

# VALUE ENGINEERING REPORT

SR 284 over the Chattahoochee River/Lake Lanier  
BRST-2424(3), P.I. No. 142291  
Hall County

April 29, 2009

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## 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

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# **EXECUTIVE SUMMARY**

# Executive Summary

VALUE ENGINEERING STUDY  
BRST-2424(3), P.I. No. 142291  
SR 284 over the Chattahoochee River/Lake Lanier  
March 30 – April 2, 2009

## Introduction

This report summarizes the results of a value engineering (VE) study conducted on the proposed design for the reconstruction of the SR 284 bridge over the Chattahoochee River/Lake Lanier. The bridge is approximately four miles west of the city of Gainesville in Hall County. The existing SR 284 bridge was constructed in 1958 and has been classified as structurally deficient. The proposed project will construct a new two-lane, 952-foot long prestressed concrete girder bridge over the Chattahoochee River/Lake Lanier approximately 50 feet to the east of the existing bridge. The northern portion of the bridge will require constructing a new rock embankment to facilitate the tie-in. The project will also include a new park entrance to the Hall County park located on both sides of SR 284 on the north side of the project. These parks contain the buildings/marina and the rowing course, viewing and competition areas for an International rowing venue. Pedestrian traffic between these facilities will require a pedestrian underpass to be constructed under SR 284 near the park entrance intersection.

The proposed design for the bridge and roadway approach sections will provide a typical section consisting of two, 12-foot lanes, two, 4-foot bike lanes, and sidewalks on both sides of the road. Major contract work items include bridge construction, roadway/rock embankment, bituminous concrete pavement, pedestrian underpass culvert, drainage, concrete curb and gutter, and concrete sidewalk. The total estimated project cost including R/W is \$12.4 million. The design is currently in the concept stage. The Value Engineering study was conducted on March 30 – April 2, 2009, at the Georgia DOT General Office in Atlanta, using a four person VE team.

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 VE team has included a "Mark-Up" calculation in the Recommendation Cost Worksheet. The mark-up calculation for this project is 7.1 percent and represents the cost of the additive items of Construction Inspection, Fuel Adjustment, Liquid AC Adjustment, and Bridge Replacement with no Added Capacity. Adding these non-construction costs to the construction/R/W costs results in a grand total project cost that is equal to the State's overall program cost. Lastly, 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 project being evaluated under this study has an estimated construction cost of \$8.6 million (not including R/W). The project will have an impact on two Hall County parks on the north end of the project (acquiring R/W, revising entrances, and constructing a pedestrian underpass) and the Chattahoochee River/Lake Lanier basin (constructing a new bridge, demolishing and removing old bridge, constructing rock fill). The VE team was advised of several constraints to consider when developing their recommendations. The recommendations could not; extend the 60-day detour period for the full road closure, negatively impact R/W, eliminate a pedestrian underpass/protected crossing in the park area, or adversely impact the flow of the Chattahoochee River/Lake Lanier. A Revised Project Concept Report was approved in 2007. A Draft Categorical Exclusion is being prepared for the project. Right-of-way acquisition is scheduled for 2010 and the construction phase has not been scheduled.

## **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 60 ideas with 29 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed nine independent recommendations and three optional recommendations. A detailed write-up of each recommendation is contained in the respective portion of this report. A summary of the recommendations follows.

## **Recommendation Highlights**

### **Idea A-6: Lengthen the bridge on the north end by two spans to reduce the amount of rock fill placed in the lake and reduce the project's impact on the lake.**

The current bridge design utilizes a 952-foot long prestressed concrete girder bridge that ties to its north approach roadway that will be constructed on a new large rock fill to be placed in Lake Lanier. The bridge will be constructed using large BT 72 PSC beams. The bridge typical section includes two 12-foot lanes, and 4-foot bike lanes, and 6-foot sidewalks on both sides of the road.

It is recommended that the proposed bridge be lengthened on the north end by adding two 89-foot spans using AASHTO Type III PSC beams. Lengthening the north end of the bridge (new total length of 1,130 feet) would essentially eliminate the need to place 13,600 cubic yards of rock embankment in Lake Lanier. Eliminating 13,600 cubic yard of "lake fill" will reduce mitigation required to satisfy the COE's requirement to provide for a like amount of new lake storage for any embankment placed in the lake. The cost of providing new lake storage will significantly off-set the additional cost shown for constructing the two extra bridge spans. The VE team was unable to obtain a cost estimate for the lake mitigation work, however this recommendation should improve the environmental and hydrologic impacts to the lake.

**The total potential cost increase if accepted is \$543,000.**

### **Idea A-15: Construct 11-foot lanes in-lieu-of 12-foot lanes on the bridge and roadway to reduce the overall width of the bridge/roadway sections.**

The proposed SR 284 roadway/bridge typical sections for this project include 12-foot wide travel lanes in both directions.

It is recommended that 11-foot lanes be used in-lieu-of 12-foot lanes on both the bridge and roadway sections of the project. A reduction of one-foot per travel lane would reduce the width of the pavement section, the bridge, the amount of earthwork, and R/W acquisition costs. Reducing the amount of required R/W would lessen the project's impact on the surrounding area. The 11-foot lanes would provide the same function as the current design and accommodate current and future local AADT traffic demands. The 11-foot lanes would provide adequate safety for a rural bridge/roadway section with a posted speed of 45 MPH. This concept results in significant R/W and construction cost savings.

**The total potential savings if accepted is \$114,000.**

### **Idea A-16: Reduce the bridge and roadway width by constructing a rural roadway/bridge section for the entire length of the project.**

The proposed urban roadway design utilizes two 12-foot travel lanes, two 4-foot bike lanes, and a 12-foot wide urban shoulder with curb and gutter and sidewalks on both sides of the road. The proposed urban bridge design utilizes two 12-foot lanes, two 4-foot bike lanes, and a curb and gutter section with 6-foot sidewalks on both sides.

It is recommended that a rural roadway/bridge design be used for the entire length of the project in-lieu-of the proposed urban design. The rural roadway section would consist of two 12-foot travel lanes and two 10-foot shoulders (6.5-feet paved). The rural bridge section would consist of two 12-foot travel lanes and two 10-foot shoulders. Existing SR 284 is a rural 2-lane facility with no sidewalks. The existing bridge consists of a 28-foot wide structure with no sidewalks. The project is not in an area that would generate pedestrian traffic since individuals would most likely drive and park in the County Park on the north side to attend rowing events, thus negating the need for sidewalks on the project. The bicycle lanes could easily be accommodated on the roadway and bridge paved shoulders (there are no bike lanes on the existing facility). This concept results in significant R/W and construction cost savings.

**The total potential savings if accepted is \$849,000.**

**Idea E-1: Option 1 Increase the cost of the bridge removal item to include the cost of using cofferdams to remove the old bridge piers.**

The current cost estimate for the removal of the old bridge is very low for removing a long structure over deep water. The estimate does not include the cost for constructing cofferdams to remove the old piers from the lake as required by the COE.

It is recommended that the cost estimate for removing the old bridge be raised significantly to address the higher cost for removing the existing long bridge over deep water using barges and complying with the COE strict requirements for working in Lake Lanier, the major water reservoir for the Atlanta metropolitan area. The estimate also needs to include the cost of constructing eight cofferdams to remove the existing bridge piers from the lake bed.

**The total potential cost increase if accepted is \$986,000.**

**Idea E-1.1: Option 2 Keep the old bridge in place and use it as a bike trail, pedestrian walkway, and fishing pier to enhance the community value of the area.**

The current cost estimate for the removal of the old bridge is very low for removing a long structure over deep water. The estimate does not include the cost for constructing cofferdams to remove the old piers from the lake as required by the COE.

It is recommended that consideration be given to allowing the old bridge to remain in place and function/serve as a bike trail, pedestrian walkway, and fishing pier to enhance the community value of the area. The cost to remove the existing bridge is very high due to its removal over deep water, complying with strict COE requirements, and the need to construct cofferdams to remove the existing piers. This concept would also allow for changes to be made to the roadway/bridge typical section that would further reduce project costs. Approval to allow the old bridge to remain in place will have to be approved by the COE. Future costs to maintain the old bridge for bike and pedestrian traffic have been added into the cost of this recommendation.

**The total potential savings if accepted is \$1,391,000.**

**Idea I-1: Revise the bituminous pavement design for the project.**

The original design for the pavement section uses a 19.5 inch full depth bituminous concrete pavement section consisting of; 1.5 inches of 12.5 mm Superpave, 2 inches of 19 mm Superpave, 6 inches of 25 mm Superpave, and 10 inches of Graded Aggregate Base Course.

It is recommended that a thinner bituminous concrete pavement section be considered consisting of ; 1.5 inches of 12.5 mm Superpave, 2 inches of 19 mm Superpave, 4 inches of 25 mm Superpave, and 10 inches of Graded Aggregate Base Course. Based on the current traffic projections, the thickness of the full depth bituminous concrete pavement section can be reduced. Traffic projections will allow for a thinner section of the asphaltic concrete base course (25 mm Superpave).

**The total potential savings if accepted is \$45,000.**

**Idea J-1: Option 1 Relocate the pedestrian culvert underpass and new dual park entrances closer to the existing (Station 52+50) park driveway entrances and widen the underpass approach sidewalks to 10 feet.**

The original design moves the current park entrance driveways approximately 270 feet south of their current intersection with SR 284. Shifting the park driveways south allows room for a new 10-foot x 8-foot pedestrian culvert underpass to be constructed just north of the revised driveway intersection.

It is recommended that the new park entrance driveways be relocated back to their original location (Station 52+20), the pedestrian underpass culvert be constructed just north of the park entrance driveways (Station 52+90), and the pedestrian underpass approach sidewalks be widened to 10 feet to easily accommodate wheelchair pedestrians traveling in opposite directions. Shifting the park entrance driveways back would remove the intersection from the horizontal curve, provide better sight distance, eliminate the superelevation from the intersection, and may reduce the steep grades on the two driveways. Shifting the pedestrian culvert underpass would place it directly in the pedestrian flow path between the rowing venue's buildings/marina and the rowing course viewing/competition area.

**The total potential savings if accepted is \$4,000.**

**Idea J-1.1: Option 2 Eliminate the pedestrian culvert underpass and install a signalized pedestrian crossing.**

The original design concept features the installation of a 10-foot by 8-foot concrete box culvert underpass to allow pedestrians to cross safely between parks sites without crossing SR 284 at-grade.

It is recommended that consideration be given to replacing the box culvert underpass with a state of the art "on-demand" pedestrian activated grade crossing system. While the installation of a traffic signal at the park entrance intersection is not warranted due to traffic demands, expected pedestrian traffic wanting to cross SR 284 during park event times could be significant enough to

warrant an “on-demand” pedestrian activated crossing system. An “on-demand” pedestrian activated crossing system would be less expensive and easier to construct than the proposed pedestrian culvert underpass and require less long-term maintenance.

