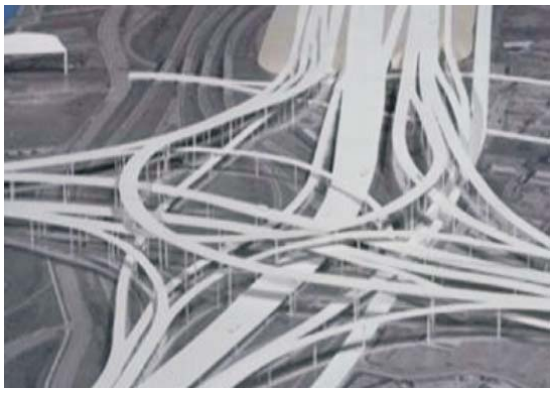
URS

THE OHIO RIVER BRIDGES

# OHIO RIVER BRIDGES
# SECTION 1 - KENNEDY INTERCHANGE
# VALUE ENGINEERING STUDY REPORT

Item Number 5-118.18 & 5-118.19

Study Date: January 28 - February 1, 2008
Report Date: February 15, 2008



KENTUCKY TRANSPORTATION CABINET

# LOUISVILLE SOUTHERN INDIANA
# OHIO RIVER BRIDGES
# SECTION 1 – KENNEDY INTERCHANGE

**Item Number 5-118.18 & 5-118.19**

**VALUE ENGINEERING STUDY**
**for**
**Kentucky Transportation Cabinet**

Study Date: January 28 – February 1, 2008

**Final Report**

**February 15, 2008**

**URS Corporation**

# EXECUTIVE SUMMARY

**General**
URS conducted a Value Engineering Study of the Louisville Southern Indiana Ohio River Bridges (LSIORB), Section 1 – Kennedy Interchange. The topic was the 80% Joint Inspection Submission prepared for the Kentucky Transportation Cabinet (KYTC) by Kentucky Transportation Associates (KTA).

The VE Team undertook the task assignment using the value engineering work plan and approach. The ideas generated from this process and chosen for full development as VE Team Recommendations are presented in Section 3 of this report. These recommendations are presented to all project stakeholders for judgment as to whether they should be implemented.

**Estimate of Construction Costs and Budget**
The construction cost estimate provided to the VE Team with the project documents indicates a total construction cost of $1,035,226,431. This amount included a mark-up of 10% contingency for all construction elements not including engineering, right-of-way or mitigation/enhancements. The estimate is in 2006 dollars without inflation. This project is scheduled to be let as a design/bid/build project, thus the cost of construction will be determined by the winning contractor's bid.

These potentials savings are based upon the VE Team's cost estimates of the individual recommendations selected by the VE Team as noted on the Summary of Recommendations table below. Total cost savings realized by KYTC will be based upon the final implementation status of these VE recommendations.

**Summary of VE Study Results**
During the speculation phase of this VE study, 154 creative ideas were identified. 74 of these ideas were developed into VE recommendations and design comments with cost implications where applicable. Many of the ideas represent changes in design approach, reconsideration of criteria, and in some cases, modification of the project scope. In general, the idea evaluation took into account the economic impact, other benefits obtained, and the effect on the overall project objectives.

The following table presents a summary of the ideas developed into recommendations and design comments with cost implications where applicable. Since cost is an important issue for comparison of VE proposals, the costs presented in this report are based upon original design quantities with unit rates obtained from the estimate as prepared by the design team and included in their submission to KYTC, published cost databases, and VE Team member experience.

The cost estimates provided within this report are based on acceptance of the individual recommendation alone. Many of the recommendations overlap, are mutually exclusive, or acceptance of one recommendation impacts the cost of another. Many of the recommendation are interrelated when it comes to cost and acceptance. The VE team did not attempted to provide a list of "Best Combination of Recommendations List", and therefore cannot propose a total suggested savings number as a result of this VE study.

| SUMMARY OF RECOMMENDATIONS | | |
|---|---|---|
| Rec # | Recommendation Title / Description | Present Worth Cost Savings (or cost ) |
| VE-1 | Terminate Buchanan Street north of Witherspoon in lieu of building bridges over this road | $6,022,000 |
| VE-2 | Terminate Adams Street north of Witherspoon in lieu of building bridges over this road | $2,713,000 |
| VE-3 | Utilize overall project manager with absolute decision making power to improve coordination of MOT and construction management/inspection | $4,000,000 per year |
| VE-4 | With the exception of spot locations where recurrent congestion occurs, eliminate the rest of the project | $627,103,000 |
| VE-5 | Utilize temporary detour north on the existing mainline and to the south on the proposed Witherspoon Street alignment to carry all freeway traffic and construct interchange in one phase in lieu of the 5 proposed phases | $8,154,000 |
| VE-6 | Relocate the Extreme Park from the existing location to the north side of I-64 near the intersection of Clay/Campbell and River Road | $2,558,000 |
| VE-7 | Relocate Witherspoon Street to south of Ramp 42 between N. Preston Street and Campbell Street | $14,373,000 |
| VE-8 | Combine Clay Street with Campbell Street, and eliminate Clay Street from Witherspoon to Campbell while revising the Campbell Street alignment to follow the alignment of the railroad | $15,791,000 |
| VE-9 | Connect BL-3 to Frankfort Road to provide access to River Road from westbound I-64, eliminate Ramp 26B from Ramp 26 to River Road, and eliminate Ramp 34 from Ramp 34A to River Road | $19,021,000 |
| VE-10 | Utilize left turn on to Frankfort Avenue so that BL 1 (Witherspoon Street westbound) lies parallel with BL-2 (Witherspoon Street eastbound) in lieu of running BL-1 under 3 bridges | $2,935,000 |
| VE-11 | The ramp widths on the single lane ramps should be in compliance with Kentucky Transportation Cabinet policy and AASHTO policy on the geometric design for highways and streets (applies to Ramps 6, 51A, 52 24, 26) | $1,568,000 |
| VE-12 | Merge Ramp 8 with Ramp 7 on westbound I-64 sooner to shorten Ramp 8 by 500 feet | $693,000 |
| VE-13 | Eliminate Ramp 22 and a portion of Ramp 42 | $29,449,000 |
| VE-14 | Decrease the number of lanes on Ramp 26 generally from I-64 westbound to I-65 southbound | $5,039,000 |
| VE-15 | Eliminate the construction to the west end of River Road, on the north side of the interstate | $396,000 |
| VE-16 | Eliminate the new bridges over the Great Lawn and use rehabilitated and widened existing bridges | $21,297,000 |
| VE-17 | Eliminate the bridge over the Great Lawn and use embankment instead | $54,311,000 |

| SUMMARY OF RECOMMENDATIONS | | |
|---|---|---|
| Rec # | Recommendation Title / Description | Present Worth Cost Savings (or cost ) |
| VE-18 | Analyze local street grid to determine if certain streets can be closed permanently, such as South Jackson, thereby reducing the number of bridges/structures | $4,047,000 |
| VE-19 | Design utility corridor within freeway footprint between I-65 and I-64 | Comment |
| VE-20 | Consolidate the construction of I-64 from Third Street (or POB) to Payne (or POE) to minimize duration | $15,686,000 |
| VE-21 | Use freeway closures in lieu of maintaining two lanes on each freeway | $69,390,000 |
| VE-22 | Use contractor-QC, KYTC-QA and warranties in lieu of total KYTC construction inspection | $4,874,000 |
| VE-23 | Use steel plate girder bridges in lieu of steel tub girders throughout this project | $73,352,000 |
| VE-24 | Maintain constant width for bridges B64-2, B64-15, B71-10 and B65-24A in lieu of having the bridge width conform to the roadway geometry | $407,000 |
| VE-25 | Utilize a 2-lane typical section with 6’ bike lanes on Clay Street in lieu of a 4-lane typical section with 6’ bike lanes | $1,045,000 |
| VE-26 | Construct Frankfort Avenue as a 2-lane facility in lieu of a 4-lane facility with a median | $291,000 |
| VE-27 | Eliminate the proposed bike path and relocate to the old railroad bridge | $37,897,000 |
| VE-28 | Provide a conventional reinforced earth wall outside of CSD areas | $2,762,000 |
| VE-29 | Reduce length of the project by stopping new construction on I-64 just south of the Mellwood Avenue exit | $556,000 |
| VE-30 | Utilize a retaining wall on the north side (Ohio River side) of Ramp 32 in lieu of a 2:1 slope and right-of-way fence; sell excess right-of-way | $1,527,000 |
| VE-31 | Utilize the existing bridges and/or proposed bridge in lieu of utilizing temporary bridge T-12 during construction phasing | $1,549,000 |

| SUMMARY OF DESIGN COMMENTS | |
|---|---|
| DC # | Description Title |
| DC-32 | Provide roadway system redundancy (Incident Management) |
| DC-33 | Provide an alternative structure type for areas which are not aesthetically critical |
| DC-34 | Modify the roadway geometrics to improve the bridge geometrics |
| DC-35 | Utilize railroad right-of-way for project construction easement |
| DC-36 | Utilize at grade roundabout intersections along Witherspoon Street in lieu of signalized intersections |
| DC-37 | Replace permanent temporary structures with removable temporary structures (example 8070/T-7) whenever it is a stand-alone and not for a widening |
| DC-38 | Examine the differences between Design-Bid-Build, Design-Build, and other procurement methods |
| DC-39 | Utilize performance specifications with warranties in lieu of method or prescriptive specifications |
| DC-40 | Utilize friction piles where possible |
| DC-41 | Utilize two lanes for Ramp 51A in lieu of one lane, utilize design standards acceptable to KYTC and AASHTO, and utilize reduced shoulder width across longer bridges (AASHTO 200 ft) |
| DC-42 | Utilize precast, post tension bridge decks |
| DC-43 | Utilize stay-in-place forms for bridge decks |
| DC-44 | Utilize fly-ash for fill material from Louisville Gas & Electric (E-on) |
| DC-45 | Utilize specialty contracts for project-wide construction elements |
| DC-46 | Standardize design elements such as the pier columns in order to maximize the reuse of concrete formwork or to allow standard precast elements |
| DC-47 | Allow precast wing-wall panels as an alternate in lieu of cast-in-place wing-walls |
| DC-48 | Investigate sight distance due to the relatively sharp curve on I-65 adjacent to the hospital |
| DC-49 | Construct Ramp 26 and Ramp 21 under Ramp 10 in lieu of over Ramp 10 |
| DC-50 | Combine bike rail with barrier wall |
| DC-51 | Utilize alternative contracting methods to minimize impacts to motorists and/or expedite the construction schedule |
| DC-52 | Utilize ramp metering techniques |
| DC-53 | Use standard specifications for sign supports |
| DC-54 | Use standard specifications for lighting fixtures |
| DC-55 | Use wick drains in fill areas to reduce settlement time |
| DC-56 | Utilize open drain and multi-access closed drain system on structure in lieu of traditional “closed” systems |

