

Value Engineering Report

Participant Study Workbook

Project Name: SR 372 @ Etowah River 2.3 miles SE of Ball Ground

Location: Cherokee County

P.I. No.: 642400 Date: 8/30/2010

STUDY IDENTIFICATION

Project: BRST0-1022-00(010)	Date: 8/30/2010
Location: SR 372 @ Etowah River 2.3 miles SE of Ball Ground – Cherokee County	

VE Team Members

Name:	Position:	Organization:	Telephone:
Margaret E. Reitz	Roadway Design	GDOT	404-631-1674
Robert L. Reid, Jr.	Roadway Design	GDOT	404-631-1803
Sonya Sykes	Roadway Design	GDOT	404-631-1698
Walter Taylor	Roadway Design	GDOT	404-631-1617
Nebiat Abraham	Roadway Design	GDOT	404-631-1732

Project Description

Project BRST0-1022-00(010) is the replacement of the SR 372 Bridge over the Etowah River, 2.3 miles southeast of the city of Ball Ground. The project length is approximately 4000 feet 0.76 mile, beginning at mile post 11.11 and ending at mile post 11.87. The purpose of the project is to replace a structurally deficient and functionally obsolete bridge on SR 372 over the Etowah River. The existing bridge sufficiency rating is currently 39.17.

Project Constraints

Proposed Design Speed – 55 mph

Maximum grade allowable – 7.0%

Maximum degree of curve allowable – 6

Improve operation and safety of this roadway

Designated school bus route

8% Truck traffic

Archaeological site surrounds project / three endangered species exist within project limits

Bio Retention Basin (Station 22+00 – 23+50 (RT))

INFORMATION PHASE - SOURCES

Approving/Authorizing Persons

Name:	Position:	Telephone:
Russell McMurray	Office Head – Roadway Design	404-631-1700
Darrell Richardson	Assistant Office Head – Roadway Design	404-631-1705
Tim Matthews	Project Manager – Program Delivery	404-631-1568

Personal Contacts

Name:	Telephone:	Notes:
Lionel Alexander	404-631-1911	Cost of detour bridge approximately \$85,000
Bill Duvall	404-631-1883	Raising / Lowering proposed bridge would not result in major bridge report changes (BFI). Skewing Bridge / Changing location would result in major bridge report changes.
Lisa Wesley	770-387-3680	Possible off-site detour utilizing county roads. Public Hearing and agreement with local jurisdiction needed before implementing.
James Magnus	404-631-1971	Staging / Constructability consult

Documents/Abstracts

Reference:	Notes:
Preconstruction Status Report	Bridge Replacement
Need and Purpose	Bridge sufficiency rating = 39.17, posted speed = 55 mph, 8% Truck Traffic
Concept Report	Proposed 12 foot travel lanes with 10 foot shoulders, 9 parcels w/ 1 residency, archaeological site (Long Swamp Site) surrounds project – three endangered species exist within project limits, 5 alternates considered including off-site detour
Cost Estimate	High cost items are earthwork and pavement
Project Layout	Curve Data, Horizontal Alignment
Preliminary Plans	Typical Sections, Construction Plans, Cross Sections, Profiles

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	CREATIVE IDEA	COMMENTS	IDEA RATING
1	Utilize proposed profile / Revise alignment	Option corrects substandard existing horizontal alignment and reduces earthwork and pavement work necessary. There is also a reduction in Right of Way cost and staging works well.	1
2	Utilize proposed alignment / Revise profile (lower)	Option reduces and balances earthwork and staging works well.	2
3	Utilize proposed bridge location / Revise horizontal curves to a 960 foot radius / Adjust vertical curves. Follow existing alignment as much as possible / Propose some milling and overlay as well as full depth pavement.	Option corrects substandard existing horizontal / vertical curves and reduces earthwork and pavement work necessary.	3
ADDITIONAL OPTIONS			
4	Maintain traffic on existing roadway and build proposed bridge. Install warning lights on 45 mph caution signs (for safety). No roadway work except immediate vicinity of bridge.	Option does not correct substandard existing horizontal / vertical curves. Accidents / Fatalities along roadway as a result of the existing alignment. Reduces earthwork and pavement work needed.	5
5	Close roadway and use off-site detour while replacing bridge and correcting substandard horizontal curve(s).	Option allows the Contractor to complete this construction work quickly and work could be done during summer months (when school is not in session). Roadway work would be minimized since no stage construction would be needed.	4

