	Project	B	7,500	20	7,000
B	Base and Paving	Support	Traffic	B	4,611	12	4,611
C	Retaining Walls	Separate	Grade	S	4,174	11	3,500
		Minimize	ROW	S			
D	Sound Barriers	Reflect	Noise	S	3,392	9	3,000
E	Bridges	Separate	Grade	B	3,231	9	3,000
F	Mitigation	Save	Artifacts	S	2,000	5	2,000
G	Traffic control and staging	Divert	Traffic	S	1,550	4	1,000
		Stage	Work				
H	ATMS	Supply	Information	S	1,530	4	1,530
		Manage	Traffic				
I	Utilities	Relocate	Services	S	1,454	4	454
J	Earthwork	Achieve	Grade	B	1,387	4	1,000
		Support	Road				
TOTAL					30,829	82	27,095

* B = Basic, S = Secondary

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
Abercorn Street Extension Improvements			
NO.	CREATIVE IDEA	COMMENTS	IDEA RATING **
A	Right of Way		
A-1	Shift Mariner's Way signal SW		√
B	Base and Paving		
B-1	Run King George Boulevard over SR 204		√
B-2	Reduce radius of North Ramp – mirror image South Ramp		√
B-3	Minimize mainline resurfacing at project limits		√
B-4	Use shoulder paving in lieu of full depth paving where possible		√
C	Retaining Walls		
C-1	Buy ROW in lieu of building a wall at CSX and Pine Grove Rd.		√
C-2	Eliminate Piggly Wiggly wall, slope to grade		√
C-3	Eliminate low wall on the south side SR 204, STA 480-490 and buy ROW		√

** √ = Idea will be evaluated; X= idea will be dropped; DC = Design Consideration – presented for consideration by the design team

NO.	CREATIVE IDEA	COMMENTS	IDEA RATING **
D	Sound Barriers		
D-1	Shorten / lower walls	Analyze as design progresses	X
D-2	Delete wall CSX to Pine Grove		See C-1
E	Bridges		
E-1	Put pier in King George Boulevard (KGB) – use 2 span in lieu of 1 span, and reduce KGB cut under SR 204		√
E-2	Reduce bridge width, shift gore		√
F	Mitigation		
F-1	Minimize mitigation, acquire earthwork elsewhere	Not feasible as land already purchased	X
F-2	Have students do mitigation		DC
G	Traffic control and staging		
G-1	Do not lower KGB, build SR 204 over, 1/2 at a time		√
G-2	Delete off ramp to KGB northbound, combine with southbound off ramp, add a signal at KGB		√
H	ATMS		
	No ideas generated		

** √ = Idea will be evaluated; X = idea will be dropped; DC = Design Consideration – presented for consideration by the design team

NO.	CREATIVE IDEA	COMMENTS	IDEA RATING **
I	Utilities		
	No ideas generated		
J	Earthwork		
J-1	Haul in fill vs. using deep ponds		√
K	Other		
K-1	Delete interchange lighting		√
K-2	Evaluate detention pond drainage		X

** √ = Idea will be evaluated; X= idea will be dropped; DC= Design Consideration – presented for consideration by the design team

VE STUDY SIGN-IN SHEET

Project No.: NH000-0111-01(024)

County: Chatham

PI No.: 522870-

Date: March 15-18, 2010

Days

1	4	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers		Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders		Engineering Services	404-631-1752	msanders@dot.ga.gov
✓		James K. Magnus		Construction	404-631-1971	jmagnus@dot.ga.gov
✓		Ken Werho		Traffic Operations	404-635-8144	kwerho@dot.ga.gov
		XXXXXXXXXX		Engineering Services	404-631-1753	xxxxxxxx@dot.ga.gov
✓	✓	DAVID WOLKSCHEID		MACTEC	571-217-0808	DLWOLKSCHEID@MACTEC.COM
✓	✓	ALAN HUNLEY		PARSONS	628-969-2304	alan.hunley@parsons.com
✓	✓	GEORGE OBARANEC		MACTEC	770-421-3346	GAOBARANEC@MACTEC.COM
✓	✓	GREG GRANT		WOLVERTON & ASSOC	770-447-8999	greg.grant@wolverton-assoc.com
✓	✓	Tommy Crochet		McGee Partners	770-938-6400	tcrochet@mcgeepartners.com
✓	✓	CHRIS MARSENGILL		McGEE PARTNERS	770-938-6400	CMARSENGILL@MCGEEPARTNERS.COM
✓		LARRY BOWMAN		GDOT / office of Env.	404-631-1362	lbowman@dot.ga.gov
✓		Masood Shabazz		Heath & Lineback	770-424-1668	mshabazz@heath-lineback.com
✓	✓	Jennifer Tait		GDOT Bridge Design	404-631-1906	jtait@dot.ga.gov
✓		BEN BUCHANAN		GDOT Dir. of Engineering	1519	
✓	✓	ROBERT MURPHY		GDOT	1526	
✓		B. N. D. WALK		GDOT	1883	bduvall@dot.ga.gov
	✓	Jenny Jenkins		McGee Partners	770-938-6400	jjenkins@mcgeepartners.com

✓ Check all that apply

16 Attended Project Overview (Day 1)

11 Attended Project Presentation (Day 4)

NO VIDEO

NO VIDEO