| SUMMARY OF DESIGN COMMENTS | |
|---|---|
| DC # | Description Title |
| DC-57 | Configure drainage to eliminate longitudinal drainage particularly behind MSE walls |
| DC-58 | Utilize one construction package in lieu of 14 or 22 construction packages |
| DC-59 | Incorporate TRIMARC into the entire MOT process to monitor traffic, divert traffic from work area, and to control access to work area |
| DC-60 | Utilize low maintenance vegetation in areas of aesthetic viewpoints in lieu of vegetation that requires irrigation and/or frequent attention by agronomist |
| DC-61 | Utilize a steel guardrail barrier system in lieu of barrier type A and handrail where aesthetics are not as critical |
| DC-62 | Utilize “re-boundable” crash cushions in lieu of cartridge reliant crash type barrier units |
| DC-63 | Utilize multi-use agreement for the right-of-way area under structures |
| DC-64 | Utilize 42” high bridge parapet/barrier walls in lieu of 32" walls to allow for a future overlay and paving |
| DC-65 | Utilize the sidewalk directly behind the curb in lieu of providing a 3 feet grass strip between curb and sidewalk as proposed on typical sections |
| DC-66 | Utilize aesthetic fence for all of the right of way in lieu of a chain link or standard woven wire field fence where retaining walls are not used for right of way barrier |
| DC-67 | Reduce the radius on Ramp 9 and Ramp 43 to increase the area where Witherspoon Street could be relocated |
| DC-68 | Check peak hour traffic volumes on roadways that are less than 10% ADT |
| DC-69 | Divert traffic from work area by utilizing alternate routes, time shifts, and other methods |
| DC-70 | Construct all shoulders to full depth in lieu of partial depth |
| DC-71 | Add a ramp to connect southbound I-71 to eastbound I-64 as well as a ramp to connect westbound I-64 to northbound I-71 |
| DC-72 | Improve the operation of the I-71 westbound and Frankfort Avenue interchange |
| DC-73 | Review retaining wall IW64-7 to verify location and dimensions on the plans and cross-sections |
| DC-74 | Utilize graffiti deterring measures in lieu of not providing any measures |

**Acknowledgments**
A thank you is given to the staff members from the Kentucky Transportation Cabinet and the design team members from KTA. Special thanks are also extended to Mr. Robert Semones for his assistance with the setting up of this study.

**Value Engineering Study - Core Team**

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**Certification**
This is to verify that the Value Engineering Study was conducted in accordance with standard Value Engineering principles and practices.

Kyle Schafersman, EIT, CVS
Value Engineering Program Manager

# TABLE OF CONTENTS

# SECTION 1 - INTRODUCTION

This report documents the results of a value engineering study on the Ohio River Bridge, Section 1 – Kennedy Interchange. The study workshop was held at the URS offices in Louisville, KY on January 28 – February 1, 2008. The study team was from URS. Kyle Schafersman and Kenneth True, Certified Value Specialist (CVS) team leaders from URS, facilitated the study. The names and telephone numbers of all participants in the study are listed in Appendix A.

**The Job Plan**
This study followed the value engineering methodology as endorsed by SAVE International, the professional organization of value engineering. This report does not include any detailed explanations of the value engineering / value analysis processes used during the workshop in development of the results presented herein. This would greatly expand the size of the report. The sole purpose of this report is to document the results of the study. Additional information regarding the processes used during the study can be obtained by contacting the Certified Value Specialist team leaders that facilitated the study.

**Ideas and Recommendations**
Part of the value engineering methodology is to generate as many ideas as is practical, evaluate each idea, and then select as candidates for further development only those ideas that offer added value to the project. If an idea thus selected, turns out to work in the manner expected, that idea is put forth as a formal value engineering recommendation. Recommendations represent only those ideas that are proven to the VE team's satisfaction.

**Design Comments**
Some ideas that did not make the selection for development as recommendations, were, nevertheless judged worthy of further consideration. These ideas have been written up as Design Comments and are included in Section 3 after the recommendations.

**Level of Development**
Value Engineering studies are working sessions for the purpose of developing and recommending alternative approaches to a given project. As such, the results and recommendations presented are of a conceptual nature, and are not intended as a final design. Detailed feasibility assessment and final design development of any of the recommendations presented herein, should they be accepted, remain the responsibility of the designer.

**Organization of the Report**
The report is organized in the following outline.

1. Introductory Information
    a. Section 1- Introduction
    b. Section 2- Project Description
2. Primary body of results……Section 3- Recommendations and Design Comments
4. Supporting documentation……Appendices

## SECTION 2 – PROJECT DESCRIPTION

The Ohio River Bridges Project (Project) is comprised of six primary sections including: 1) reconstruction/relocation of the Interstates and ramp systems to the south of the existing Kennedy Interchange ("Spaghetti Junction"); 2) a new downtown bridge just east of the existing Kennedy Bridge; 3) a new Indiana approach to the (new) bridge and ramps systems in Jeffersonville; 4) a new connection linking the new "East End" bridge to the existing Gene Snyder Freeway (KY 841); 5) an "East End" bridge approximately eight miles from downtown Louisville; and 6) a new Indiana connection linking the Lee Hamilton Highway (IN 265) to the new "East End" bridge.

The Kennedy Interchange (Section 1), where Interstates I-64, I-65, and I-71 converge, will be completely rebuilt just south of its current location. This interchange facilitates travel between three major Interstates for over 300,000 vehicles per day (VPD). A new interchange will be constructed at Mellwood Avenue and I-64, along with a reconstructed, partial interchange at I-71 and Frankfort Avenue/Ohio Street. Witherspoon will also be extended approximately one mile to Frankfort Avenue/Ohio Street. The existing ramp system at I-65 and Jefferson Street/Muhammad Ali Boulevard will also be reconstructed to improve traffic flow in that area. The second phase affecting downtown Louisville and Butchertown will be the new downtown bridge across the Ohio River. This will include the construction of a new six-lane bridge adjacent to the existing Kennedy Bridge to carry northbound traffic across the river on I-65. Traffic patterns on the existing Kennedy Bridge will be reconfigured to accommodate all southbound traffic on I-65.

The purpose of this project is to improve the cross-river mobility while reducing congestion, improving traffic safety, accommodating existing and forecasted growth, and addressing the local transportation plans. With this construction, I-64 will become a "through" facility. The project is trying to eliminate left-side exits where possible and eliminate weaving sections where possible. The project includes 27 miles of roadway alignments including city streets, ramps, and multi lane interstate. At one cross section, the interstate has 28 driving lanes. The project includes 37 separate retaining walls that span over 22,000 linear feet and have a surface area over 6 acres. The project requires 73 new bridges and 8 temporary bridges to accommodate Maintenance of Traffic (MOT). Surveys have been completed for over 100 miles of utilities, over 700 acres of urban area, and 300 right-of-way parcels.

The overall aesthetic goal of this project as presented in the Aesthetic Design Guidelines (October 25, 2005) is the following: Integration of the Kennedy Interchange into the existing urban context, historic neighborhoods, and waterfront park through the adoption of visually attractive and context sensitive designed structures and landscaping.

The 80% Joint Inspection (JI) Submission was prepared for the Kentucky Transportation Cabinet (KYTC) by Kentucky Transportation Associates (KTA). The JI cost estimate for Section 1 was $1,035,226,431. The project is expected to take approximately 13.5 years to construct. This is the most complex urban system interchange in the state of Kentucky.

# SECTION 3 - VE RECOMMENDATIONS & DESIGN COMMENTS

**Organization of Recommendations**
This section contains the complete documentation of all recommendations that resulted from this study. Each recommendation has been marked by a unique identification number.

The parent idea, or ideas from which the recommendation began, can be determined from the Creative Idea List located in Appendix D of this report.

Each recommendation is documented by a separate write-up that includes a description of both the original design and recommended change, a list of advantages and disadvantages, sketches where appropriate, calculations, cost estimate, and the economic impact of the recommendation on the first cost, and where applicable, the life cycle cost. The economic impact is shown in terms of savings or added cost.

**Acceptance of VE Recommendations**
The Summary of Recommendations table presented in the Executive Summary of this report identifies the recommendations that, in the opinion of the VE Team, are plausible and logical to be implemented. This list takes into account not only that the recommendations (and likewise their cost savings) are possibly summarily additive, but also the likelihood and ease of implementing the recommendations.

However, this report also includes other recommendations that could enhance the value of this project. These recommendations may be mutually exclusive of other recommendations presented by the VE Team (i.e. implementing one immediately precludes the implementation of another) or they require additional design and/or evaluation prior to implementation. These recommendations should be evaluated individually to determine whether they are worthy of implementation or not. Consideration should be given to the areas within a recommendation that are acceptable and implement only those parts. Any recommendation can be accepted in whole or in part as the owner and design team see fit.

## SECTION 3.1 – VE Team Recommendations

# VALUE ENGINEERING RECOMMENDATION # VE-1

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Terminate Buchanan Street north of Witherspoon Street in lieu of building bridges over this road.

**ORIGINAL DESIGN:**
The original design specifies Buchanan Street connecting from Witherspoon Street to River Road. The existing Buchanan Street currently ends at Franklin Street. The original design extends Buchanan Street below 9 new bridges (BTA-9, BTA-8, BTA-7, BTA-6, BTA-5, BTA-4, BTA-3, BTA-2, and BTA-1). Theses nine bridges are not listed on the cost estimate or the Bridge Data sheet provided to the VE team, so assumptions had to be made. The 9 bridges carry over 22 lanes of traffic and all appear to be an average of 100 ft long.

**RECOMMENDED CHANGE:**
The VE team recommends terminating Buchanan Street at Witherspoon Street lieu of connecting it to River Road. Connect Buchanan Street and Witherspoon in a signalized "T" interchange. Eliminate the new 9 bridges and utilize the roadway on embankment similar to the rest of the ramps in this section. With the elimination of these bridges, the overall elevation of the 22 lanes could potentially be reduced to grade.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $6,349,000 | | $6,349,000 |
| RECOMMENDED DESIGN | $327,000 | | $327,000 |
| ESTIMATED SAVINGS OR (COST) | $6,022,000 | $0 | $6,022,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-1

**ADVANTAGES:**

- Eliminates the construction of 9 bridges
- Eliminates maintenance of 9 bridges
- Buchanan does not currently connect to River Road
- Lowers elevation of all 22 lanes traveling through this area
- Does not violate ROD just because a recommendation of the Butchertown HPP was not implemented
- Eliminates the delineation of the newly acquired green space to the north of the new interchange
- Eliminates stoplight and access point on River Road

**DISADVANTAGES:**

- Reduces quantity of access from Butchertown to the Ohio River
- Reduces the limited view of the river from Butchertown through a approximately 500 ft tunnel