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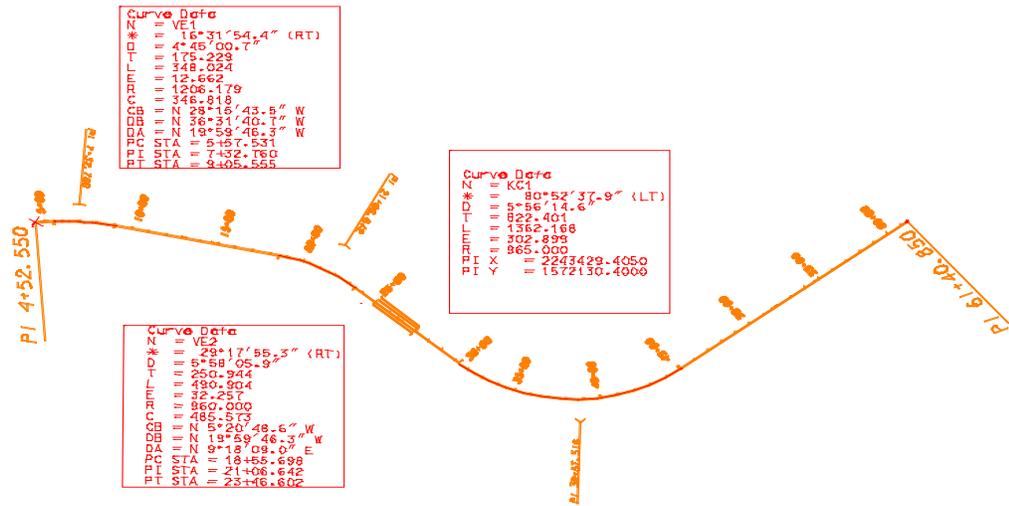
Project: BRST0-1022-00(010)

Idea No. : 1

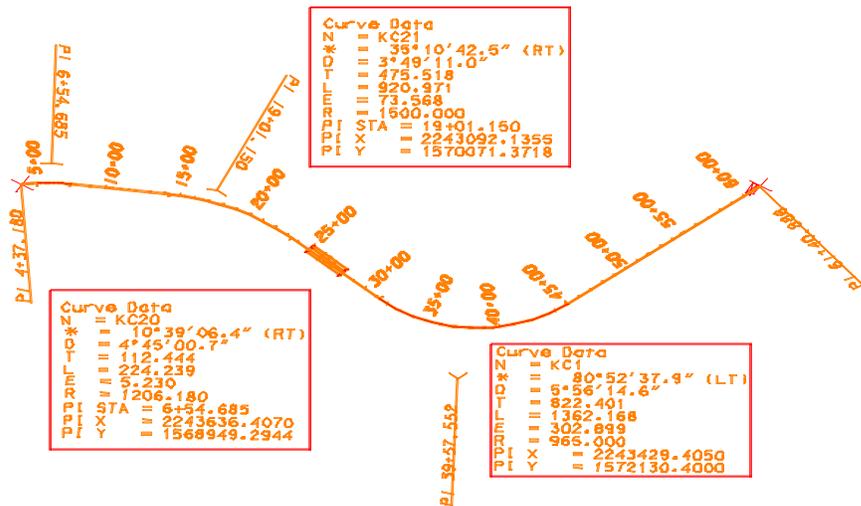
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VE Team Option



Consultants Option



CALCULATIONS

Project: BRST0-1022-00(010)

Idea No. : 1
Client:
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See Attachments

DEVELOPMENT AND RECOMMENDATION PHASE

Project: BRST0-1022-00(010)

Idea No.: 2	Sheet No.: of	CREATIVE IDEA: Utilize proposed alignment / Revise profile (lower)
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Comp By: Date: March 1, 2012 Checked By: Date:

Original Concept: There are 6 vertical curves ranging in length from 80 feet to 800 feet. The grades for these vertical curves are 0.5661% to -6.8298%

Proposed Change: The revised vertical curves will be reduced to 3 vertical curves maintaining the 80 foot beginning and ending curves and revising the 4 remaining curves with 1 vertical curve with a length of 1400 feet. The grades for this vertical curve are -5.2% and 5.1052%.

Justification: This option will balance the earthwork and provide a grade design below the 7% maximum grade allowable.