**The total potential savings if accepted is \$66,000.**

**Idea J-4: Construct the pedestrian culvert underpass using a corrugated metal arch culvert in-lieu-of a concrete box culvert.**

The current design proposes to construct a 10-foot wide by 8-foot tall pedestrian culvert underpass at Station 50+80. The proposed underpass culvert is 86 feet long.

It is recommended that consideration be given to constructing a corrugated metal arch culvert in-lieu-of the proposed concrete box culvert. The use of a corrugated metal arch underpass with a stone wall end section would provide a more aesthetically pleasing facility in a park setting. The additional rounded space provided by an arch structure would also give a more “open” view/feeling to the structure. Constructing a metal arch structure may require additional drainage considerations due to the need to place the structure lower than the box culvert to address its larger height and the depth/amount of fill needed to be placed over the arch.

**The total potential savings if accepted is \$41,000.**

**Idea J-5: Reduce the roadway width by using 2:1 side slopes and MSE side walls to reduce the length of the pedestrian culvert underpass.**

The proposed roadway typical section where the pedestrian culvert underpass is to be constructed includes 4:1 slopes with 2:1 slopes being used elsewhere.

It is recommended that all roadway slopes be reduced to 2:1 throughout project limits. Reducing the roadway slopes from 4:1 to 2:1 would reduce earthwork volume, the length of the pedestrian culvert underpass, and R/W acquisition costs. Changing to 2:1 slopes will require constructing two retaining walls at the culvert ends and the placing guardrail on the top of all 2:1 slopes. Using 2:1 slopes would reduce the underpass culvert by 26 feet. Reducing the length of the underpass culvert would provide more space for the approach sidewalks, thereby reducing their grades and making them more wheelchair compatible.

**The total potential savings if accepted is \$120,000.**

**Idea K-1: Option 1 Eliminate the sidewalk on the east side of the project to reduce the width of the roadway/bridge sections.**

The proposed roadway design includes 5-foot concrete sidewalks on both sides of SR 284. The proposed bridge design includes dual 6-foot sidewalks over its entire length for a 48-foot outside to outside width.

It is recommended that consideration be given to eliminating the east side sidewalk and constructing only a single sidewalk on the west side. This concept would retain the 6-foot sidewalk on west side of bridge deck and a 2-foot shoulder from the edge of bike lane to face of barrier wall on the east side of the bridge. There is no current sidewalk network along existing SR 284 for the proposed new sidewalk to tie into. The surrounding residential neighborhoods do not have any sidewalks. Constructing a single sidewalk would reduce the overall roadway/bridge typical section width and reduce the R/W needs for the project.

**The total potential savings if accepted is \$716,000.**

**Idea K-1.1: Option 2 Eliminate both sidewalks on the project to reduce the width of the roadway/bridge sections.**

The proposed roadway design includes 5-foot concrete sidewalks on both sides of SR 284. The proposed bridge design includes dual 6-foot sidewalks over its entire length for a 48-foot outside to outside width.

It is recommended that consideration be given to eliminating both sidewalks along the SR 284 corridor. The concept would result in a revised 40-foot wide bridge section consisting of two 12-foot lanes, two 4-foot bike lanes, and a 2-foot wide shoulder from the edge of the bike lane to the face of the barrier wall. There is no current sidewalk network along existing SR 284 for the proposed new sidewalk to tie into. The surrounding residential neighborhoods do not have any sidewalks. Eliminating sidewalks would reduce the overall roadway/bridge typical section width and reduce the R/W needs for the project. Eliminating sidewalks on the bridge may improve safety by eliminating the possibility of fishing or diving from the bridge.

**The total potential savings if accepted is \$1,431,000.**

**SR 284 Bridge Over Chattahoochee River/Lake Lanier  
SUMMARY OF POTENTIAL COST SAVINGS**

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	SAVINGS POTENTIAL* (%)
<b>RECOMMENDATIONS</b>							
A-6	Lengthen the bridge on the north end by two spans to reduce the amount of rock fill placed in the lake and reduce the project's impact on the lake.	\$610,000	\$1,153,000	(\$543,000)	N/A	(\$543,000)	100%
A-15	Construct 11-foot lanes in-lieu-of 12-foot lanes on the bridge and roadway to reduce the overall width of the bridge/roadway sections.	\$114,000	\$0	\$114,000	N/A	\$114,000	100%
A-16	Reduce the bridge and roadway width by constructing a rural roadway/bridge section for the entire length of the project.	\$961,000	\$67,000	\$894,000	N/A	\$894,000	100%
E-1	<b>Option 1</b> Increase the cost of the bridge removal item to include the cost of using cofferdams to remove the old bridge piers.	\$278,000	\$1,264,000	(\$986,000)	N/A	(\$986,000)	100%
E-1.1	<b>Option 2</b> Keep the old bridge in place and use it as a bike trail, pedestrian walkway, and fishing pier to enhance the community value of the area.	\$1,521,000	\$14,000	\$1,507,000	(\$116,000)	\$1,391,000	100%

**SR 284 Bridge Over Chattahoochee River/Lake Lanier**  
**SUMMARY OF POTENTIAL COST SAVINGS**

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	SAVINGS POTENTIAL* (%)
I-1	Revise the bituminous pavement design for the project.	\$45,000	\$0	\$45,000	N/A	\$45,000	100%
J-1	<b>Option 1</b> Relocate the pedestrian culvert underpass and new dual park entrances closer to the existing (Station 52+50) park driveway entrances.	\$22,000	\$18,000	\$4,000	N/A	\$4,000	100%
J-1.1	<b>Option 2</b> Eliminate the pedestrian culvert underpass and install a signalized pedestrian crossing.	\$146,000	\$80,000	\$66,000	N/A	\$66,000	100%
J-4	Construct the pedestrian culvert underpass using a corrugated metal arch culvert in-lieu-of a concrete box culvert.	\$107,000	\$66,000	\$41,000	N/A	\$41,000	100%
J-5	Reduce the roadway width by using 2:1 side slopes and MSE side walls to reduce the length of the pedestrian culvert underpass.	\$154,000	\$34,000	\$120,000	N/A	\$120,000	100%
K-1	<b>Option 1</b> Eliminate the sidewalk on the east side of the project to reduce the width of the roadway/bridge sections.	\$716,000	\$0	\$716,000	N/A	\$716,000	100%



## **STUDY IDENTIFICATION**

## Study Identification

<b>Project:</b> SR 284 Over the Chattahoochee River/Lake Lanier	<b>Date:</b> March 30 – April 2, 2009
<b>Location:</b> Gainesville, Georgia	

### VE Team Members

Name:	Title:	Organization:	Telephone:
Keith Borkenhagen, PE, CVS	VE Team Facilitator	MACTEC	623-556-1875
Alex Wiley, PE	Roadway Design	MACTEC	770-421-3481
Aruna Sastry, PE	Structures	Sastry and Assoc.	678-366-9375
Dan Cogan, PE	Construction	KEA	678-904-8591

### **Project Description:**

This project would reconstruct the SR 284 bridge over the Chattahoochee River/Lake Lanier. The bridge is approximately four miles west of the city of Gainesville in Hall County. The existing SR 284 bridge was constructed in 1958 and has been classified as structurally deficient. The proposed project would construct a new two-lane, 952-foot long prestressed concrete girder bridge over the Chattahoochee River/Lake Lanier approximately 50 feet to the east of the existing bridge. The northern portion of the bridge will require constructing a new rock embankment to facilitate the tie-in. The project will also include a new intersection for park entrances to the Hall County parks located on either side of SR 284 on the north side of the project. These parks contain the buildings/marina and rowing course, viewing and competition areas for an International rowing venue. Pedestrian traffic between these facilities will require a pedestrian underpass to be constructed under SR 284 near the park entrance intersection.

The proposed design for the bridge and roadway approach sections will provide a typical section consisting of two, 12-foot lanes, two, 4-foot bike lanes, and sidewalks on both sides of the road. Major contract work items include bridge construction, roadway/rock embankment, bituminous concrete pavement, pedestrian underpass culvert, drainage, concrete curb and gutter, and concrete sidewalk. The total estimated project cost including R/W is \$12.4 million.

## **Project Constraints:**

The VE team was given the following constraints:

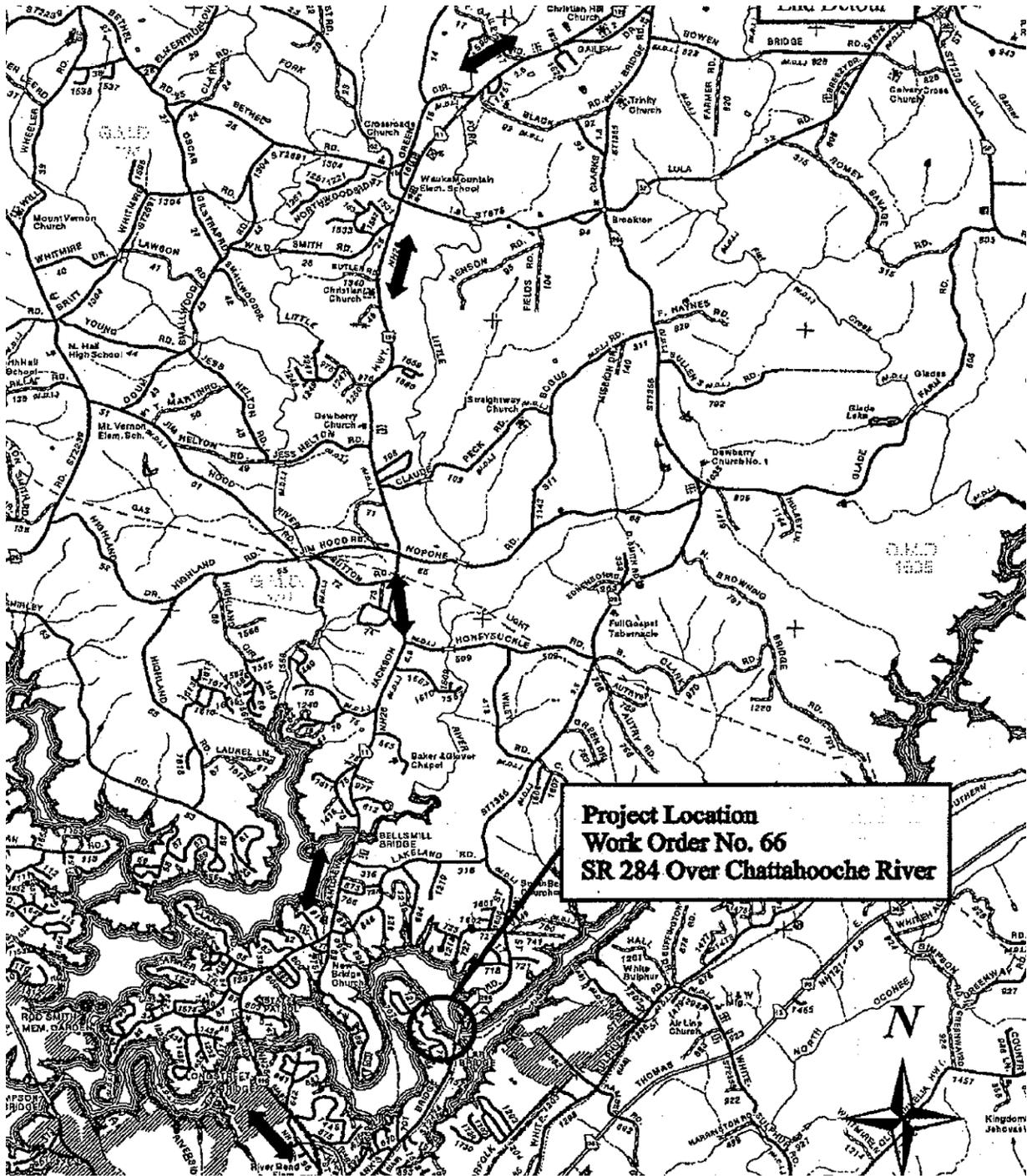
- Recommendations could not extend the 60-day detour period for the full road closure,
- Recommendations could not negatively impact R/W,
- The project was to provide a pedestrian underpass or protected crossing in the park area on the north end,
- The project was to include provisions for bicycle traffic, and
- Recommendations could not adversely impact the flow of the Chattahoochee River/Lake Lanier.