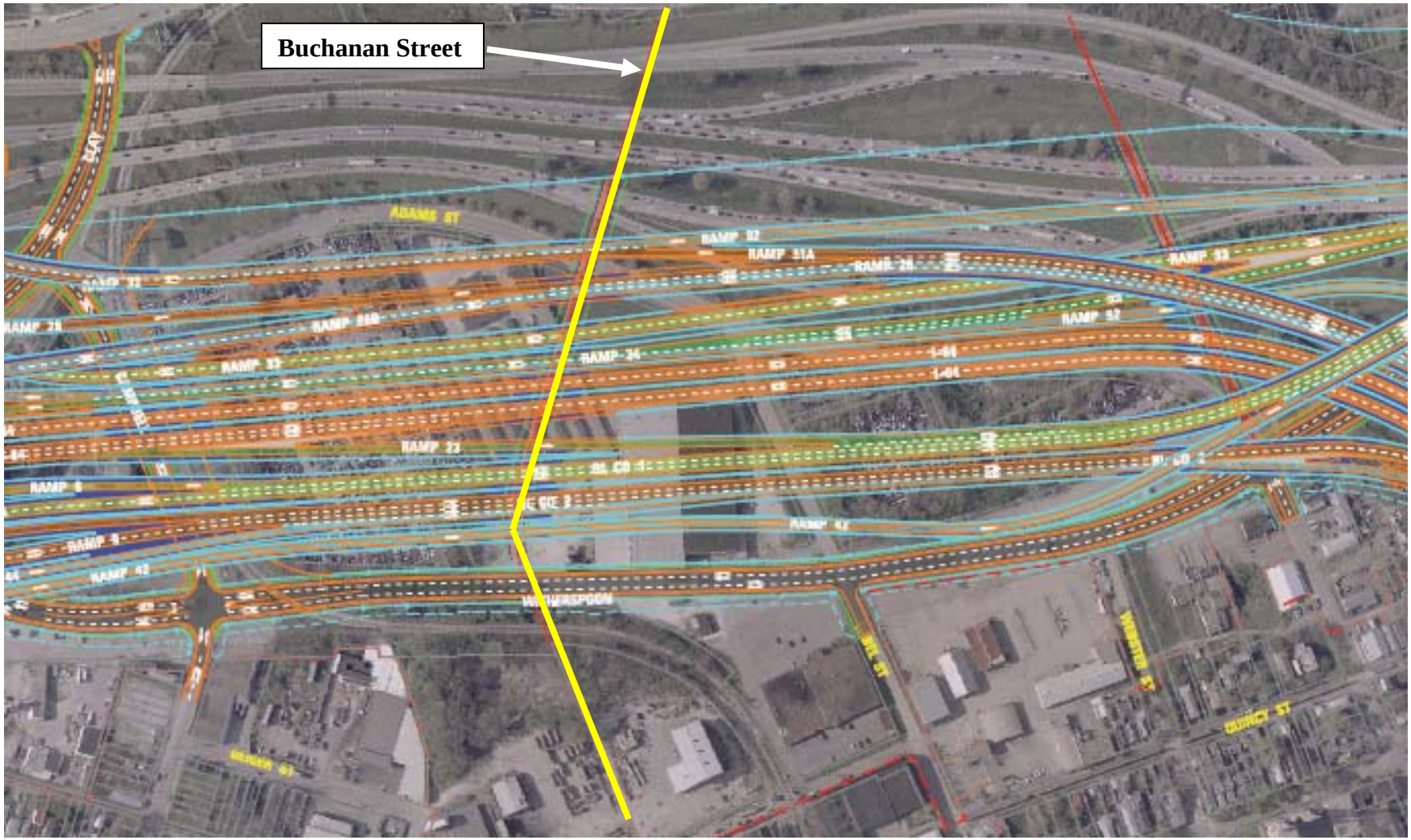
**JUSTIFICATION:**

The current construction estimate does not reflect a cost for these 9 bridges, but they are identified on the LSIORB Kennedy Interchange Proposed Brides document dated February 2007. The connection from Buchanan to River Road does not currently exist today. The VE team feels it is not prudent to construct these 9 bridges to create a new access, when there will already be access provided by Campbell Road 700 ft to the west and Adams Street 1,700 ft to the east. Other connections from Witherspoon to River Road that are designed within this interchange include Preston Street, Clay Street, and Frankfort Street. This makes a total of 6 connections between Witherspoon and River Road within a 3,100 ft.

It has become evident to the VE team that the only reason this project is constructing these 9 new bridges is to satisfy a recommendation made in the Butchertown Historical Preservation Plan (HPP). The recommendation in the HPP encourages more connections between Butchertown and the Ohio River. The existing condition only provides 2 overall connections, and the original design of the project now provides 6 connections. The VE team suggests eliminating one or more of these connections, which shouldn't be considered a violation of the HPP. The VE team feels that not all recommendations of the HPP are required to be implemented to satisfy the ROD.

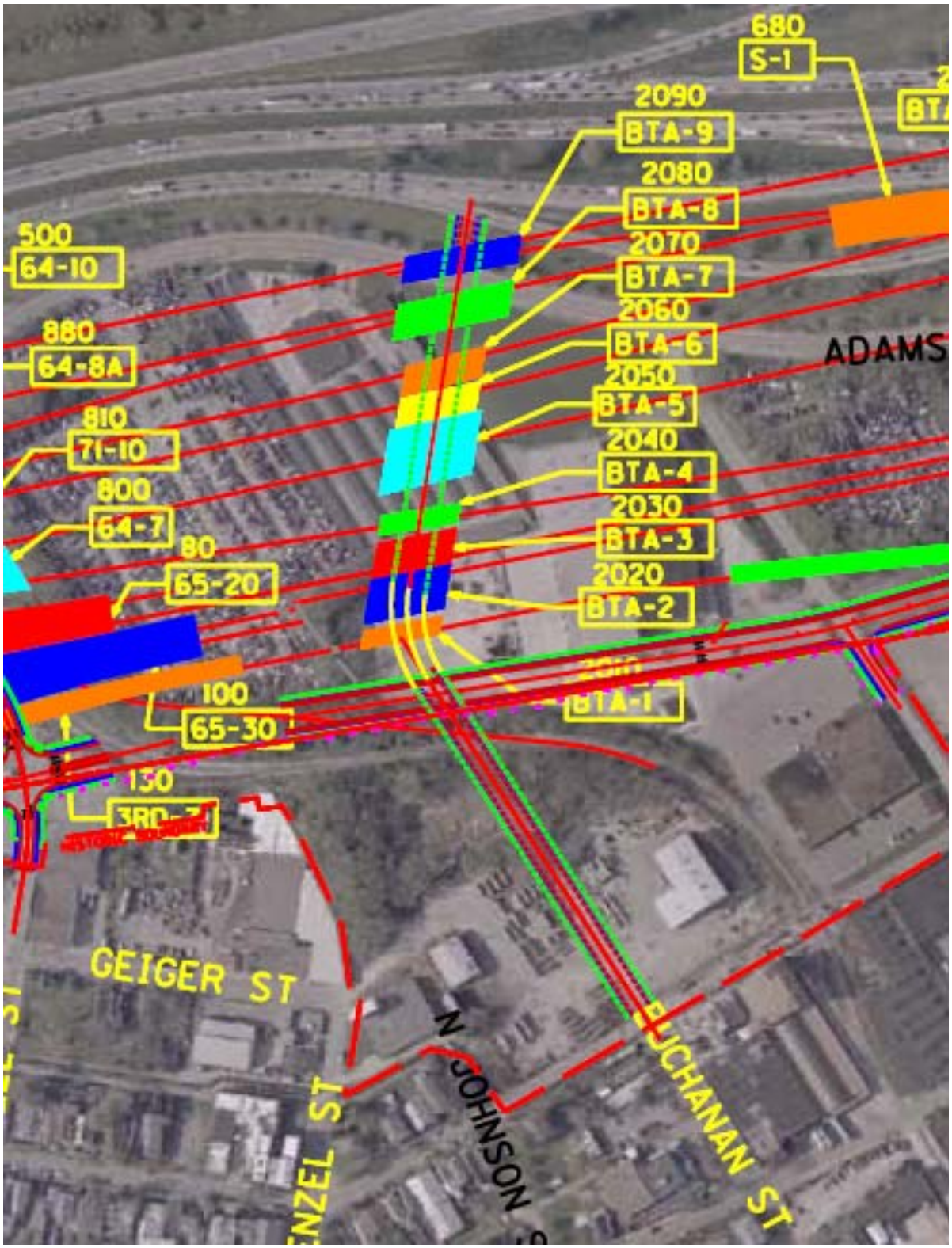
# VALUE ENGINEERING RECOMMENDATION # VE-1

## SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-1

### SKETCH OF ORIGINAL DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-1

## DOCUMENTATION CONTINUED

Excerpts from the Record of Decision:

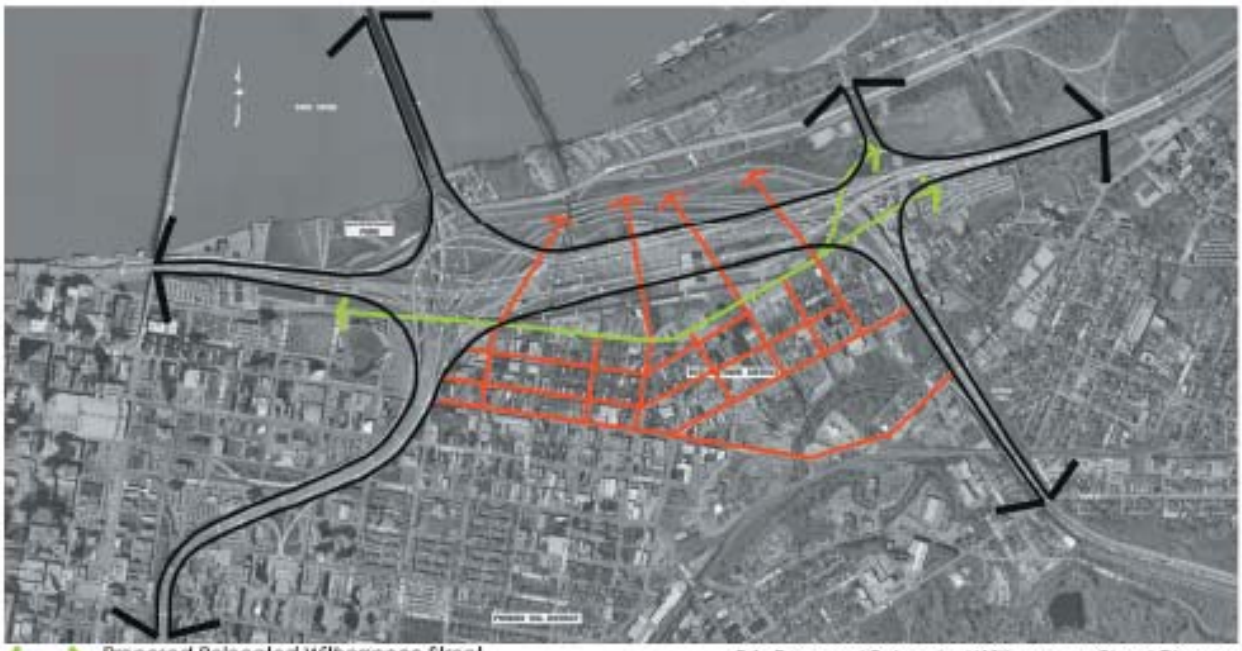
K. **Butchertown Historic District**

1. KYTC shall develop an HPP for the property as set forth in Stipulation II.F. The HPP shall include recommended measures for context sensitive design, noise abatement, streetscape improvements, connectivity to the river, and interpretive signage which shall be implemented as part of the Project to mitigate adverse effects to the historic district and provide additional strategies for rehabilitation and reuse of buildings and grounds that could enhance the district. The HPP shall develop a thematic context to assist with future nominations in the region. The HPP shall be coordinated with the latest development plans available from the Louisville/Jefferson County Metro Government (Metro Government) that affect the historic district and East Downtown area.