LIFE CYCLE COST SUMMARY	INITIAL Project Cost	FUTURE Project Cost	TOTAL Present Worth Cost
INITIAL COST: Original	735,382		
Proposed	464,332		
Savings	271,050		
FUTURE COST: Savings			
TOTAL PRESENT WORTH SAVINGS			

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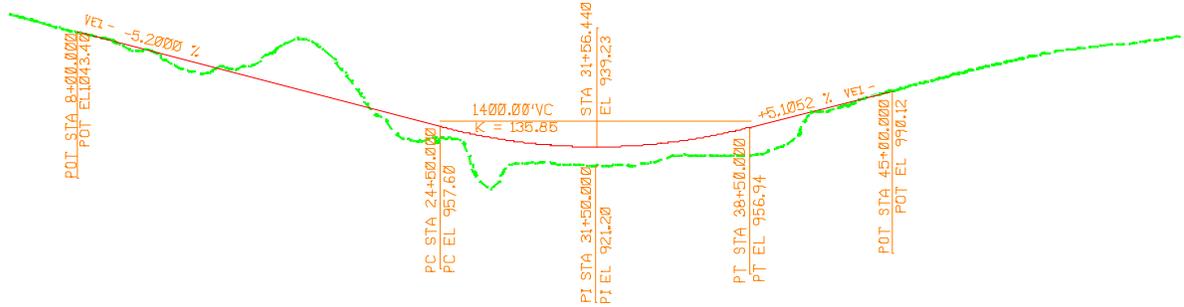
Project: BRST0-1022-00(010)

Idea No. : 2

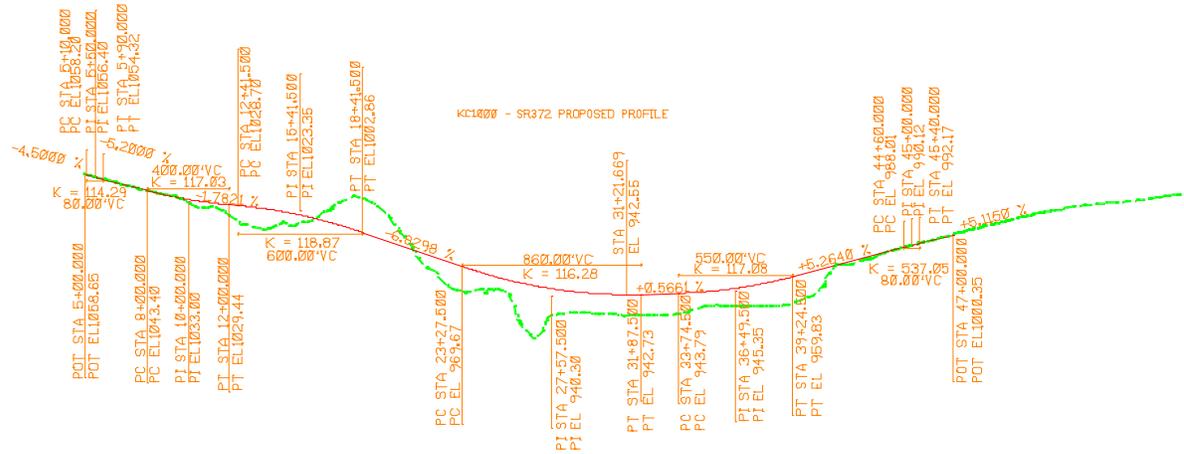
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VE Team Option:



Consultants Option:



CALCULATIONS

Project: BRST0-1022-00(010)

Idea No. : 2
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See Attachments

Note: There will also be some Right of Way savings.