## **Project Briefing:**

Prior to beginning the study, the VE team was briefed on the current design status of the project. The following items were discussed:

- The project consists of the construction of a new long bridge over the Chattahoochee River/Lake Lanier. The existing bridge has been classified as structurally deficient. It is also in the state's top 20 list for bridges needing replacement.
- Lake Lanier is the primary reservoir for the metropolitan Atlanta area and is owned and maintained by the Army CORP of Engineers (COE). All work in/around the lake will have to be reviewed and approved by the COE.
- Hall County has leased property from the COE on the north end of the project and constructed parks on both sides of SR 284. The parks contain the buildings/marina and rowing course viewing/competition area for an International rowing venue (former Olympic venue).
- The COE and Hall County have asked that a pedestrian underpass culvert be constructed under SR 284 to connect the parks and serve the pedestrians attending rowing events.
- A revised Project Concept Report for the project was approved in 2007. The report was revised to include the pedestrian underpass.
- A Draft Categorical Exclusion is being prepared for the project. Even though the project will require R/W from the parks, the State and FHWA have reviewed the takings and determined that a Section 4(f) statement is not required.
- Right-of-way acquisition is scheduled for 2010. The construction phase has not been scheduled.
- Due to comments received at the public information meetings, the FHWA has limited the total road closure (detour) to construct the project to a maximum of 60 days. The time will be used to construct the north bridge approach and pedestrian underpass.
- SR 284 has been designated as a bike route. The project will have to accommodate bike traffic.
- The existing section of SR 284 is a two-lane rural roadway. There are no sidewalks or bike lanes on the existing facility.
- The existing SR 284 bridge is a narrow two-lane structure, 28 feet wide with no sidewalks or bike lanes.
- The COE has stated that the existing bridge has to be removed to reduce flow restrictions from the river and increase lake capacity.

# Project Sketch Map



## **VE RECOMMENDATIONS**

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> A-6	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Lengthen the bridge on the north end of the project by two spans to reduce/eliminate the rock embankment placed in the lake.
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Comp By: Aruna Sastry Date: 03/31/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The current bridge design uses a 952-foot long by 50-foot wide prestressed concrete girder bridge that ties to the north approach roadway on a new large rock fill to be constructed within the Lake. The concrete girders are BT 72 PSC beams. The bridge typical section includes two 12-foot lanes, with 4-foot bike lanes, and 6-foot sidewalks on both sides of the road.

**Proposed Change:**

It is recommended that the proposed bridge be lengthened on the north end by adding two 89-foot spans using AASHTO Type III PSC beams. This will result in a total bridge length of 1,130 feet.

**Justification:**

Lengthening the bridge on the north end will essentially eliminate the need to place 13,600 cubic yards of rock embankment in the lake on the north side. This will significantly reduce the project's encroachment and impact on the lake.

Eliminating 13,600 cubic yard of fill will reduce the amount of mitigation the State will have to perform to satisfy the COE's requirement to provide for a similar amount of new lake storage for any embankment placed in the lake. The VE team was unable to obtain a cost estimate for any mitigation work and it is not included in the construction cost estimate, however, this recommendation will improve the environmental, hydrological and storage impacts to the Lake.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST: – Original</b>	\$610,000		
– Proposed	\$1,153,000		
– Savings	(\$543,000)		(\$543,000)
<b>FUTURE COST: – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>(\$543,000)</b>



## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: A-6  
Client: GDOT  
Sheet 3 of 3

### Rock Embankment:

Total Embankment in plans: = 19,640 CY

Embankment on the south side: =  $(28 \text{ ft} \times 45 \text{ ft} \times 130 \text{ ft})/27 = 6,066 \text{ CY}$  Say 6,000 CY

Embankment on the north side: =  $19,640 \text{ CY} - 6,000 \text{ CY} = 13,640 \text{ CY}$

### Change in Bridge Length:

Lengthen bridge by two 89-foot spans

$178 \text{ ft} \times 50.41 \text{ ft} = 8,973 \text{ SF}$

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> A-15	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Construct 11-foot lanes in-lieu-of 12-foot lanes on the bridge/roadway to reduce the overall width of the bridge and its approach roadway sections.
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Comp By: D.P.C. Date: 4/1/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The proposed roadway and bridge typical sections for this project include 12-foot wide travel lanes in both directions.

**Proposed Change:**

It is recommended that 11-foot lanes be used in-lieu-of 12-foot lanes on both the bridge and roadway sections of the project.

**Justification:**

Reduction of one-foot per lane of bridge and roadway section reduces the width of the pavement section, the bridge, earthwork, and right-of-way (R/W) acquisition costs. The one-foot reduction in lane width would reduce the amount of required R/W and lessen the project's impact on the surrounding area. Over half of the cost savings from this concept is obtained from the reduction in R/W. It would also reduce the amount and cost of earthwork, and roadway and bridge construction.

The 11-foot lanes would provide the same function as the current design and accommodate current and future local AADT traffic demands. They would provide adequate safety for a rural bridge and roadway section with a posted speed of 45 MPH. This concept results in significant cost savings to the project.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST: – Original</b>	\$114,000		
– Proposed	\$0		
– Savings	\$114,000		\$114,000
<b>FUTURE COST: – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$114,000</b>



## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: A-15  
Client: GDOT  
Sheet 3 of 3

### **Mainline Section:**

Project limits: STA 28+00 to STA 55+31.

- a. Current mainline (2) 12-foot lanes from begin project to end project = 2,731 ft.

Total pavement section 2-foot reduction = 2,731 ft x 2.0 ft = 5,462 SF/9 = 610 SY

### **GAB and Asphalt SY to Ton calculations:**

1. GAB – 128 # x 610 SY/2,000 # = 40 Tons – this project had GAB priced as SY.
2. 12.5 mm mix – 165 # x 610 SY/2,000 # = 51 Tons
3. 19 mm mix – 220 # x 610 SY/2,000 # = 70 Tons
4. 25 mm mix – 660 # x 610 SY/2,000 # = 202 Tons

### **Right-of-Way (R/W) Cost:**

Total estimated cost is \$2.9 million over 5.602 acres. (43,560 SF = 1.0 acre) x 5.602 acres = 244,023 SF = \$11.89 SF

STA 28+00 to STA 55+31 = 2,731 ft long x 2 ft wide strip = 5,462 SF

### **Borrow Embankment, incl. material:**

2,731 ft x 2 ft width x 8 ft avg. depth = 43,700 CF/27 = 1,620 CY embankment material.

### **Storm Drain Cross-Drain Pipes:**

Quantities taken directly from plan sheets.

## DEVELOPMENT AND RECOMMENDATION PHASE

### Project: SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> A-16	<b>Sheet No.:</b> 1 of 4	<b>CREATIVE IDEA:</b> Reduce the bridge and roadway overall width by constructing a rural roadway/bridge section for the entire length of the project.
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Comp By: A.W. Date: 03/31/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The current roadway design calls for two 12-foot travel lanes, two 4-foot bike lanes, and a 12-foot wide urban shoulder with curb and gutter and sidewalks on both sides of the road. The current bridge design calls for an urban section with two 12-foot lanes, two 4-foot bike lanes, and curb and gutter with 6-foot sidewalks on both sides.

**Proposed Change:** It is recommended that a rural roadway/bridge typical section be used for the entire length of the project. The rural roadway section would consist of two 12-foot travel lanes and two 10-foot shoulder (6.5-feet paved). The rural bridge section would consist of two 12-foot travel lanes and two 10-foot shoulders.

**Justification:** The existing SR 284 roadway section consists of a rural 2-lane facility with no sidewalks on either end. The existing bridge section consists of a 28-foot wide structure with no sidewalks. The project does not appear to be in an area that would generate pedestrian traffic along the roadway. Individuals would most likely drive and park in the County Park on the north side of the project and simply cross SR 284 to attend rowing events, thus negating the need for sidewalks on the project.