# VALUE ENGINEERING RECOMMENDATION # VE-1

## DOCUMENTATION CONTINUED

Excerpt from the Aesthetic Design Guidelines:




F.1- Proposed Relocated Witherspoon Street Diagram

It will be important to integrate the at-grade arterial roads like Witherspoon St with the rest of the grid system of the historic neighborhoods (see figures F.1 and F.3).

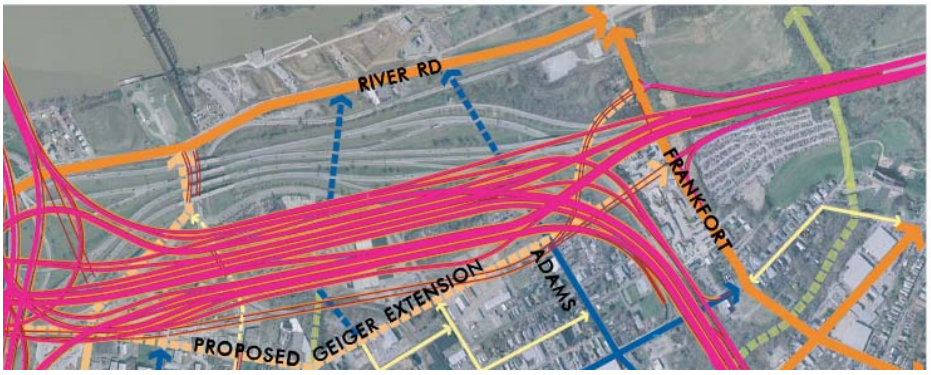
Aesthetic Design Guidelines

Urban Interchange Design Principles
F. Urban Fabric and Streetscape Treatments

# VALUE ENGINEERING RECOMMENDATION # VE-1

## DOCUMENTATION CONTINUED

Excerpts from the Butchertown Historic Preservation Plan:




**Linkages to the Ohio River:**

- return 2-way traffic to all major north-south streets
- extend Clay, Campbell, Wenzel/ Buchanon and Adams Streets through the Kennedy Interchange
- encourage the utilization of Beargrass Creek as a multi-use pedestrian corridor

**Butchertown:**

- proposed Geiger Street extension as a buffer from the interstate and gateway corridor to Butchertown and downtown
- proposal to create a 4-point interchange at I-64 and Mellwood Avenue and eliminate Story Avenue

**Introduction**

The remainder of this historic preservation plan explores overall recommendations for the Butchertown neighborhood. This chapter proposes a vision or "big picture ideas" for Butchertown's historic district.

### 4.2 NEIGHBORHOOD REDEVELOPMENT FEATURES

The conceptual plan on the following page and list of recommendations below form the basis for the remaining recommendations within this plan. This plan recognizes the disparate, and sometimes competing, activities that make up the Butchertown neighborhood.

The overarching goal, as illustrated on the following page, is to combine the assets of these two areas in order to strengthen the Phoenix Hill historic district and the neighborhood as a whole. Additional goals of this conceptual redevelopment plan include:

1. Strengthen connections to the Ohio River by extending Adams, Buchanon/Wenzel, and Clay/Campbell Streets through the interstate to River Road
2. New Geiger Street extension (alignment) through the district allowing redevelopment opportunities along both sides of the street
3. Redevelopment along Geiger Street extension scaled to buffer neighborhood from the interstate
4. Conversion of railroad right-of-way into pedestrian trail connecting to the Beargrass Creek greenway
5. Restore the street edge along Story Avenue through appropriate infill development
6. Long-term redevelopment strategy for the Swift Plant property into neighborhood activities
7. Conversion of north/south streets as well as Story and Main Streets to two-way traffic to improve circulation patterns within the neighborhood and to surrounding neighborhoods
8. New local street along Beargrass Creek connecting Adams and Main Streets - infill development patterns along street highlights/encourages access to the creek
9. Utilize and promote Beargrass Creek as a multi-use greenway including the incorporation of trailheads

BUTCHERTOWN HISTORIC PRESERVATION PLAN | FINAL DRAFT - APRIL 19, 2007

# VALUE ENGINEERING RECOMMENDATION # VE-1

## CALCULATIONS

Since the cost of these 9 bridges is not included in the estimate the VE team has made the following assumptions:

- The bridges over Buchanan road incorporate 22 lanes
- Total lane width of 12 ft per lanes to accommodate the shoulders
- Each bridge also incorporates 20 ft for shoulders and walls
- Assumed the average length of these 9 bridge structures is 100 ft
- Bridges cost and average of $130 per square foot
- Roadway put in place in lieu of bridges cost $60 per square yard

(22 lanes x 12 ft per lane + 20 ft per bridges x 9 bridges) = 444 ft wide

444 ft (width) x 100 ft (length) = 44,400 square foot of bridges

Amount of roadway to back in place of removed bridges = 44,400 SF = 4,950 SY

# VALUE ENGINEERING RECOMMENDATION # VE-1

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Proposed Bridges (BTA-1 thru BTA-9) | SF | 130.00 | 7 | 44,400 | $5,772,000 | | |
| Roadway and embankment | SY | 60.00 | 7 | | | 4,950 | $297,000 |
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| | | | | | | | |
| Subtotal | | | | | $5,772,000 | | $297,000 |
| Contingency | @ | 10.00% | | | $577,200 | | $29,700 |
| Total | | | | | $6,349,200 | | $326,700 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-2

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Terminate Adams Street north of Witherspoon Street in lieu of building bridges over this road.

**ORIGINAL DESIGN:**
The original design specifies Adams Street connecting from Witherspoon Street to River Road. The existing Adam Street currently follows I-64 alignment to the west and terminates at Campbell Street. The original design extends Adams Street below 9 new bridges (BTA-10, BTA-11, BTA-12, BTA-13, BTA-14, CD3-3, 3RD-9, CD3-1, S-1). At least 4 of these bridges are exclusively to span Adams Street. Theses 4 bridges are not listed on the cost estimate or the Bridge Data sheet provided to the VE team, so assumptions had to be made. The 4 bridges carry over at least 10 lanes of traffic and all appear to be an average of 100 ft long.

**RECOMMENDED CHANGE:**
The VE team recommends terminating Adams Street at Witherspoon Street lieu of connecting it to River Road. Connect Adams Street and Witherspoon in a signalized "T" interchange. Eliminate at least the new 4 bridges dedicated to spanning Adams Road and utilize the roadway on embankment similar to the rest of the ramps in this section. With the elimination of these bridges, the overall elevation of the 10 lanes could potentially be reduced to grade.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $2,860,000 | | $2,860,000 |
| RECOMMENDED DESIGN | $147,000 | | $147,000 |
| ESTIMATED SAVINGS OR (COST) | $2,713,000 | $0 | $2,713,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-2

**ADVANTAGES:**

- Eliminates the construction of at least 4 bridges
- Eliminates maintenance of 4 bridges
- Adams Street does not currently connect to River Road
- Lowers elevation of all 10 lanes traveling through this area
- Does not violate ROD just because a recommendation of the Butchertown HPP was not implemented
- Eliminates the delineation of the newly acquired green space to the north of the new interchange
- Eliminates stoplight and access point on River Road

**DISADVANTAGES:**

- Reduces quantity of access from Butchertown to the Ohio River
- Reduces the limited view of the river from Butchertown through an approximately 500 ft tunnel

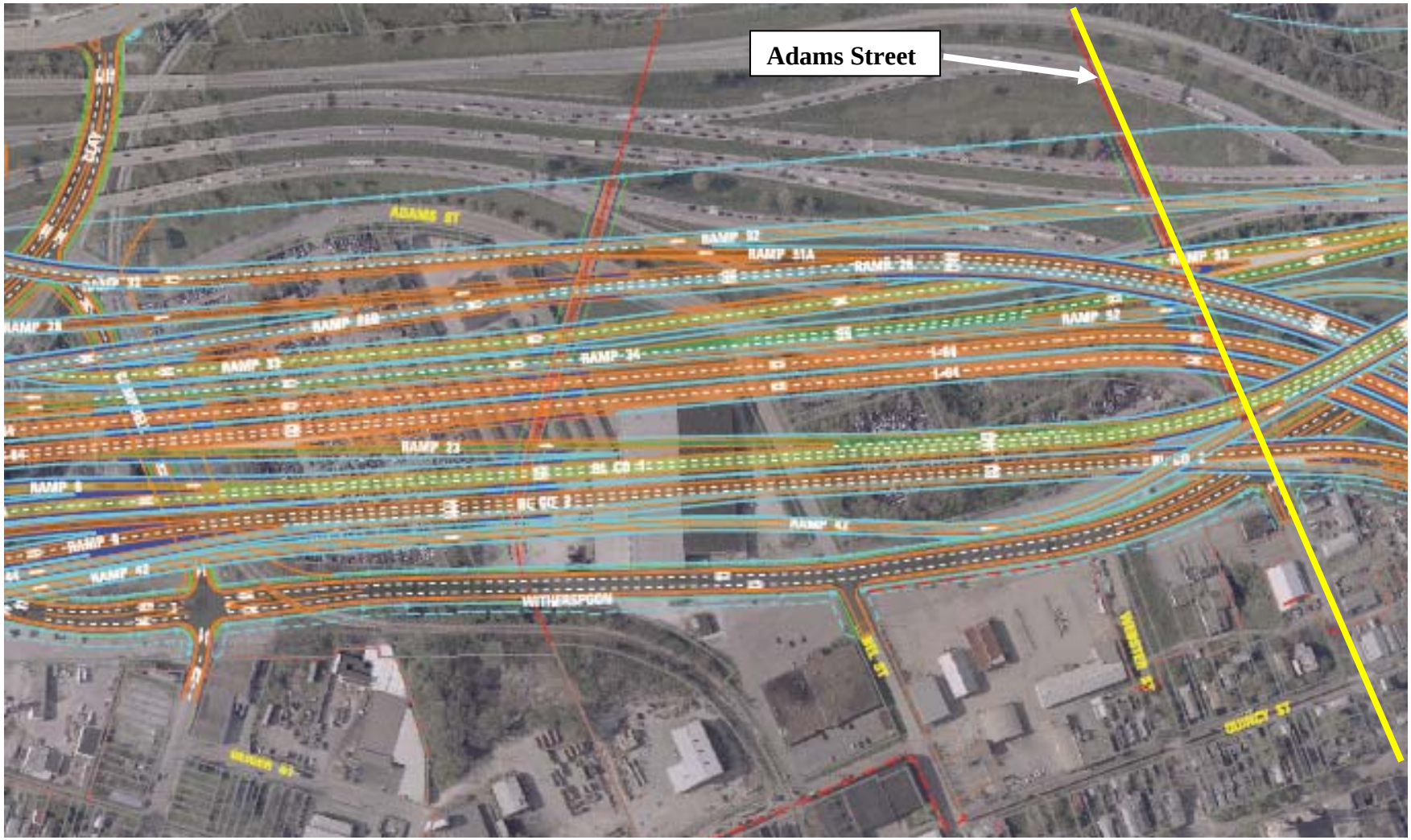
**JUSTIFICATION:**

The current construction estimate does not reflect a cost for these 4 bridges, but they are identified on the LSIORB Kennedy Interchange Proposed Brides document dated February 2007. The connection from Adams Street to River Road does not currently exist today. The VE team feels it is not prudent to construct these 4 bridges to create a new access, when there will already be access provided by Buchanan Street 1,700 ft to the west, and Frankfort Street 1,100 ft to the east. Other connections from Witherspoon to River Road that are designed within this interchange include Preston Street, Campbell Street, and Clay Street. This makes a total of 6 connections between Witherspoon and River Road within a 3,100 ft.