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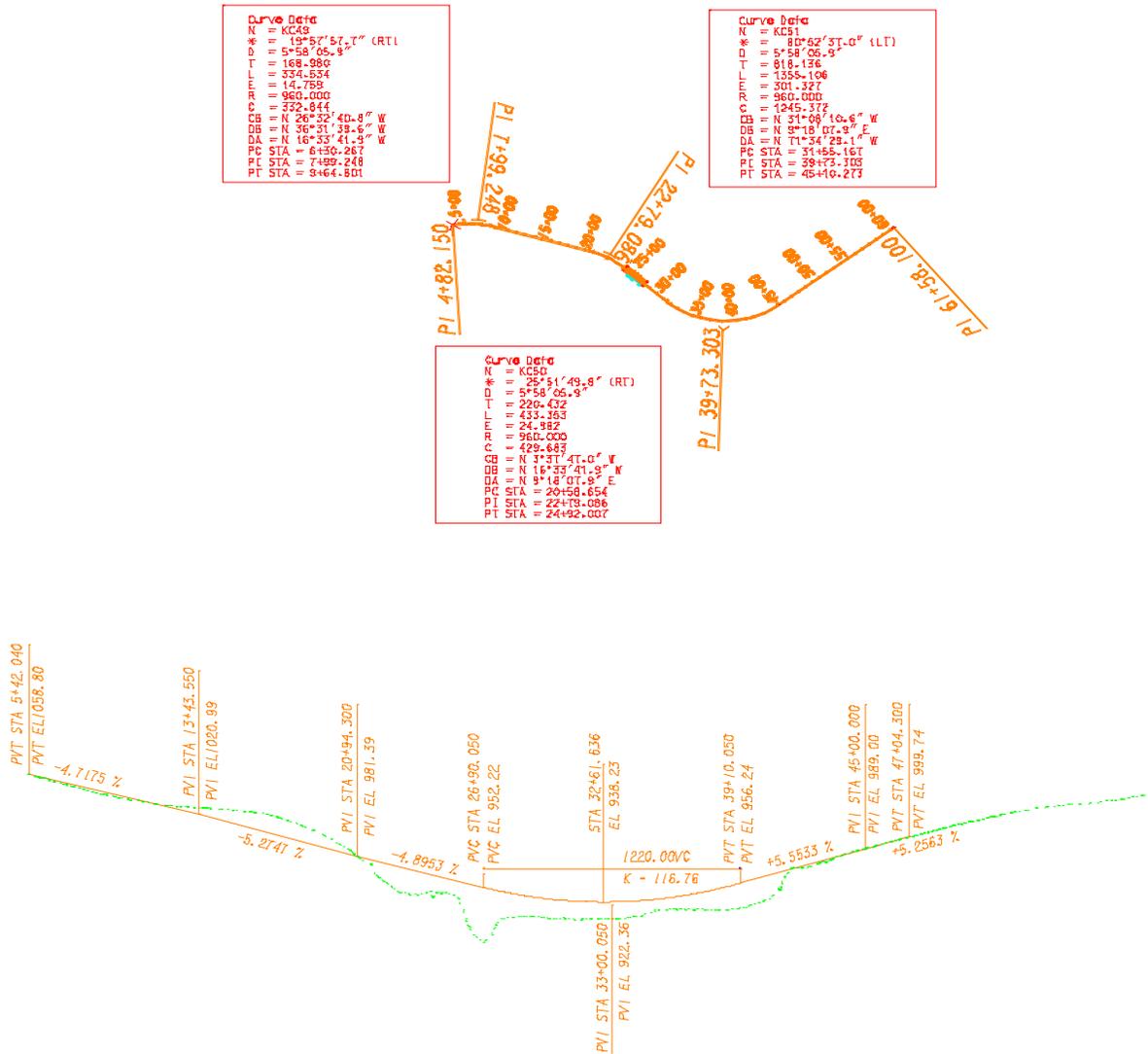
Project: BRST0-1022-00(010)

Idea No. : 3

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VE Team Option



CALCULATIONS

Project: BRST0-1022-00(010)

Idea No. : 3
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See Attachments

NOTE: There would also be some Leveling and Right of Way savings. A design variance or deviance will be required to meet the GDOT standards.

SKETCH

Project: BRST0-1022-00(010)

Idea No. : 4

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CALCULATIONS

Project: BRST0-1022-00(010)

Idea No. : 4

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Assumptions:

- There will be a decrease in the amount of embankment needed since only bridge work along with enough roadway work to tie the proposed bridge to the existing roadway is needed.

- Use less than Option 3 Unclassified Excavation and Borrow Excavation quantities.
(NOTE: This Option more closely represents the work that will be done for the bridge and roadway tie-in work)

- Assume proposed roadway work needed is approximately 300 ft on either side of the proposed bridge. $600 \text{ ft} * 44 \text{ ft} = 26,400 \text{ ft}^2 = 2934 \text{ yd}^2$

12" GAB = $2934 \text{ yd}^2 * 165 \text{ lb} / \text{yd}^2 = 484,110 \text{ lbs.} = 245 \text{ tons}$

9.5 MM = $2934 \text{ yd}^2 * 135 \text{ lb} / \text{yd}^2 = 396,090 \text{ lbs.} = 200 \text{ tons}$

19 MM = $2934 \text{ yd}^2 * 220 \text{ lb} / \text{yd}^2 = 645,480 \text{ lbs.} = 325 \text{ tons}$

25 MM = $2934 \text{ yd}^2 * 440 \text{ lb} / \text{yd}^2 = 1,290,960 \text{ lbs.} = 650 \text{ tons}$

- Assume Preliminary Engineering work is $\$50 / \text{hour} * 15 \text{ days} * 8 \text{ hours} / \text{day} = \$6,000$