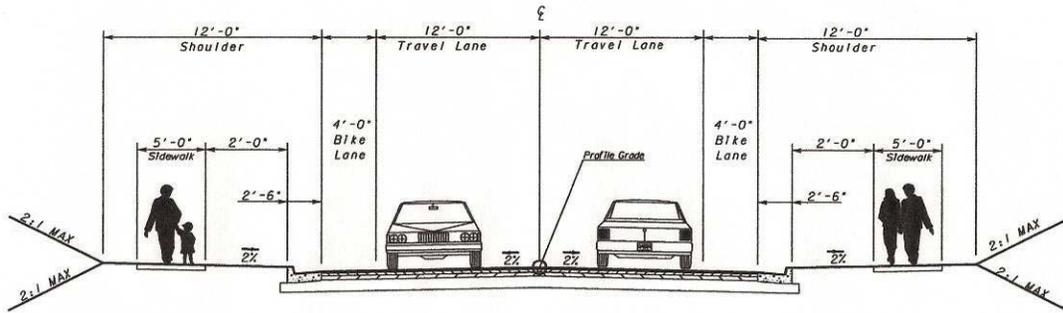
The bicycle lanes could easily be accommodated on the roadway and bridge paved shoulders (there are no bike lanes on the existing facility). This concept would reduce the width of the typical section, the embankment, some full depth asphalt pavement, and project R/W needs. Using a rural shoulder instead of the proposed urban shoulder plus bicycle lanes and sidewalks could reduce the bridge width by approximately 4 feet.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST: – Original</b>	\$961,000		
– Proposed	\$67,000		
– Savings	\$894,000		\$894,000
<b>FUTURE COST: – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$894,000</b>

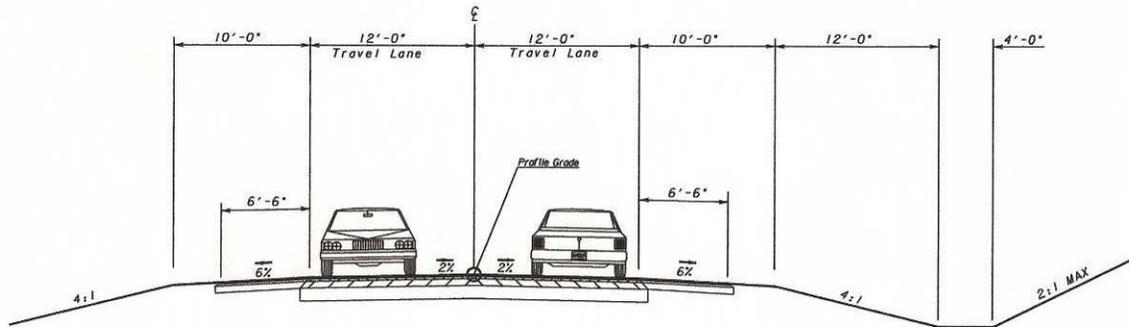
# SKETCH

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: A-16  
Client: GADOT  
Sheet 2 of 4



CURRENT SECTION



PROPOSED SECTION

## COST WORKSHEET

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: A-16

Client: GADOT

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CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
Item	Unit	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
<b>Pavement:</b>							
12.5 mm Superpave	TON	248	\$64.00	\$15,872			
19 mm Superpave	TON	330	\$64.26	\$21,206			
25 mm Superpave	TON	990	\$60.11	\$59,509			
10" Graded Aggregate Base	SY	3,000	\$16.44	\$49,320			
<b>Shoulder:</b>							
12.5 mm Superpave	TON				206	\$64.00	\$13,184
19 mm Superpave	TON				275	\$68.26	\$18,772
6" Graded Aggregate Base	SY				2,500	\$12.06	\$30,150
Rumble Strips	GLM				0.63	\$855.47	\$539
<b>Other Items:</b>							
Concrete Curb & Gutter	LF	3,538	\$14.98	\$52,999			
4" Concrete Sidewalk	SY	1,800	\$34.66	\$62,388			
Catch Basins	EA	12	\$2,499.45	\$29,993			
18" Storm Drain Pipe	LF	1,000	\$37.74	\$37,740			
Bridge Width Reduction	SF	3,015	\$120.00	\$361,800			
Reduction in Right of Way	SF	17,360	\$11.89	\$206,410			
<b>SUBTOTAL</b>				\$897,237			\$62,645
<b>MARK-UP (7.1%)</b>				\$63,704			\$4,448
<b>TOTAL</b>				\$960,941			\$67,093
<b>TOTAL ROUNDED</b>				<b>\$961,000</b>			<b>\$67,000</b>

## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: A-16  
Client: GADOT  
Sheet 4 of 4

Length of bituminous paving:

STA. 27+50 to STA. 34+40 = 690 LF

STA. 44+52 to STA. 55+31 = 1079 LF

1769 LF x 2 sides = 3538 LF

3538 LF – 3 driveway/street openings x 70' = 3328 LF

Shoulder Paving:

3328 LF x 6.5'/9 SF/SY = 2404 SY, Use 2500 SY

1.5" – 12.5 mm Superpave = 2500 SY x 110 LB/SY x 1.5/2000 LB/Ton = 206 Ton

2" – 19 mm Superpave = 2500 SY x 110 LB/SY x 2/2000 LB/Ton = 275 Ton

6" Graded Aggregate Base = 2500 SY

Rumble Strips – 3328 LF/5280 LF/Mile = 0.63 Mi.

Mainline paving for bicycle lanes (4' wide x 2 sides = 8' wide)

3328 LF x 8'/9 SF/SY = 2958 SY, Use 3000 SY

1.5" – 12.5 mm Superpave = 3000 SY x 110 LB/SY x 1.5/2000 LB/Ton = 248 Ton

2" – 19 mm Superpave = 3000 SY x 110 LB/SY x 2/2000 LB/Ton = 330 Ton

6" – 25 mm Superpave = 3000 SY x 110 LB/SY x 6/2000 LB/Ton = 990 Ton

10" Graded Aggregate Base = 3000 SY

Conc. Curb & Gutter = 3538 LF

4" Conc. Sidewalks:

STA. 28+58.22 to STA. 34+40 Lt. = 582 LF

STA. 28+00.00 to STA. 34+40 Rt. = 640 LF

STA. 44+52.00 to STA. 49+70 Lt. = 518 LF

STA. 44+52.00 to STA. 49+50 Rt. = 498 LF

STA. 50+30.00 to STA. 55+31 Lt. = 501 LF

STA. 50+40.00 to STA. 55+31 Rt. = 491 LF

3230 LF x 5'/9 SF/SY = 1794 SY,

Use 1800 SY

Reduced bridge width: 50'-5" – 47'-3" = 3.16667'

952 LF x 3.1667 = 3015 SF

Drainage: 12 Catch Basins

1050 LF 18" Pipe

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> E-1	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA: <u>Option 1</u></b> Increase the cost of the bridge removal item to include the cost of using cofferdams to remove the old bridge piers.
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Comp By: A.W. Date: 4/1/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The current cost estimate for the removal of the old bridge is very low for removing a long structure over deep water. The estimate does not include the cost for constructing cofferdams to remove the old piers from the lake as required by the Corps of Engineers.

**Proposed Change:**

It is recommended that the cost estimate for removing the old bridge be raised significantly to include the high cost to remove a long structure over deep water using barges and complying with the COE strict requirements for working in Lake Lanier. The cost estimate also needs to include the cost for eight cofferdams to remove the old piers from the lake.

**Justification:**

Removing the existing long bridge over deep water will be costly. This structure will have to be removed using barges which will significantly increase the cost. The structure will also have to be removed under strict COE requirements due to Lake Lanier being the major water reservoir for the Atlanta area which will also increase cost.

Eight of the existing bridge piers are located in deep water requiring the construction of a cofferdam for their complete removal from the lake bed. The cost of a single cofferdam to work in this depth of water is estimated at about \$115,000.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$278,000		
– Proposed	\$1,264,000		
– Savings	(\$986,000)		(\$986,000)
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>(\$986,000)</b>



## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> E-1.1	<b>Sheet No.:</b> 1 of 4	<b>CREATIVE IDEA: <u>Option 2</u></b> Let the old bridge remain in place and function as a bike trail, pedestrian walkway, and fishing pier.
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Comp By: A.W. Date: 4/1/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The current cost estimate for the removal of the old bridge is very low for removing a long structure over deep water. The estimate also does not include the cost for constructing cofferdams to remove the old piers from the lake as required by the COE.

**Proposed Change:**

It is recommended that the old bridge remain in place to function/serve as a bike trail, pedestrian walkway and fishing pier. This concept would enhance the community value of the area. This would also allow changes to be made to the roadway/bridge typical section that would further reduce project costs.

**Justification:**

The cost to remove the existing long bridge over deep water will be very expensive and significantly above the cost shown in the estimate. This structure will have to be removed using barges and under strict COE requirements for working in Lake Lanier, the major water reservoir for the metropolitan Atlanta area. In addition, eight of the existing bridge piers are located in deep water and will require the construction of cofferdams for their complete removal from the lake bed. The cost of a single cofferdam to work in this depth of water is estimated at about \$115,000. Multi-use trails would tie the old bridge to the new roadway.

Approval to allow the old bridge to remain in place will have to be re-negotiated with the COE. Future costs to maintain the old bridge for bike and pedestrian traffic have been added into the cost of this recommendation.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$1,521,000		
– Proposed	\$14,000		
– Savings	\$1,507,000		\$1,507,000
<b><u>FUTURE COST:</u> – Savings</b>		(\$116,000)	(\$116,000)
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$1,391,000</b>

## COST WORKSHEET

<b>Project:</b> SR 284 over the Chattahoochee River/Lake Lanier					Idea No.: E-1.1		
					Client: GDOT Sheet 2 of 4		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
Item	Unit	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
<b>Current Design:</b>							
Remove Existing Bridge (Est)	LS	1	\$260,000	\$260,000	0		\$0
Construct Cofferdams	EA	8	\$115,000	\$920,000	0		\$0
<b>VE Design:</b>							
Additional cost estimate to remove bridge using barges over deep water	LS	1	\$240,000	\$240,000			
<b>Construct Bituminous Trail:</b>							
19 mm Superpave	TON				73	\$68.26	\$4,983
6" Graded Aggregate Base	SY				666	\$12.06	\$8,032
<b>SUBTOTAL</b>				<b>\$1,420,000</b>			<b>\$13,015</b>
<b>MARK-UP (7.1%)</b>				<b>\$100,820</b>			<b>\$924</b>
<b>TOTAL</b>				<b>\$1,520,820</b>			<b>\$13,939</b>
<b>TOTAL ROUNDED</b>				<b>\$1,521,000</b>			<b>\$14,000</b>

## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: E-1.1

Client: GDOT

Sheet 3 of 4

Connect old bridge/roadway bike/pedestrian trail to new roadway.

South Side: Station 29+00 to 32+00 = 300 ft x 10 ft/9 = 333 SY

North Side: Station 48+00 to 51+00 = 300 ft x 10 ft/9 = 333 SY (end at pedestrian culvert)

Total trail: 666 SY bituminous pavement for trail

2" – 19 mm Superpave = 666 SY x 110 LB/SY x 2/2,000 LB/Ton = 73 Ton

6" Graded Aggregate Base = 666 SY

Cost estimate to remove long bridge over deep water:

Assumed at approximately twice the cost.

Cost estimate: \$260,000 + Additional \$240,000 = Total \$500,000

### **Life-Cycle Cost Impacts:**

Assume \$100,000 cost to paint & perform other maintenance items on old bridge every 20 years.

Assume a \$50,000 initial cost to seal joints/cracks on the existing bridge prior to opening it to bike and pedestrian traffic.