It has become evident to the VE team that the only reason this project is constructing these 4 new bridges is to satisfy a recommendation made in the Butchertown Historical Preservation Plan (HPP). The recommendation in the HPP encourages more connections between Butchertown and the Ohio River. The existing condition only provides 2 overall connections, and the original design of the project now provides 6 connections. The VE team suggests eliminating one or more of these connections, which shouldn't be considered a violation of the HPP. The VE team feels that not all recommendations of the HPP are required to be implemented to satisfy the ROD.

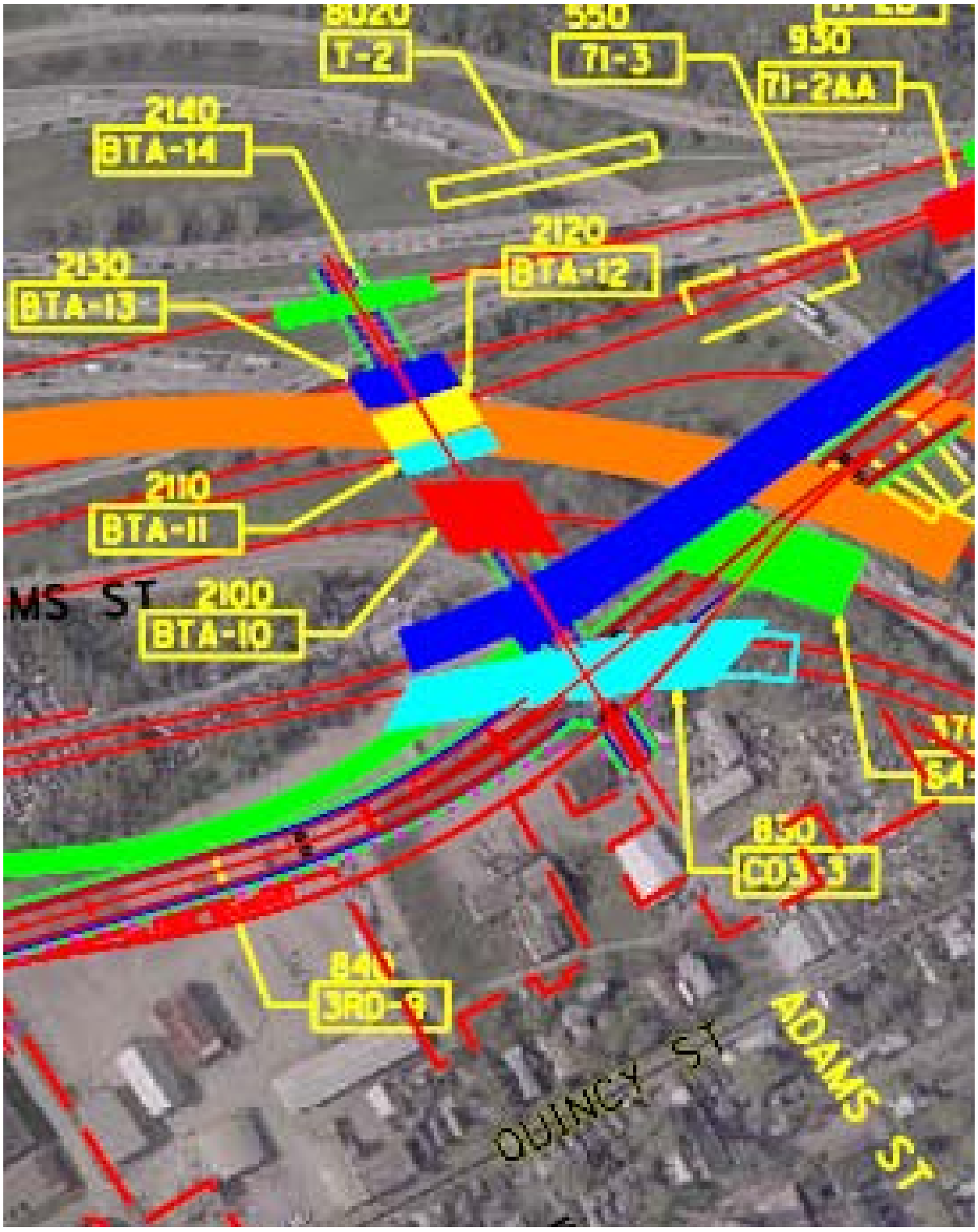
## VALUE ENGINEERING RECOMMENDATION # VE-2

## SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-2

### SKETCH OF ORIGINAL DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-2

## DOCUMENTATION CONTINUED

Excerpts from the Record of Decision:

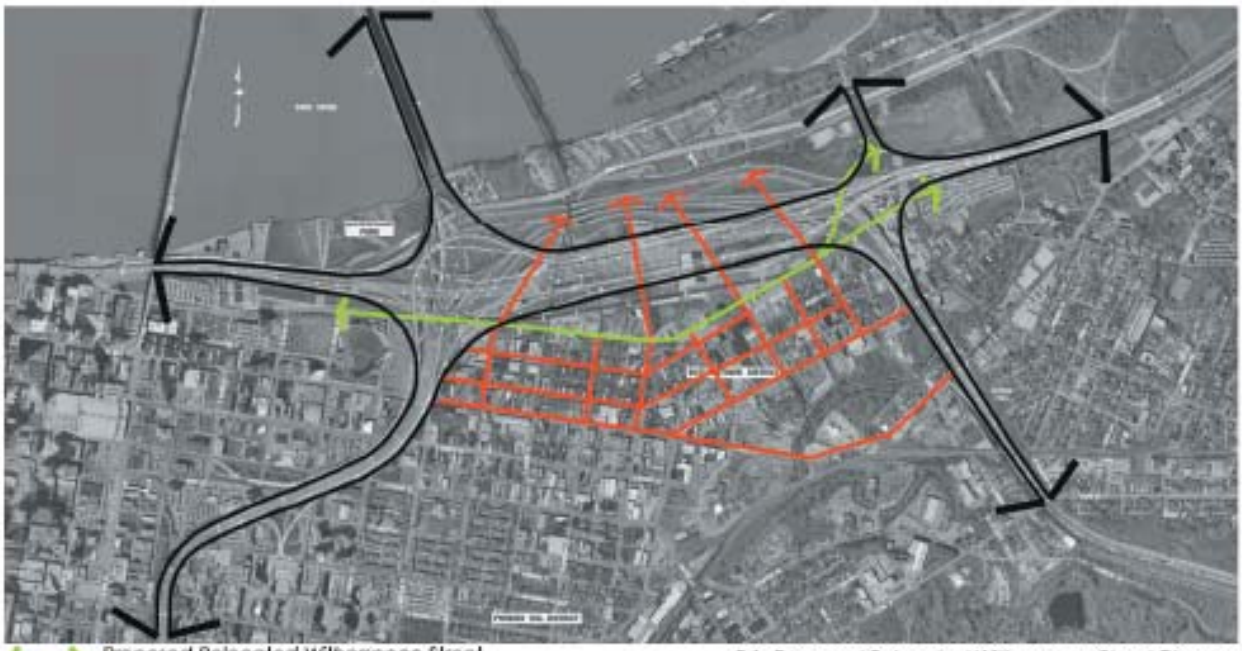
K. **Butchertown Historic District**

1. KYTC shall develop an HPP for the property as set forth in Stipulation II.F. The HPP shall include recommended measures for context sensitive design, noise abatement, streetscape improvements, connectivity to the river, and interpretive signage which shall be implemented as part of the Project to mitigate adverse effects to the historic district and provide additional strategies for rehabilitation and reuse of buildings and grounds that could enhance the district. The HPP shall develop a thematic context to assist with future nominations in the region. The HPP shall be coordinated with the latest development plans available from the Louisville/Jefferson County Metro Government (Metro Government) that affect the historic district and East Downtown area.

# VALUE ENGINEERING RECOMMENDATION # VE-2

## DOCUMENTATION CONTINUED

Excerpt from the Aesthetic Design Guidelines:



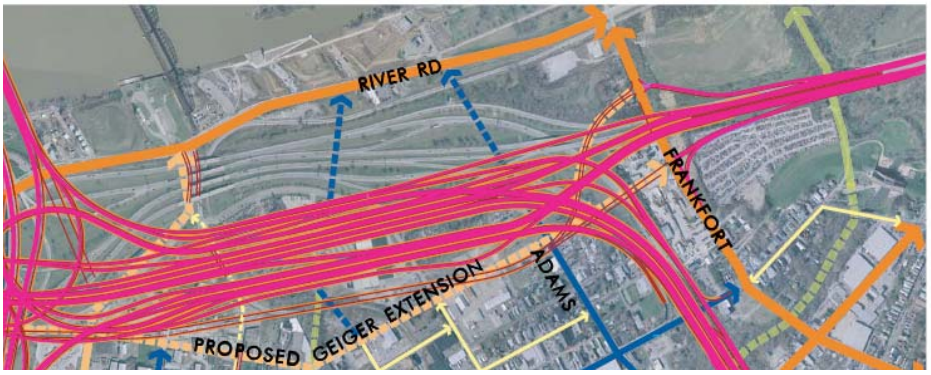

*F.1- Proposed Relocated Witherspoon Street Diagram*

It will be important to integrate the at-grade arterial roads like Witherspoon St with the rest of the grid system of the historic neighborhoods (see figures F.1 and F.3).

# VALUE ENGINEERING RECOMMENDATION # VE-2

## DOCUMENTATION CONTINUED

Excerpts from the Butchertown Historic Preservation Plan:




**Linkages to the Ohio River:**

- return 2-way traffic to all major north-south streets
- extend Clay, Campbell, Wenzel/ Buchanon and Adams Streets through the Kennedy Interchange
- encourage the utilization of Beargrass Creek as a multi-use pedestrian corridor

**Butchertown:**

- proposed Geiger Street extension as a buffer from the interstate and gateway corridor to Butchertown and downtown
- proposal to create a 4-point interchange at I-64 and Mellwood Avenue and eliminate Story Avenue

**Introduction**

The remainder of this historic preservation plan explores overall recommendations for the Butchertown neighborhood. This chapter proposes a vision or "big picture ideas" for Butchertown's historic district.