DEVELOPMENT AND RECOMMENDATION PHASE			
Project: BRST0-1022-00(010)			
Idea No.: 5	Sheet No.: of	CREATIVE IDEA: Close roadway and use off-site detour while replacing bridge and correcting substandard horizontal curves.	
Comp By:	Date: March 1, 2012	Checked By:	Date:
<p>Original Concept: Build proposed bridge offset to the west from existing and demolish the existing bridge.</p> <p>Proposed Change: Close roadway to traffic during months when school is not in session and build proposed bridge within same location as the existing bridge structure and improve horizontal curves as needed. Provide Contractor with incentive to complete work on time / early. Utilize liquidated damages to encourage timely completion.</p> <p>Justification: A road closure will result in a shorter construction time period for the bridge and roadway work and will eliminate the need for barrier and shoring.</p>			
LIFE CYCLE COST SUMMARY	INITIAL Project Cost	FUTURE Project Cost	TOTAL Present Worth Cost
INITIAL COST: Original	1,712,932		
Proposed	1,117,498		
Savings	595,434		
FUTURE COST: Savings			
TOTAL PRESENT WORTH SAVINGS			

SKETCH

Project: BRST0-1022-00(010)

Idea No. : 5

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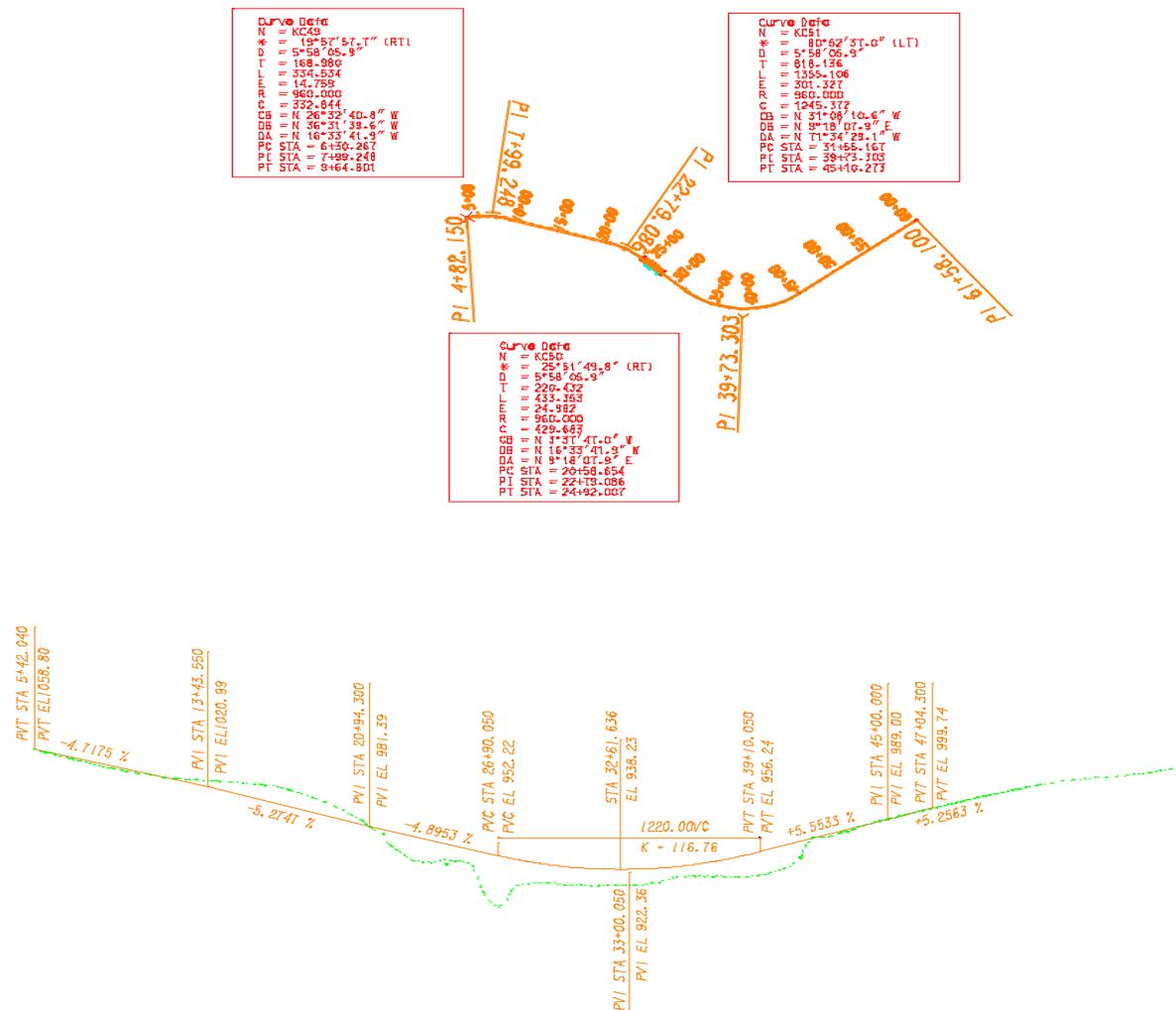
NOTE: Suggested off-site detour routes include SR20, I-575, Airport Road (County Road), Old Hwy 5 (County Road) to SR 372 which is approximately 20 miles long. Another route is approximately 15 miles long and would utilize county roads.