**Life Cycle Cost Analysis – Present Worth Method**  
**Future Cost Calculation**

**PROJECT:** SR 284 over the Chattahoochee River/Lake Lanier

Creative Idea: E-1.1 Seal Joints/Cracks Year 1 – Future painting & maintenance

Discount Rate: 4% Economic Life: 40 Years

	A	B	C	D
	Original Design		Alternate Design	
	Cost	PW	Cost	PW
<b>1. Single Expenditures:</b> (i.e., stage Construction, Major Maintenance)				
a. Year <u>  1  </u> PWF <u>  1  </u>	\$0		\$50,000	\$50,000
b. Year <u> 20 </u> PWF <u> .456 </u>	\$0		\$100,000	\$45,600
c. Year <u> 40 </u> PWF <u> .208 </u>	\$0		\$100,000	\$20,800
d. Salvage/Unused Service Life Year <u>      </u> PWF <u>      </u>				
<b>1. Total Future Single Costs:</b>				\$116,400

<b>2. Annual Costs:</b>				
a. General Maintenance PWF' =				
b. Other Annual Costs PWF' =				
<b>2. Total Future Annual Costs</b>				

<b>3. Total Future Costs: (1 + 2)</b>				\$116,400
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<b>4. Total Future Cost Savings on a Present Worth Basis (3B-3D)</b>		\$116,400
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## DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 284 over the Chattahoochee River/Lake Lanier**

<b>IDEA No.:</b> I-1	<b>Sheet No.:</b> 1 of 4	<b>CREATIVE IDEA:</b> Revise the bituminous concrete pavement section for the project.
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Comp By: A.W. Date: 03/31/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The original or current pavement section calls for a 19.5 inch full depth section consisting of:

- 1.5" of 12.5 mm Superpave
- 2" of 19 mm Superpave
- 6" of 25 mm Superpave
- 10" of Graded Aggregate Base Course

**Proposed Change:**

It is recommended that a thinner bituminous concrete pavement section be considered consisting of :

- 1.5" of 12.5 mm Superpave
- 2" of 19 mm Superpave
- 4" of 25 mm Superpave
- 10" of Graded Aggregate Base Course

**Justification:**

Based on the current plans and traffic projections, the thickness of the full depth bituminous concrete pavement section can be reduced. Traffic projections will allow for a thinner section of the asphaltic concrete base course (25 mm Superpave).

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST: – Original</b>	\$45,000		
– Proposed	0		
– Savings	\$45,000		\$45,000
<b>FUTURE COST: – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$45,000</b>





## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: I-1  
Client: GADOT  
Sheet 4 of 4

(Graded Aggregate Base Course area from cost estimate:  $2934 + 2650 = 5584$  SY)

Paving area from plans (Assumes full depth throughout mainline):

STA. 27+50 to STA. 34+40 = 690 LF

STA. 44+52 to STA. 55+31 = 1079 LF

$1769 \text{ LF} \times 32 \text{ FT} = 56,608 \text{ SF} / 9 \text{ SF/SY} = 6290 \text{ SY}$

Use 6300 SY

$6300 \text{ SY} \times 110 \text{ LB/SY} \times 2 / 2000 \text{ LB/Ton} = 693 \text{ Tons}$  Use 700 Tons

## DEVELOPMENT AND RECOMMENDATION PHASE

### Project: SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> J-1	<b>Sheet No.:</b> 1 of 5	<b>CREATIVE IDEA: <u>Option 1</u></b> Relocate the pedestrian culvert underpass and new dual park entrances closer to the existing park driveway entrances.
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Comp By: A.W. Date: 04/01/09 Checked By: K.B. Date: 04/06/09

**Original Concept:** The original design moves the current park entrance driveways approximately 270 feet south of their current intersection with SR 284. Shifting the park driveways south allows room for a new 10-foot x 8-foot pedestrian culvert underpass to be constructed just north of this revised driveway intersection.

**Proposed Change:**

It is recommended that the new park entrance driveways be relocated back to their existing location (Station 52+20) and the pedestrian underpass culvert be constructed just north of the new entrance driveways (Station 52+90) and that the pedestrian underpass approach sidewalks be widened to 10 feet to easily accommodate wheelchair pedestrians traveling in opposite directions.

**Justification:** Shifting the park entrance driveways back to Station 52+20 will remove the intersection from the horizontal curve on SR 284. This shift will provide better sight distance, eliminate the SR 284 superelevation from the intersection, and may reduce the steep grades on the two driveways.

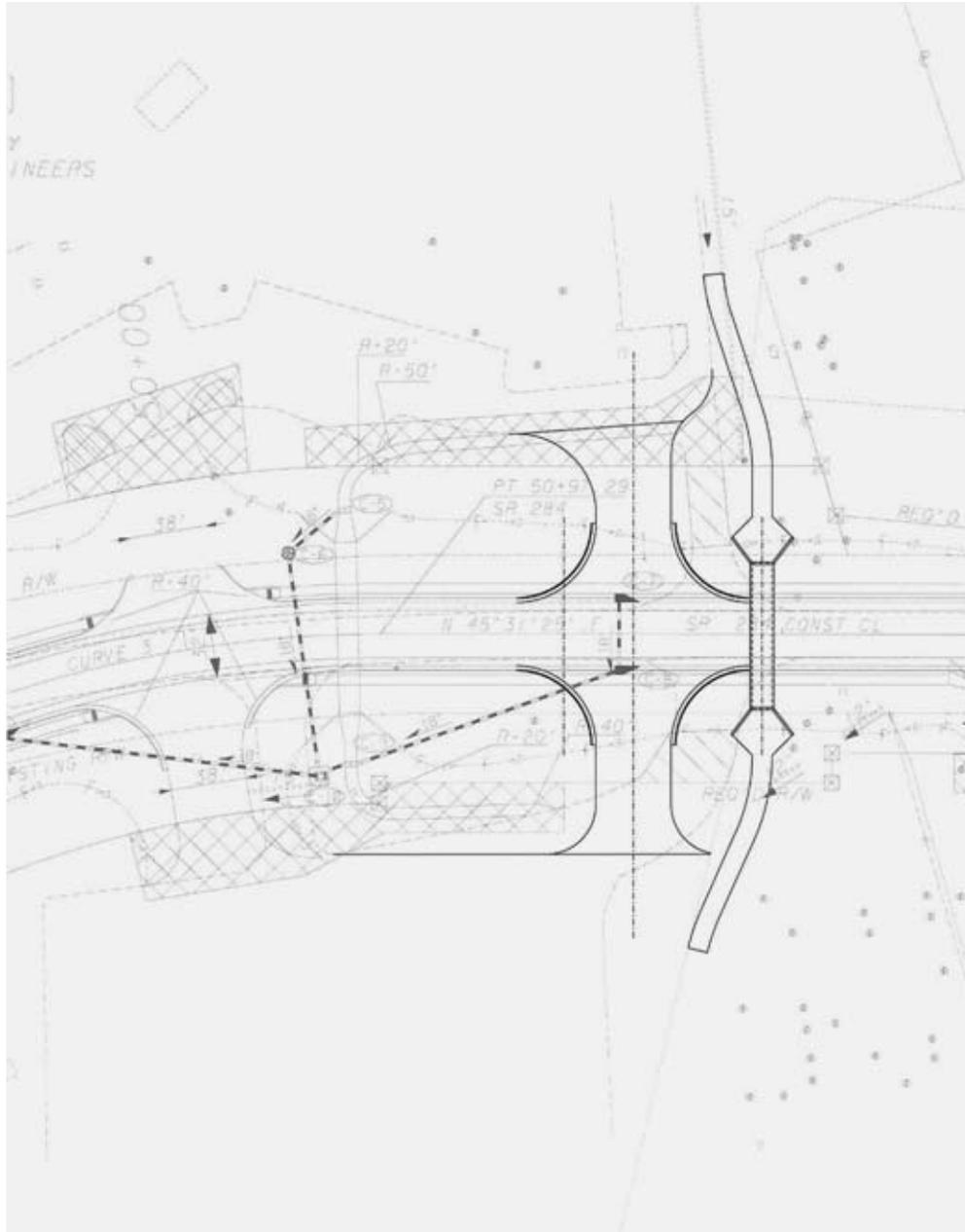
Shifting the pedestrian culvert underpass to Station 52+90 will place the underpass directly in the primary pedestrian flow path from the rowing venue’s buildings/marina on the west side of SR 284 and the rowing course viewing/competition area on the east side of SR 284. Constructing the underpass at this location would shorten the culvert, its connecting sidewalks, and eliminate the 90 degree turns in the currently designed approach sidewalks. Constructing the underpass at this location would allow it to be raised reducing underpass drainage impacts and allowing for a reduced grade on the approach sidewalks.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$22,000		
– Proposed	\$18,000		
– Savings	\$4,000		\$4,000
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$4,000</b>

# SKETCH

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

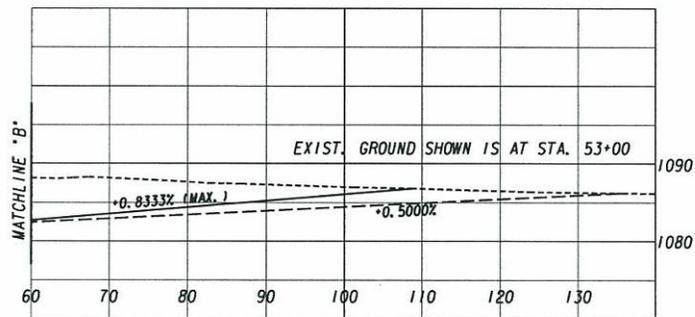
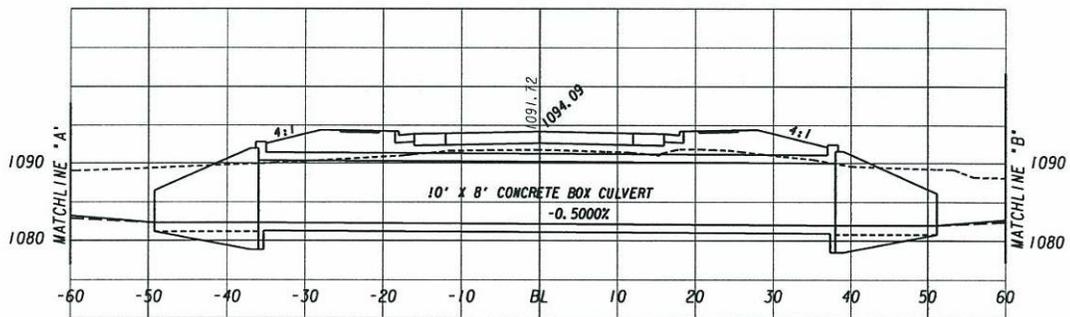
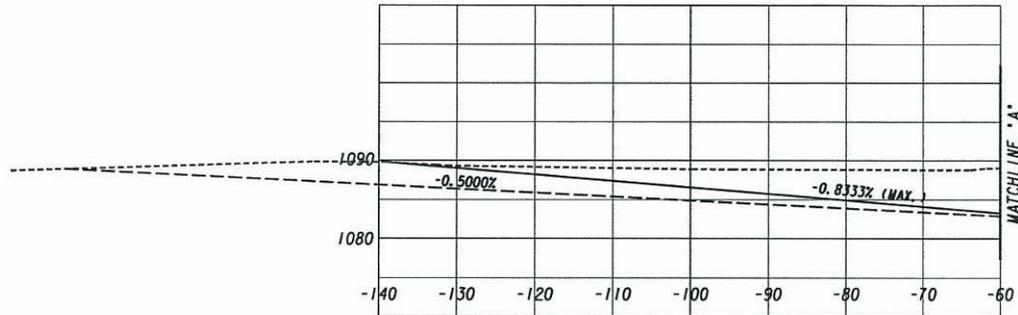
Idea No.: J-1  
Client: GADOT  
Sheet 2 of 5