### 4.2 NEIGHBORHOOD REDEVELOPMENT FEATURES

The conceptual plan on the following page and list of recommendations below form the basis for the remaining recommendations within this plan. This plan recognizes the disparate, and sometimes competing, activities that make up the Butchertown neighborhood.

The overarching goal, as illustrated on the following page, is to combine the assets of these two areas in order to strengthen the Phoenix Hill historic district and the neighborhood as a whole. Additional goals of this conceptual redevelopment plan include:

1. Strengthen connections to the Ohio River by extending Adams, Buchanon/Wenzel, and Clay/Campbell Streets through the interstate to River Road
2. New Geiger Street extension (alignment) through the district allowing redevelopment opportunities along both sides of the street
3. Redevelopment along Geiger Street extension scaled to buffer neighborhood from the interstate
4. Conversion of railroad right-of-way into pedestrian trail connecting to the Beargrass Creek greenway
5. Restore the street edge along Story Avenue through appropriate infill development
6. Long-term redevelopment strategy for the Swift Plant property into neighborhood activities
7. Conversion of north/south streets as well as Story and Main Streets to two-way traffic to improve circulation patterns within the neighborhood and to surrounding neighborhoods
8. New local street along Beargrass Creek connecting Adams and Main Streets - infill development patterns along street highlights/encourages access to the creek
9. Utilize and promote Beargrass Creek as a multi-use greenway including the incorporation of trailheads

BUTCHERTOWN HISTORIC PRESERVATION PLAN | FINAL DRAFT - APRIL 10, 2007

# VALUE ENGINEERING RECOMMENDATION # VE-2

## CALCULATIONS

Since the specific price of these 4 bridges is not identified in the estimate, the VE team has made the following assumptions:

- The bridges over Adams Street incorporate 102 lanes
- Total lane width of 12 ft per lanes to accommodate the shoulders
- Each bridge also incorporates 20 ft for shoulders and walls
- Assumed the average length of these 4 bridge structures is 100 ft
- Bridges cost and average of $130 per square foot
- Roadway put in place in lieu of bridges cost $60 per square yard

(10 lanes x 12 ft per lane + 20 ft per bridges x 4 bridges) = 200 ft wide

200 ft (width) x 100 ft (length) = 20,000 square foot of bridges

Amount of roadway to back in place of removed bridges = 20,000 SF = 2,222 SY

# VALUE ENGINEERING RECOMMENDATION # VE-2

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Proposed Bridges (BTA-10 thru BTA-14) | SF | 130.00 | 7 | 20,000 | $2,600,000 | | |
| Roadway and embankment | SY | 60.00 | 7 | | | 2,222 | $133,320 |
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| Subtotal | | | | | $2,600,000 | | $133,320 |
| Contingency | @ | 10.00% | | | $260,000 | | $13,332 |
| Total | | | | | $2,860,000 | | $146,652 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-3

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize overall project manager with absolute decision-making power to improve coordination of MOT and construction management/inspection.

**ORIGINAL DESIGN:**
This VE study is for Section One, Kennedy Interchange, which is part of the larger project, Ohio River Bridges. Presently, Section One is divided into 9 phases and between 14 to 22 construction packages. And this does not include construction packages for the larger picture project. The management method/responsibility to execute the construction, to the VE teams knowledge, has not been specifically addressed. However, it is assumed that the Kentucky Transportation Cabinet with the assistance of a Construction Management contract will over see the construction.

**RECOMMENDED CHANGE:**
Appoint a single point of contact with full authority to make final and binding decision to enable rapid resolution of issues that arise in the field.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $4,000,000 | | $4,000,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $4,000,000 | $0 | $4,000,000 per year |

# VALUE ENGINEERING RECOMMENDATION # VE-3

**ADVANTAGES:**

- Expedites decisions
- Reduces construction delays
- Reduces potential impact to traffic
- Provides a greater degree of safety for roadway users during construction
- Provides better interface between contractors
- Helps to reduce potential after the fact litigation

**DISADVANTAGES:**

- Appointing one person, or small group, with total "power" will be difficult politically to accomplish
- Deciding how/who to appoint could be painful
- Getting all parties to sign up to "One control" may be difficult

**JUSTIFICATION:**

The concept of this idea is rather simple. Have one person or a very small group ultimately responsible so that as the project begins and proceeds, time smart decisions can be rendered. A project of this size, complexity, and duration should be expected, even with near prefect engineering and planning, to encounter unknown field problems that need resolution prior to the construction proceeding. Since this project involves many diverse government and private groups, resolving field problems could be very time and cost sensitive. The VE team understands that when construction contractors have large crews in the field, TIME IS MONEY. Any delays in resolving interface problems or a myriad of other problems that will arise must be able to be addressed and resolve expeditiously. The best way to address this issue is to have ONE point of contact, readily accessible to solve the problem. The most efficient way to address this is to have one point of contact that has the authority to make binding decisions.

The key to making this work is to give this person or small team, the FULL authority to make on the spot decisions, including financial authority. They should not be responsible for upward reporting or second-guessing. The challenge in implementation is to put a person in place with this type of authority. A lot of officials would be reluctant

# VALUE ENGINEERING RECOMMENDATION # VE-3

## CALCULATIONS

Assume a $1.0 billion project over a ten year life span.

If the construction placement was uniform over a ten year period, that equates to $100 million per year or $2.0 million per week or $50,00 per hour.

If you assume a more realistic placement curve, the mid years could have double that placement with the beginning and end years at half.

Using $50,000 per hour in placement, a one-hour delay to the project due to an unforeseen problem could cost $50,000. If a one point contact to resolve the issues is not in place, a simply delay of one day could cost $400,000.

Assuming just one delay per month per year equates to possibly as much as ($400,000 X 12 X 10) $48 million. That is still only less than 5% of the total costs. Experience tells us that a 5% cost growth for large project would be less than normal.

Therefore, appoint a one person “Answer Man” at $200,000 or more per year and potentially save a lot of money.

Assuming this person resolves one problem per month that would have delayed the project by one day each incident, that savings would be ($4,800,000 - $200,000) over $4.0 million per year.

# VALUE ENGINEERING RECOMMENDATION # VE-3

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Savings per year | LS | 4,000,000 | 7 | 1 | $4,000,000 | | |
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| | | | | | | | |
| Subtotal | | | | | $4,000,000 | | $0 |
| Contingency | @ | | | | $0 | | $0 |
| Total | | | | | $4,000,000 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-4

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
With the exception of spot locations where recurrent congestion occurs, eliminate the rest of the project.

**ORIGINAL DESIGN:**
Total redesign of the existing I-64, I-65, and I-71 interchanges

- $1.03 billion
- Service 37,500 fewer vehicles than no build (the proposed east end crossing will reduce the demand on this intersection)
- Over 13 year construction operation

**RECOMMENDED CHANGE:**
Modify existing ramps to eliminate the weaves that create recurring congestion, and redesign ramps which have a significant crash history.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $1,044,267,000 | | $1,044,267,000 |
| RECOMMENDED DESIGN | $417,164,000 | | $417,164,000 |
| ESTIMATED SAVINGS OR (COST) | $627,103,000 | $0 | $627,103,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-4

**ADVANTAGES:**

- Utilize existing right-of-way
- Eliminate major weaves
- Eliminate accident hot spots
- Utilize much of the existing infrastructure
- Minor impact on surrounding neighborhoods

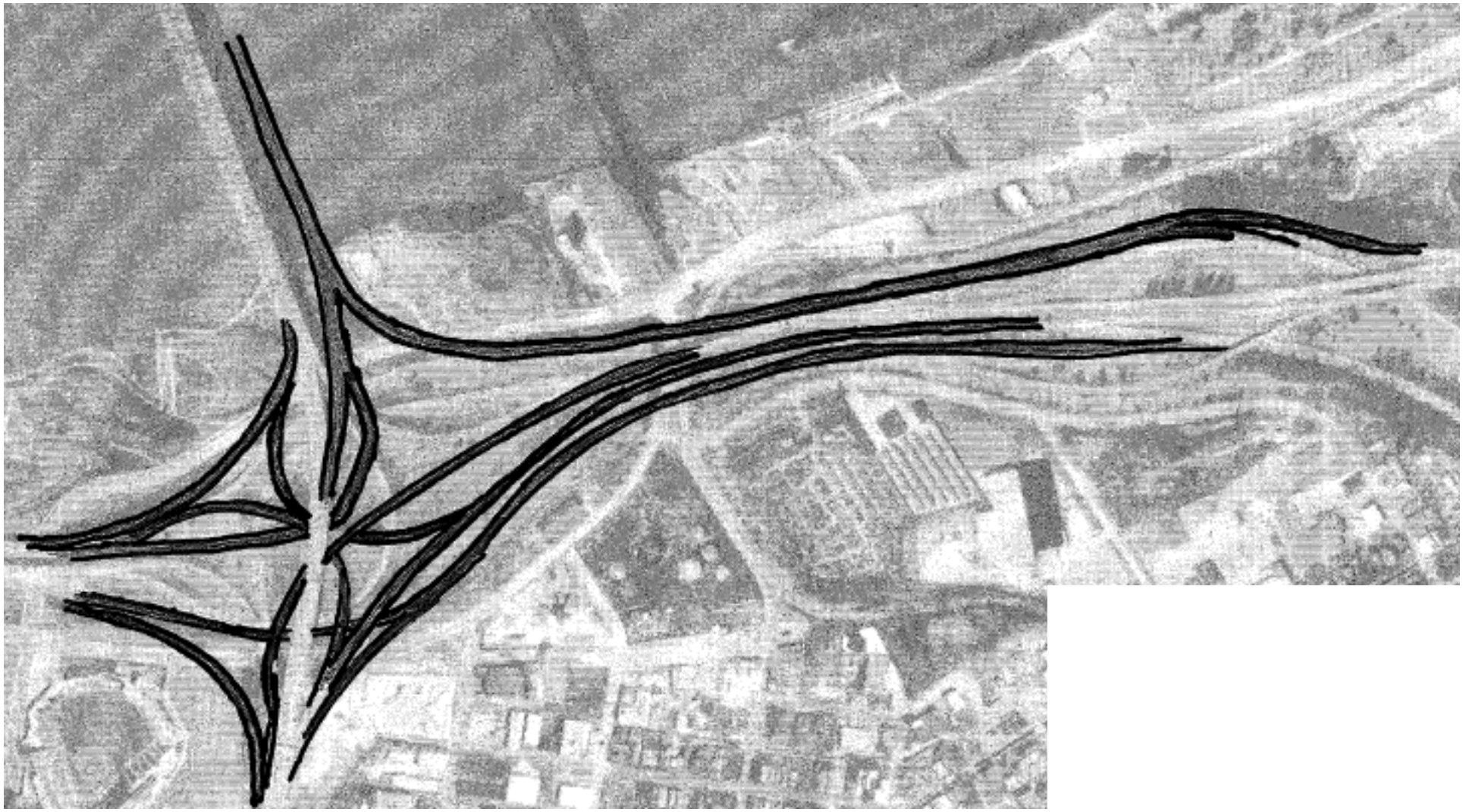
**DISADVANTAGES:**

- Retain left exits
- All ramp geometrics may not be ideal
- May not fully address peak hour demands of the system
- Reduce the level of mitigation

**JUSTIFICATION:**
The lower level of development is capable of addressing the more immediate needs of the redesign in a manner consistent with obtainable resources.