NOTE: Possible off-site detours presented by the Consultant include:

Detour Alternate 1 which utilizes East Cherokee Drive, a county road that currently carries a large volume of traffic.

Detour Alternate 2 which utilizes all State Route highways but is approximately 20 miles long.

Detour Alternate 3 which utilizes mainly county roads (pavement strength and sub-standard roadway geometry are the issues with this detour).



CALCULATIONS

Project: BRST0-1022-00(010)

Idea No. : 5
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Assume the following:

- Structure will be replaced at the same offset to the West of the existing bridge as proposed by the Consultant.

- Use a horizontal curve radius of 960 feet (minimum horizontal radius for 55 mph, e = 8%).

- Use vertical curve grades no steeper than 6% with 1 vertical curve no longer than 1,400 feet.

- Design is similar to Option 3 except construction would be away from traffic; therefore, use similar number of units for Unclassified Excavation, Borrow Excavation, GAB, 9.5MM, 19MM and 25 MM.

- Add 15% to top 2 asphalt layers in anticipation of improving structure of detour route.

DEVELOPMENT PHASE - SUMMARY OF COST SAVINGS

Project: BRST0-1022-00(010)	Team No.:
Location: SR 372 @ Etowah River 2.3 MI SE of Ball Ground	Date: 8/30/2010

Idea No.	Creative Idea Description	Original Initial Cost	Proposed Initial Cost	Initial Cost Savings	Future Savings	Total Life Cycle Savings
1	Utilize proposed profile / Revise alignment	648,347	442,794	205,553		
2	Utilize proposed alignment / Revise profile (lower)	908,347	594,055	314,292		
3	Utilize proposed bridge location / Revise horizontal curves to a 960 foot radius / Adjust vertical curves. Follow existing alignment as much as possible / Propose some milling and overlay as well as full depth pavement.	1,517,680	980,443	537,237		
	ADDITIONAL OPTIONS					
4	Maintain traffic on existing roadway and build proposed bridge. Install warning lights on 45 mph caution signs (for safety). No roadway work except immediate vicinity of bridge.	1,514,065	391,317	1,122,748		
5	Close Roadway and use off-site detour while replacing bridge and correcting substandard horizontal curve.	1,712,932	1,117,498	595,434		

DEVELOPMENT PHASE - EXECUTIVE SUMMARY	
Project: BRST0-1022-00(010) Location: SR 372 @ Etowah Creek – Cherokee County	Team: Date: 8/30/2010 March 1, 2012

The Value Engineering Team recommends three main options to reduce the roadway construction work and in turn the overall project cost. The 1st option modifies the horizontal alignment while utilizing the Consultants proposed vertical alignment. The 2nd option modifies the vertical alignment while utilizing the Consultants proposed horizontal alignment and the 3rd option proposes to utilize the Consultants proposed structure location while modifying the horizontal and vertical alignment and suggesting mill & overlay roadway work instead of full depth roadway work. All three options show cost savings for mainly unclassified and borrow excavation as well as some asphalt savings.

The 4th and 5th options are merely additional options / considerations provided for previously investigated options. These two options suggest either maintaining traffic on the existing roadway in order to replace the structurally deficient existing bridge with minimal road work or an off-site detour to replace this existing bridge as well as some roadway work to improve the inadequate horizontal curves on either side of the bridge. The 5th option provides an opportunity to immediately replace the existing bridge with bridge project funds while handling the major roadway portion of work at a later date with roadway project funds. These options also provide tremendous cost savings since the earth work and roadway work are significantly reduced.