# SKETCH

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: J-1  
 Client: GADOT  
 Sheet 3 of 5





## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: J-1  
Client: GDOT  
Sheet 5 of 5

### Concrete Box Culvert:

Current Box Culvert is 86 LF

Proposed Box Culvert = 74 LF

Diff. = 12 LF

### From Ga. Std. 2324:

Class "A" Conc. is 1.528 CY/LF of culvert barrel

Bar Reinforcing Steel is 195.6 LB/LF of culvert barrel

$12 \text{ LF} \times 1.528 \text{ CY/LF} / 27 \text{ CF/CY} = 18.34 \text{ CY}$ , USE 20 CY Class "A" Concrete

$12 \text{ LF} \times 195.6 \text{ LB/LF} = 2347 \text{ LB}$ , Use 2500 LB

### Concrete Sidewalk:

(Assume 10' width for pedestrian walkway. Existing walkway design is 5' wide)

Area from CADD =  $3225 \text{ SF} / 9 \text{ SF/SY} = 358 \text{ SY}$ , Use 400 SY

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> J-1.1	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA: <u>Option 2</u></b> Eliminate the pedestrian culvert underpass and install a signalized pedestrian crossing.
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Comp By: D.P.C. Date: 04/01/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The proposed concept features the installation of a 10-foot by 8-foot concrete box culvert underpass to allow pedestrians to cross safely between parks sites without crossing traffic on SR 284 using an at-grade crossing.

**Proposed Change:**

It is recommended that consideration be given to eliminating the box culvert underpass and replacing it with a state of the art at-grade on-demand pedestrian crossing system.

**Justification:**

Traffic volumes on SR 284 are currently 11,000 AADT with future growth to 15,000 AADT. The installation of a traffic signal at the park entrance intersection, as requested by Hall County Park System and local citizens, is not warranted. Without a signalized crossing of SR 284, pedestrians would be at risk crossing the roadway to attend various events.

Expected pedestrian traffic wanting to cross SR 284 during park event times could be significant enough to warrant an on-demand pedestrian activated crossing system. An on-demand pedestrian activated crossing system would be less expensive and easier to construct than the proposed pedestrian culvert underpass.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$146,000		
– Proposed	\$80,000		
– Savings	\$66,000		\$66,000
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$66,000</b>



## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> J-4	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Construct the pedestrian culvert underpass using a corrugated metal arch culvert in-lieu-of a concrete box culvert.
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Comp By: Aruna Sastry Date: 03/31/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The current design proposes to construct a pedestrian culvert underpass at Station 50+80. The underpass culvert is 86 feet long, 10 feet wide, and 8 feet high.

**Proposed Change:**

It is recommended that consideration be given to constructing a corrugated metal arch culvert in-lieu-of the proposed concrete box culvert. The size of the corrugated metal arch culvert would be 86 feet long, 12 feet wide and 11 feet high.

**Justification:**

The use of a corrugated metal arch underpass with a stone wall end section would provide a more aesthetically pleasing facility in a park setting. The additional rounded space provided by an arch structure would also give a more “open” view/feeling to the structure. A metal arch pedestrian structure would be straight forward to construct.

Constructing a metal arch structure may require additional drainage considerations due to the need to place the structure lower than the box culvert to address its larger height and the depth/amount of fill needed to be placed over the arch.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$107,000		
– Proposed	\$66,000		
– Savings	\$41,000		\$41,000
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$41,000</b>



## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: J-4  
Client: GDOT  
Sheet 3 of 3

**Current concrete box culvert design:**

86 ft. long by 10 ft. high and 8 ft. wide

Foundation Backfill Material : \$10,948.00

Class A Concrete.....: \$61,972.81

Reinforcing Steel.....: \$27,434.24

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Total : \$100,355.05

Cost per foot of culvert: =  $\$100,355/86 = \$1,167$  per foot

**Corrugated Metal Arch Concept:**

Corrugated metal arch (multi-Plate) culvert 86 ft. long x 12 ft. x 11 ft. rise:

Estimated Cost per foot: = \$720 per foot

Total cost: =  $\$720 \times 86 = \$61,920$

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> J-5	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Reduce the roadway width by using 2:1 side slopes and MSE side walls to reduce the length of the pedestrian culvert underpass.
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Comp By: D.P.C. Date: 04/01/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The proposed roadway typical section where the pedestrian culvert underpass is to be constructed includes 4:1 slopes with 2:1 slopes used elsewhere throughout the project.

**Proposed Change:**

It is recommended that all roadway slopes be reduced to 2:1 throughout project limits.

**Justification:**

Reducing the roadway slopes from 4:1 to 2:1 would reduce earthwork volume, the length of the pedestrian culvert underpass, and R/W acquisition costs. Changing the slopes to 2:1 will require the construction of two retaining walls at culvert ends and the placement of guardrail on the top of all 2:1 slopes.

Changing the slopes to 2:1 would make the underpass culvert 26 feet shorter in length. A shorter underpass culvert will be perceived as a safer facility than a longer structure. Reducing the length of the underpass culvert would also provide more space to construct the approach sidewalks, thereby reducing their grades and making them more wheelchair compatible.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST: – Original</b>	\$154,000		
– Proposed	\$34,000		
– Savings	\$120,000		\$120,000
<b>FUTURE COST: – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$120,000</b>



## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: J-5  
Client: GDOT  
Sheet 3 of 3

### **Pedestrian Culvert Section:**

Location STA 50+81:

Placing MSE walls vertical after sidewalk section on both sides of roadway reduces box culvert by 26'

### **Sidewalk:**

Reducing length of box culvert increase length of sidewalks (26') connecting to existing parking areas on both sides of SR 284:  $26' \times 5' / 9 = 14.4$  SY

### **Right-of-Way (R/W) Cost:**

Total estimated cost is \$2.9 million over 5.602 acres.  $(43,560 \text{ SF} = 1.0 \text{ acre}) \times 5.602 \text{ acres} = 244,023 \text{ SF} = \$11.89$  SF

- a. 4:1 slope areas: STA 51+50 to 54+50 Right = 300' in length x 10' avg. width = 3,000 SF
- b. 4:1 slope areas: STA 48+50 to 53+50 Left = 600' in length x 10' avg. width = 6,000 SF
- c. Total = 9,000 SF

### **Borrow Embankment, incl. material:**

- d. 4:1 slope areas: STA 51+50 to 54+50 Right = 300' in length x 10' avg. width x 6' avg. height x .5 =  $9,000 \text{ CF} / 27 = 334 \text{ CY}$  material.
- e. 4:1 slope areas: STA 48+50 to 53+50 Left = 600' in length x 10' avg. width x 6' avg. height x .5 =  $18,000 \text{ CF} / 27 = 667 \text{ CY}$  material.
- f. Culvert outlet and inlet ends (2 ends)  $(30' \text{ long} \times 6' \text{ high} \times 10' \text{ wide} \times 0.5) = 1,800 \text{ CF} / 27 = 70 \text{ CY}$   
 $667 + 334 + 70 = 1,070 \text{ CY}$  embankment material.

### **Storm Drain Cross-Drain Pipes:**

Quantities taken directly from plan sheets. (Structures C-5 through C-11 affected.)

### **MSE Retaining Wall and coping:**

Assume 50' long wall at a height of 10' at center reducing to zero as it meets toe of slope.

$(20' \times 10' \times 0.5) + (20' \times 10' \times 0.5') + (10' \times 10' \times 8' \times 10') = 220 \text{ SF}$  of wall means 70' of coping.

### **Guardrail:**

All slopes at 2:1 now have to have guardrail at back break point top of slope. Using borrow embankment calculation above we have removed 900' of 4:1 slope and replaced with 900' of 2:1 slope

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> K-1	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA: <u>Option 1</u></b> Eliminate the sidewalk on the east side of the project to reduce the width of the roadway/bridge sections.
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Comp By: D.P.C. Date: 04/01/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The proposed roadway design features the use of 4-inch thick by 5-foot wide concrete sidewalks on both sides of SR 284 for the entire length of project. The proposed bridge design features 6-foot wide sidewalks on both sides over its entire length for a 48-foot outside to outside width.

**Proposed Change:**

It is recommended that consideration be given to eliminating the sidewalk on the east side of the SR 284 corridor and constructing only a single sidewalk on the west side. This concept would retain a 6-foot sidewalk on west side of bridge deck and a 2-foot wide shoulder on the east side of the bridge deck from the edge of bike lane to face of barrier wall.

**Justification:** This corridor is located in a rural area with relatively small residential communities spaced some distance apart. There is no current sidewalk network along existing SR 284 for the proposed new sidewalk to tie into. The surrounding residential neighborhoods do not have any sidewalks. It is the VE team's position that individuals attending rowing events or using the east boat ramp will drive to the park facility due to the available parking on both sides of SR 284 provided by the County Park.