## VALUE ENGINEERING RECOMMENDATION # VE-4

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-4

### CALCULATIONS

APPROACH TRAFFIC

| APPROACH | TWO WAY NO BUILD ADT | TWO WAY PROPOSED ADT |
|---|---|---|
| NORTH I-65 | 171,200 | 160,000 |
| SW I-65 | 142,300 | 118,400 |
| SE I-64 | 93,800 | 88,500 |
| EAST I-71 | 101,100 | 109,000 |
| | 508,400 | 470,000 |
| NET | | (37,500) |

REF: FIGURE 3
FIGURE A-15, A-16

CONSTRUCTION SCHEDULE

| | | |
|---|---|---|
| PHASE 1 | 22 | MONTH |
| PHASE 2 | 17 | MONTH |
| PHASE 3 | 21 | MONTH |
| PHASE 4 | 19 | MONTH |
| PHASE 5 | 18 | MONTH |
| PHASE 6 | 18 | MONTH |
| PHASE 7 | 19 | MONTH |
| PHASE 8 | 24 | MONTH |
| PHASE 9 | 2 | MONTH |
| | 160 | MONTH → 13 YR 4 MONTHS |

# VALUE ENGINEERING RECOMMENDATION # VE-4

## CALCULATIONS

PHOTO SCALE 6" = 1700'  RAMP @ 746,000 / LANE MI ~ ODOT
BRIDGE 120 / SF
(29' WIDE)

64 WB → 65 NB  Cost x 1000

(5/6) 1700 = 1550 LF = $280 — $ 643

BRIDGE #1
(9/6) 1700 = 225 LF x 29 — $ 848

BRIDGE #2
(6/6) 1700 = 340 LF x 29 — $ 1,282

71 SB → 65 NB

(5/6) 1200 = 5100 LF — $720
BRIDGE 2380 / 340 LF — $ 1,282

64 WB → 65 SB

1ST RAMP (3/6) 1700 = 1700 LF — $ 240
2ND RAMP (5 3/6) 1700 = 3000 LF — $ 424
BRIDGE (1/6) 1700 = 225 LF — $ 848

71 SB → 65 SB

2ND RAMP (5 3/6) 1700 = 3000 LF — $ 424
BRIDGE (1/6) 1700 = 225 LF — $ 848

64 EB → 65 SB

RAMP (2 3/6) (1700) = 2150 LF — $ 304

64 EB → 65 NB

RAMP (4 3/6) (1700) = 2450 LF — $ 346
BRIDGE #1 (6/6)(1700) = 340 LF — $ 1,282

## VALUE ENGINEERING RECOMMENDATION # VE-4

### CALCULATIONS

BRIDGE # 2 $\left(\frac{1}{2}\right)$ 1100 = 625 LF  $ 7,356

65 NB → 65 WB

SHIFT (2 LANE) $\left(\frac{2.5}{3}\right)$ 1700 = 1925 LF  $ 403

BRIDGE (2 LANE) $\left(\frac{1}{2}\right)$ 1700 = 390 LF  $ 1282

65 SB → 64 WB

RAMP $\left(\frac{2.5}{3}\right)$ 1700 = 1600 LF  $ 226

$ 13,758,000 TOTAL

10,028,000 BRIDGE

3,730,000 ROADWAY

REHAB REPAIRABLE ROADWAY

$40.84 / $106.87 = 37% of NEW

ORIGINAL $60,037,000

NEW 3,730,000

56,307,000

X .37 $20,833,590

REHAB REPAIRABLE BRIDGES

ASSUME 50% OF NEW

ORIGINAL $489,296,500

$ 244,648,250

# VALUE ENGINEERING RECOMMENDATION # VE-4

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Total Roadway | LS | 60,037,000 | 7 | 1 | $60,037,000 | | |
| Total Roadway | LS | 3,730,000 | 7 | | | 1 | $3,730,000 |
| Total Bridge | LS | 489,296,500 | 7 | 1 | $489,296,500 | | |
| Total Bridge | LS | 10,028,000 | 7 | | | 1 | $10,028,000 |
| Existing Roadway Rehab | LS | 20,833,590 | 7 | | | 1 | $20,833,590 |
| Existing Bridge Rehab | LS | 244,648,250 | 7 | | | 1 | $244,648,250 |
| All other elements of the project | LS | 400,000,000 | 7 | 1 | $400,000,000 | 0.25 | $100,000,000 |
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| Subtotal | | | | | $949,333,500 | | $379,239,840 |
| Contingency | @ | 10.00% | | | $94,933,350 | | $37,923,984 |
| Total | | | | | $1,044,266,850 | | $417,163,824 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-5

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize temporary detour north on the existing mainline and to the south on the proposed Witherspoon Street alignment to carry all freeway traffic and construct interchange in one phase in lieu of the 5 proposed phases.

**ORIGINAL DESIGN:**
The sequence of construction is divided into 9 sequential phases with an estimated length of construction exceeding 13 years.

**RECOMMENDED CHANGE:**
The VE team recommends moving eastbound I-64 traffic to a temporary alignment following proposed Witherspoon Street design for 4 lanes of traffic. Move westbound I-64 to the northern directional roadway in the existing interchange. Widen as needed to support 4 lanes of traffic during construction.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $14,053,000 | | $14,053,000 |
| RECOMMENDED DESIGN | $5,899,000 | | $5,899,000 |
| ESTIMATED SAVINGS OR (COST) | $8,154,000 | $0 | $8,154,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-5

**ADVANTAGES:**

- Allow the central portion of the interchange to be constructed unencumbered by demands from outside the project
- Will permit one large contract for efficiency
- Will allow concurrent construction of many fills and roadways to condense schedule
- Will provide a long term traffic pattern

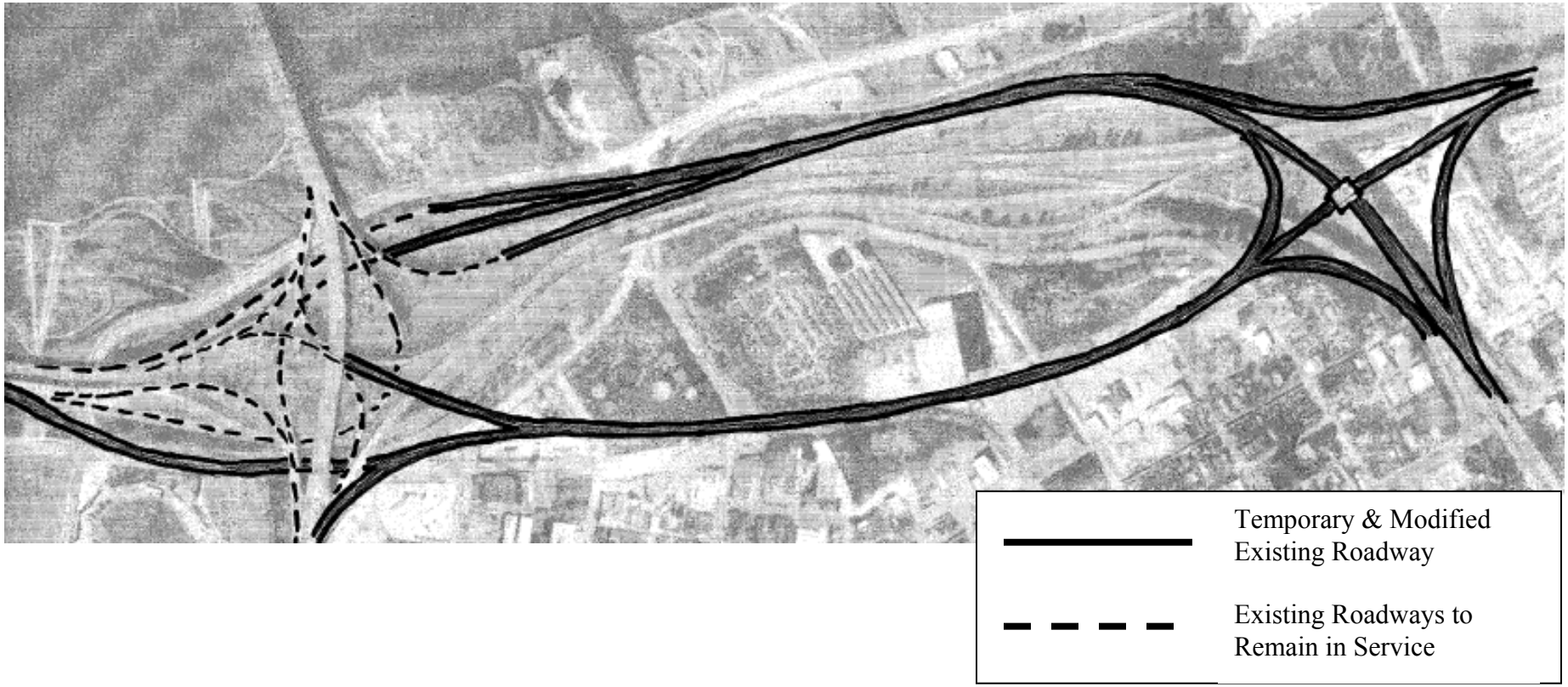
**DISADVANTAGES:**

- Large amount of temporary roadway
- Requires a temporary bridge
- Will not provide more system capacity than the original
- Embankment temporary may have to be wasted at end of project off site

**JUSTIFICATION:**
This results in a shortened construction schedule and fewer temporary bridges resulting in a cost savings of $7,412,000. Also it results in a long term, stable traffic pattern, which results in better acceptance by the public and stake holders.