Constructing a single sidewalk would reduce the overall roadway/bridge typical section width and reduce the R/W needs for the project. This concept will reduce cost and shorten the construction phase. The revised bridge width would be reduced to 44 feet outside to outside.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$716,000		
– Proposed	\$0		
– Savings	\$716,000		\$716,000
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$716,000</b>



## CALCULATIONS

**Project:** SR 284 Over the Chattahoochee River/Lake Lanier

Idea No.: K-1  
Client: GDOT  
Sheet 3 of 3

**West side of corridor:** Leave as planned.

**East side of corridor:**

Begin sidewalk STA 28+00 to 34+70 (minus 10' driveway) – on grade sidewalk = 660'

34+70 to 44+22 – bridge sidewalk = 952'

44+22 to 55+31 (minus 2 driveways) – on grade sidewalk = 1,059'

a. Total on grade =  $660' + 1,059' \times 5' \text{ wide} = 8,595' / 9 = 955 \text{ SY}$

b. Total on bridge =  $952 \text{ LF} \times 4 \text{ LF} = 3,808 \text{ SF}$

**Right-of-Way:**

Total estimated cost is \$2.9 million over 5.602 acres.  $(43,560 \text{ SF} = 1.0 \text{ acre}) \times 5.602 \text{ acres} = 244,023 \text{ SF} = \$11.89 \text{ SF}$

$660' + 1,059' + 952 = 2,671 \text{ LF} \times 5 \text{ LF} = 13,355 \text{ SF}$

**Borrow Embankment, incl. material:**

$660' + 1,059' \times 5' \times 8' \text{ depth} = 68,760 \text{ CF} / 27 = 2,547 \text{ CY}$  embankment material.

## DEVELOPMENT AND RECOMMENDATION PHASE

### SR 284 over the Chattahoochee River/Lake Lanier

<b>IDEA No.:</b> K-1.1	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA: <u>Option 2</u></b> Eliminate the sidewalks on both sides of the project to reduce the width of the roadway/bridge sections.
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Comp By: D.P.C. Date: 04/01/09 Checked By: K.B. Date: 04/06/09

**Original Concept:**

The proposed roadway design features the use of 5-foot wide concrete sidewalks on both sides of SR 284 for the entire length of project. The proposed bridge design features dual 6-foot wide sidewalks over its entire length for a 48-foot outside to outside width.

**Proposed Change:**

It is recommended that consideration be given to eliminating both sidewalks along the SR 284 corridor. The concept would result in a revised 40-foot wide bridge section consisting of two 12-foot lanes, two 4-foot bike lanes, and a 2-foot wide shoulder from the edge of the bike lane to the face of the barrier wall [2x (2 ft BW+2 ft SH+4ft BL+12 ft L) = 40].

**Justification:** This corridor is located in a rural area with relatively small residential communities spaced some distance apart. There is no current sidewalk network along existing SR 284 for the proposed new sidewalk to tie into. The surrounding residential neighborhoods do not have any sidewalks. It is the VE team's position that individuals attending rowing events or using the east boat ramp will drive to the park facility due to the available parking on both sides of SR 284 provided by the County Park.

Eliminating sidewalks would reduce the overall roadway/bridge typical section width and reduce the R/W needs for the project. This concept will reduce cost and shorten the construction phase. Eliminating sidewalks on the bridge may improve safety by eliminating the possibility of fishing or diving from the bridge.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b><u>INITIAL COST:</u> – Original</b>	\$1,431,000		
– Proposed	\$0		
– Savings	\$1,431,000		\$1,431,000
<b><u>FUTURE COST:</u> – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$1,431,000</b>



## CALCULATIONS

**Project:** SR 284 over the Chattahoochee River/Lake Lanier

Idea No.: K-1.1  
Client: GDOT  
Sheet 3 of 3

### **West side of corridor:**

Begin sidewalk STA 28+58 to 34+70 – on grade sidewalk = 612’

34+70 to 44+22 – bridge sidewalk = 952’

44+22 to 55+31 (minus 40’ driveway)– on grade sidewalk = 1,069’

### **East side of corridor:**

Begin sidewalk STA 28+00 to 34+70 (minus 10’ driveway) – on grade sidewalk = 660’

34+70 to 44+22 – bridge sidewalk = 952’

44+22 to 55+31 (minus 2 driveways) – on grade sidewalk = 1,059’

a. Total on grade =  $(612' + 1,069' + 660' + 1,059') \div 5' = 17,000/9 = 1,890$  SY

b. Total on bridge =  $952 \text{ LF} \times 8 \text{ LF} = 7,616$  SF

### **Right-of-Way:**

Total estimated cost is \$2.9 million over 5.602 acres.  $(43,560 \text{ SF} = 1.0 \text{ acre}) \times 5.602 \text{ acres} = 244,023 \text{ SF} = \$11.89 \text{ SF}$

STA 28+00 to STA 55+31 = 2,731’ long x 10’ wide strip = 27,310 SF

### **Borrow Embankment, incl. material:**

$400' + 900' + 400' + 800' \times 5' \text{ width} \times 8' \text{ depth} = 100,000 \text{ CF} / 27 = 3,700 \text{ CY}$  embankment material.

# APPENDIX

## Sources

### Approving/Authorizing Persons

Name:	Position:	Telephone:
Ron Wishon	Project Review Engineer	404-631-1753
Terry Rogers	Project Designer – Roadway Design	404-631-1567

### Personal Contacts

Name:	Telephone:	Notes:
Terry Rogers	404-631-1567	Clarification of various items in the cost estimate (drainage, additional roadway items)
Ruthie Jones	404-347-0204	R/W Costs for COE Property
Wes Brock	404-347-0177	R/W Cost for Parcels
Troy Patterson	404-631-1754	Provided cost estimate for a cofferdam to construct a single bridge pier in 30 – 50 feet of water.
Steven Poole, CONTECH Construction Products Inc.	678-662-9331	Cost for a corrugated arch culvert for the pedestrian underpass.
Mike Clements	State Bridge Maintenance Engineer	Costs for keeping old bridge in place

### Documents/Abstracts

Reference:	Reference:
30% Plans	Bridge Inventory Data
Bridge Layout Sheet	50 Scale project layout sheet
Project Cost Estimate	Revised project R/W costs
Project Concept Report	CAD Design Program
Revised Project Concept Report	
Flexible Pavement Design	

# SR 284 Bridge Over Chattahoochee River

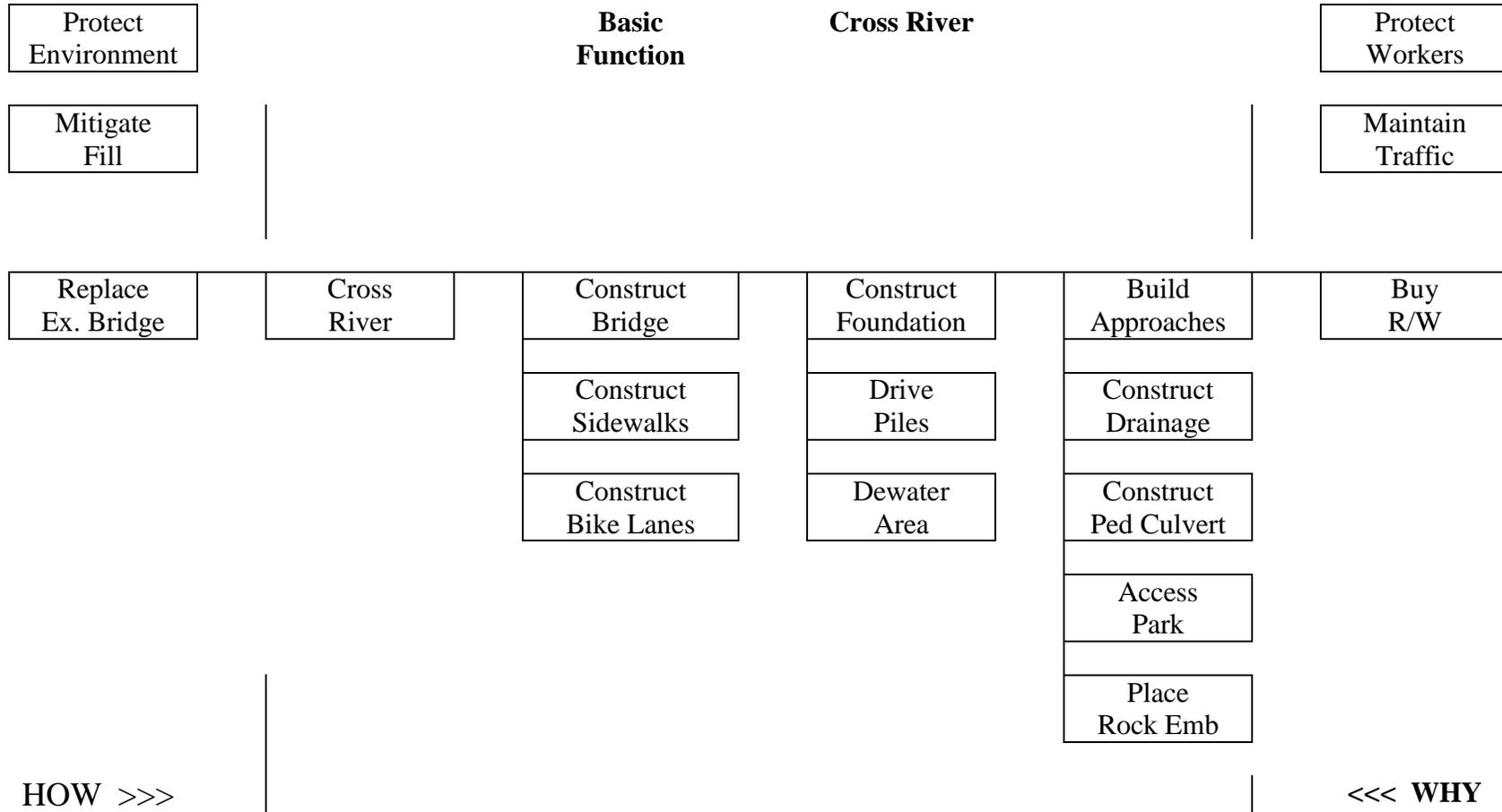
## Cost Model/Distribution

Item	Description	\$ Amount	% of Total Project
A	Bridge	\$5,760,000	50.2%
B	Right of Way	\$2,925,000	25.5%
C	Rock Embankment	\$820,000	7.1%
80% Line			
D	Grading Complete	\$400,000	3.5%
E	Bridge Removal	\$260,000	2.3%
F	Additional Roadway Items	\$240,000	2.1%
G	Temporary Barrier	\$238,000	2.1%
H	Miscellaneous	\$173,000	1.5%
I	Bituminous Pavement	\$160,000	1.4%
J	Pedestrian Culvert	\$137,000	1.2%
K	Concrete Sidewalk	\$92,000	0.8%
L	Erosion Control	\$81,000	0.7%
M	Traffic Control	\$50,000	0.4%
N	Aggregate Base Course	\$48,000	0.4%
O	Concrete Curb & Gutter	\$41,000	0.3%
P	Guardrail	\$38,000	0.3%
Q	Signing & Marking	\$22,000	0.2%
<b>Sub-Total</b>		<b>\$11,485,000</b>	<b>100%</b>
*	Construction Inspection	\$428,000	
*	Bridge Replacement w/No Add Cap	\$342,000	
*	Asphalt Index Adjustment	\$75,000	
*	Fuel Index Adjustment	\$35,000	
<b>TOTAL</b>		<b>\$12,365,000</b>	
<p><b>Note:</b> The sum of the four asterisked items above will be used as the Mark-Up percentage in the Recommendation Cost Worksheets.</p>			

# FAST DIAGRAM

**Study**

**Project Name: SR 284 Bridge Over Chattahoochee River**



## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 284 Bridge Over Chattahoochee River

**Function:** Cross River

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
<b>A</b>	<b>Bridge</b>	Cross	River	\$5,760,000	50.2%	Yes
		Accommodate	Pedestrians			
		Accommodate	Bike Lanes			
		Improve	Safety			
		Improve	Clearance			
		Replace	Existing			
<b>B</b>	<b>Right of Way</b>	Store	Project	\$2,925,000	25.5%	Yes
		Contain	Slopes			
		Accommodate	Sidewalks			
		Accommodate	Bike Lanes			
<b>C</b>	<b>Rock Embankment</b>	Fill	Lake	\$820,000	7.1%	Yes
		Support	Roadway			
		Prevent	Scour			
		Guide	Banks			
		Protect	Slopes			

## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 284 Bridge Over Chattahoochee River

**Function:** Cross River

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
<b>D</b>	<b>Grading Complete</b>	Construct	Roadway	\$400,000	3.5%	Yes
		Raise	Grade			
		Accommodate	Tunnel			
		Raise	Intersection			
<b>E</b>	<b>Bridge Removal</b>	Remove	Structure	\$260,000	2.3%	Yes
		Provide	Storage			
		Mitigate	Fill			
		Improve	Flow			
<b>F</b>	<b>Additional Roadway Items</b>	Extend	Roadway	\$240,000	2.1%	Yes
		Complete	Project			
<b>G</b>	<b>Temporary Barrier</b>	Control	Barrier	\$238,000	2.1%	Yes
		Provide	Safety			
		Hold	Temp Slope			

## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 284 Bridge Over Chattahoochee River

**Function:** Cross River

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
<b>H</b>	<b>Miscellaneous</b>	Construct	Project	\$173,000	1.5%	Yes
<b>I</b>	<b>Bituminous Pavement</b>	Provide	Surface	\$160,000	1.4%	Yes
		Accommodate	Bikes			
		Provide	Access			
<b>J</b>	<b>Pedestrian Culvert</b>	Allow	Access	\$137,000	1.2%	Yes
		Cross	Road			
		Improve	Safety			
		Increase	Liability			
<b>K</b>	<b>Concrete Sidewalk</b>	Accommodate	Pedestrians	\$92,000	0.8%	Yes
		Widen	Bridge			
		Access	Ped Culvert			
<b>L</b>	<b>Erosion Control</b>	Minimize	Sediment	\$81,000	0.7%	Yes
		Protect	Lake			
		Protect	Property			

## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 284 Bridge Over Chattahoochee River

**Function:** Cross River

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
M	Traffic Control	Protect	Motorists	\$50,000	0.4%	Yes
		Maintain	Traffic			
		Detour	Traffic			
N	Aggregate Base Course	Support	Pavement	\$48,000	0.4%	Yes
O	Concrete Curb & Gutter	Channel	Water	\$41,000	0.3%	Yes
		Control	Access			
		Protect	Sidewalk			
P	Guardrail	Protect	Motorists	\$38,000	0.3%	Yes
		Reduce	R/W			
Q	Signing & Marking	Improve	Safety	\$22,000	0.2%	Yes
		Advise	Motorists			
X	Storm Drains	Carry	Water			
X-1	Fencing	Improve	Safety			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
<b>A</b>	<b>Bridge</b>		
A-1	Eliminate the sidewalk on one side of the bridge.	See Item K-1	
A-2	Eliminate both sidewalks on the bridge.	See Item K-2	X
A-3	Eliminate the bike lanes on the bridge.	See Items A-5 & A-16	X
A-4	Construct a multi-purpose trail on the bridge in-lieu-of dual sidewalks and bike lanes.	Reduce the bridge width, reduce cost, speed construction.	✓
A-5	Keep the old bridge in-place and use for pedestrians, bikes, and fishing pier.	Reduce the bridge width, reduce cost, speed construction	✓
A-6	Lengthen the bridge on the north end to reduce the amount of rock fill placed in the lake.	Reduce project's impact on lake, reduce rock fill in lake	✓
A-7	Address the COE statement that the new bridge has to be built in the old bridge footprint.	Verify COR approval of proposed bridge in its east side location.	DS
A-8	Consider stage construction of the new bridge and shifting the north end (skew) toward the old bridge.	Simplify construction of project.	✓
A-9	Consider constructing the new bridge on the west side of the old bridge to reduce its overall length.	Reduce impact of bridge on lake, use more of the existing north embankment	✓
A-10	Skew the south abutment to be parallel to river.	Not cost effective	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
A-11	Consider constructing a steel girder structure with longer spans (less piers in lake).	Using large steel girder would raise the height of the roadway.	X
A-12	Modify the substructure to use drilled shaft concept in-lieu-of standard pilling (no cofferdams).	Would reduce the cost and accelerate construction if physically able (depth of water).	✓
A-13	Construct fencing on bridge to protect bikers.	See Item A-4 or A-16	X
A-14	Construct 1/2 the new bridge and use it to carry traffic and then construct the remaining part of the bridge.	Consider with A-8 to develop best construction option.	✓
A-15	Construct 11-foot lanes on the bridge.	Reduce bridge width and reduce cost.	✓
A-16	Reduce the bridge width by constructing a rural section and placing the bikes on the shoulders.	Reduce bridge width and reduce cost	✓
<b>B</b>	<b>Right of Way</b>		
B-1	Question the purchase of the R/W in the lake.	Pay COE for its use.	X
B-2	Eliminate one or both sidewalks to reduce R/W needs.	See Item K-1, K-2, K-3	X
B-3	Eliminate the bike lanes to reduce R/W needs.	See Idea A-4, A-5, A-16, K-4	X
B-4	Reduce the embankment slopes from 4:1 to 2:1.	See Idea D-6, J-5	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
B-5	Check to see if sidewalk is being built off the R/W at the approach ramps the pedestrian culvert.	No	X
B-6	Check to see if sidewalk can be built in park driveway. Does it require curb and gutter or other safety features?	See Item P-1	X
B-7	It appears that Parcel 7 needs to be a “whole” take.	Additional cost	DS
B-8	Need a R/W easement for parking lot work in park.	Additional cost	DS
<b>C</b>	<b>Rock Embankment</b>		
C-1	Extend bridge to the north to reduce rock embankment.	Reduce impact to lake. See Item A-5	X
C-2	Shift the new bridge to the west side and use more of the existing fill area.	Reduce impact. See Item A-9	X
C-3	Will construction trucks carrying the rock fill be allowed to cross the old bridge?	Possible special provision needed. Weight limit on old bridge?	DS
<b>D</b>	<b>Grading Complete</b>		
D-1	Revise the location of the park driveway entrances.	No Location approved by County/Park	X
D-2	Revise the location/concept of the Ped Culvert.	See Idea J-1, J-4, J-5	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
D-3	Revised the size of the pedestrian culvert.	See Item J-6	X
D-4	Use a alternate structure in-lieu-of a box culvert.	See Item J-4	X
D-5	Use a corrugated span in-lieu-of a box culvert.	See Item J-4	X
D-6	Use 2:1 slope in-lieu-of 4:1 slopes at the north end.	Reduce embankment and R/W	✓
D-7	Eliminate a sidewalk or both sidewalks and build a rural roadway section.	See Item A-16, K-1, K-2	X
D-8	Eliminate the bike lanes	See A-4, A-5, A-16	X
D-9	Build a multi-purpose trail on one side and take the trail across the old bridge.	See A-4, A-5	X
<b>E</b>	<b>Bridge Removal</b>		
E-1	With cofferdams needed to remove the piers and footings the cost estimate is very low.	Significant cost increase due to need to use cofferdams to remove piers.	✓
E-2	Do not remove the old bridge, use it for pedestrians, bikers, and as fishing pier (improve park use).	See Item A-5	X
E-3	Check/verify the cost of the bridge removal item.	Combine with B-1 Above	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
<b>G</b>	<b>Temporary Barrier</b>		
G-1	Verify the need for 4,000 feet of temporary barrier.	Excessive amount for short project.	DS
<b>H</b>	<b>Miscellaneous</b>		
H-1	No roadway drainage items in plans.	None shown in current plans	DS
<b>I</b>	<b>Bituminous Pavement</b>		
I-1	Check the pavement design for the project.	Revise depth to reduce cost.	✓
I-2	Reduce the typical section by eliminating the bike lanes.	See Item A-4, A-5	X
I-3	Construct 11-foot lanes	See Item A-15	X
I-4	Consider building a rural roadway section.	See Item A-16	X
<b>J</b>	<b>Pedestrian Culvert</b>		
J-1	Relocate the pedestrian culvert to the current park driveway entrance.		✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
J-2	Relocate to remove the 90 degree turns in the sidewalk approaches to the pedestrian culvert.	Combine with Item J-1	X
J-3	Eliminate the pedestrian culvert and have pedestrians cross roadway using pedestrian signals.	Reduce cost, Not what County/Park wants.	DS
J-4	Use some type of Con-Span or Corrugated Metal Arch for the pedestrian underpass.	Better looking, more acceptable type facility.	✓
J-5	Reduce the roadway section (2:1 slopes, no sidewalks, No bike lanes, retaining walls, etc.) to reduce length of pedestrian culvert crossing.	Reduce R/W, embankment, culvert length	✓
J-6	Revise the size of the pedestrian culvert.	Possible cost savings	✓
<b>K</b>	<b>Sidewalk</b>		
K-1	Eliminate the sidewalk on the east side of the project.	Reduce bridge width, save cost	✓
K-2	Eliminate both sidewalks on the project.	Reduce bridge width, save cost, impact ped	✓
K-3	Eliminate both sidewalks and use the old bridge.	Reduce bridge width, save cost,	✓
K-4	Combine sidewalks and bike lanes into single trail.	See Item A-4	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>JUDGMENT PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>COMMENTS</b>	<b>IDEA RATING</b>
<b>M</b>	<b>Traffic Control</b>		
M-1	Revise cost estimate higher to more reflect actual costs	Add cost to the project.	DS
<b>O</b>	<b>Concrete Curb &amp; Gutter</b>		
O-1	Use a rural roadway section	See Item A-16	X
<b>P</b>	<b>Guardrail</b>		
P-1	May need between sidewalk and parking lot & pedestrian culvert	Safety issue due to possibility of cars falling into sidewalk area.	DS
P-2	Add guardrail on north end for 2:1 slopes.	See Item D-6	X
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			