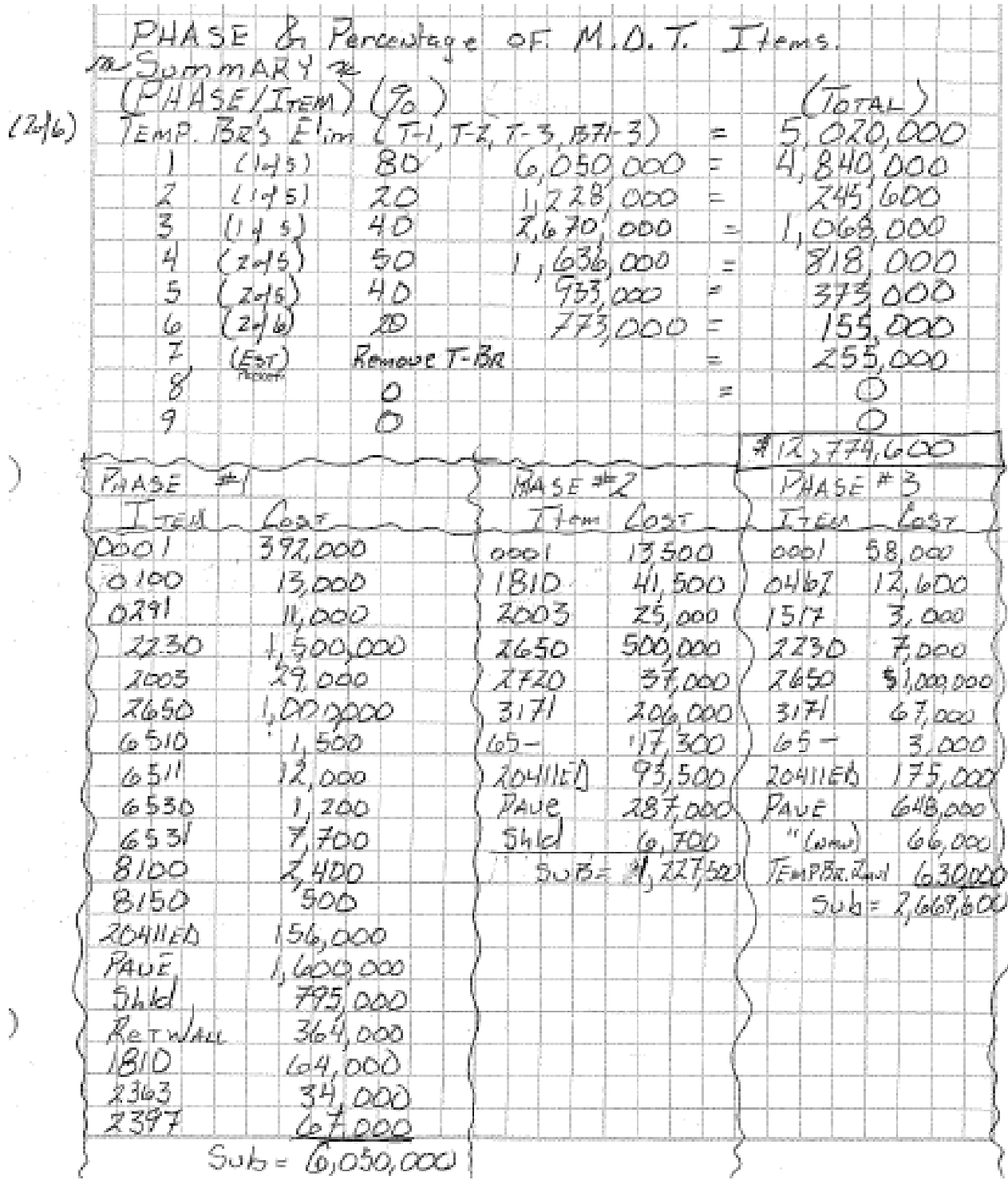
## VALUE ENGINEERING RECOMMENDATION # VE-5

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-5

### CALCULATIONS



PHASE & Percentage OF M.D.T. Items.

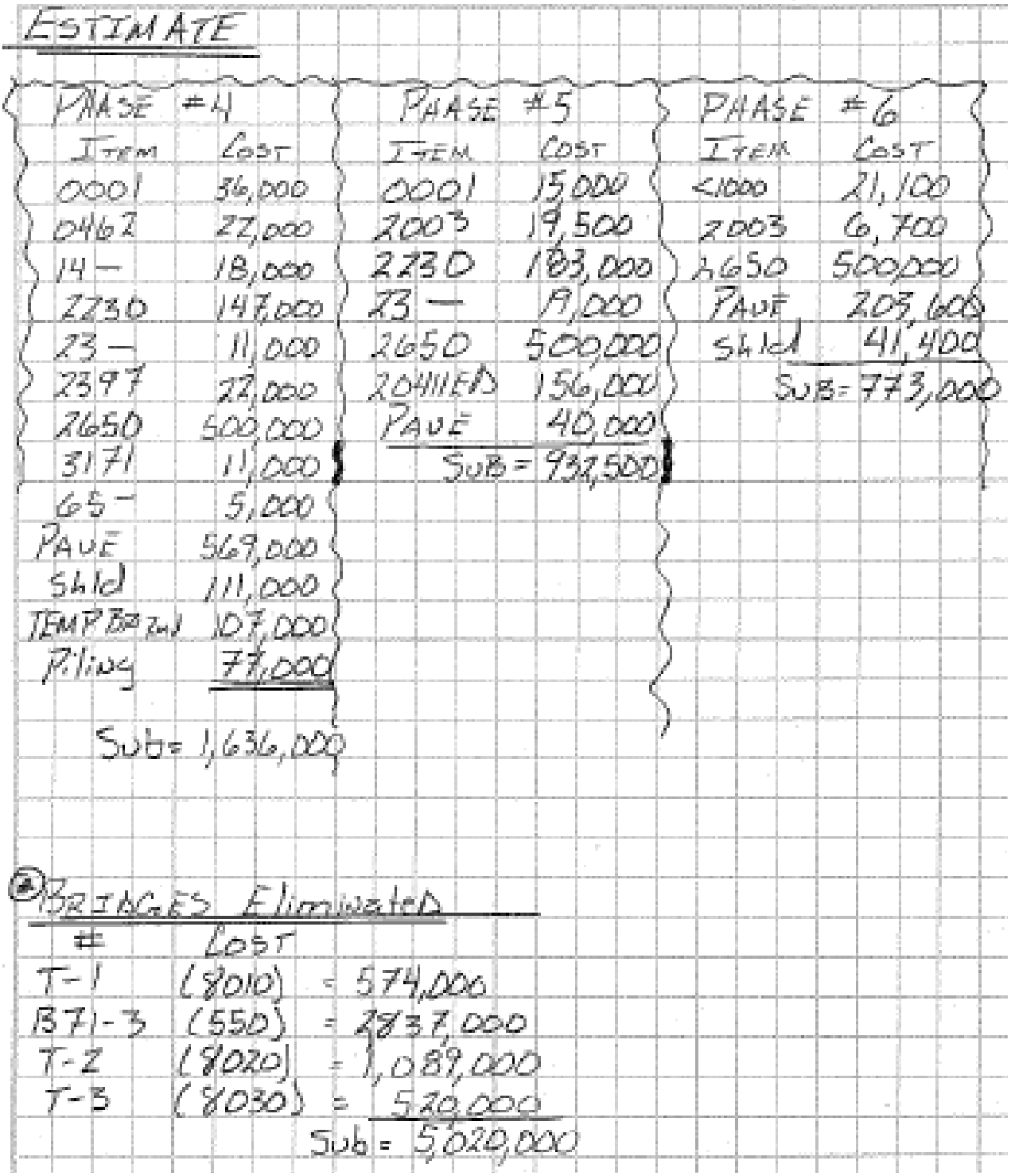
re Summary re

| | (Phase/Item) | (%) | | | (Total) |
|---|---|---|---|---|---|
| (2/6) | Temp. Br's Elim (T-1, T-2, T-3, 187-3) | | | = | 5,020,000 |
| 1 | (145) | 80 | 6,050,000 | = | 4,840,000 |
| 2 | (145) | 20 | 1,228,000 | = | 245,600 |
| 3 | (145) | 40 | 2,670,000 | = | 1,068,000 |
| 4 | (245) | 50 | 1,636,000 | = | 818,000 |
| 5 | (245) | 40 | 933,000 | = | 373,000 |
| 6 | (246) | 20 | 773,000 | = | 155,000 |
| 7 | (Est) Percent | Remove T-Br | | = | 255,000 |
| 8 | | 0 | | = | 0 |
| 9 | | 0 | | | 0 |
| | | | | | $12,774,600 |

| Phase #1 | | Phase #2 | | Phase #3 | |
|---|---|---|---|---|---|
| Item | Cost | Item | Cost | Item | Cost |
| 0001 | 392,000 | 0001 | 13500 | 0001 | 58,000 |
| 0100 | 13,000 | 1810 | 41,500 | 0461 | 12,600 |
| 0291 | 11,000 | 2003 | 25,000 | 1517 | 3,000 |
| 2230 | 1,500,000 | 2650 | 500,000 | 2230 | 7,000 |
| 2003 | 29,000 | 2720 | 37,000 | 2650 | $1,000,000 |
| 2650 | 1,000,000 | 3171 | 206,000 | 3171 | 67,000 |
| 6510 | 1,500 | 65- | 17,300 | 65- | 3,000 |
| 6511 | 12,000 | 20411ED | 93,500 | 20411ED | 175,000 |
| 6530 | 1,200 | Pave | 287,000 | Pave | 648,000 |
| 6531 | 7,700 | Shld | 6,700 | " (area) | 66,000 |
| 8100 | 2,400 | Sub = | $1,227,500 | Temp Br. Rmvl | 630000 |
| 8150 | 500 | | | Sub = | 2,669,600 |
| 20411ED | 156,000 | | | | |
| Pave | 1,600,000 | | | | |
| Shld | 795,000 | | | | |
| Ret Wall | 364,000 | | | | |
| 1810 | 604,000 | | | | |
| 2363 | 34,000 | | | | |
| 2397 | 67,000 | | | | |
| Sub = | 6,050,000 | | | | |

## VALUE ENGINEERING RECOMMENDATION # VE-5

### CALCULATIONS



ESTIMATE

| PHASE #4 | | PHASE #5 | | PHASE #6 | |
|---|---|---|---|---|---|
| ITEM | COST | ITEM | COST | ITEM | COST |
| 0001 | 36,000 | 0001 | 15,000 | <1000 | 21,100 |
| 0462 | 22,000 | 2003 | 19,500 | 2003 | 6,700 |
| 14— | 18,000 | 2230 | 183,000 | 2650 | 500,000 |
| 2230 | 147,000 | 23— | 9,000 | PAVE | 203,600 |
| 23— | 11,000 | 2650 | 500,000 | SHLD | 41,400 |
| 2397 | 22,000 | 2041IED | 156,000 | | SUB= 773,000 |
| 2650 | 500,000 | PAVE | 40,000 | | |
| 3171 | 11,000 | | SUB= 932,500 | | |
| 65— | 5,000 | | | | |
| PAVE | 569,000 | | | | |
| SHLD | 111,000 | | | | |
| TEMP BR 2nd | 107,000 | | | | |
| Piling | 77,000 | | | | |
| | Sub= 1,636,000 | | | | |

(#) BRIDGES Eliminated

| # | Cost | |
|---|---|---|
| T-1 | (8010) | = 574,000 |
| B71-3 | (550) | = 2837,000 |
| T-2 | (8020) | = 1,089,000 |
| T-5 | (8030) | = 520,000 |
| | | Sub= 5,020,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-5

## CALCULATIONS

ESTIMATE
CONSTRUCTION OF LOOP CONCEPT
-SUMMARY-

| | | |
|---|---|---|
| EMB (TEMP) | (See Sht 3) | 1,507,500 |
| TEMP G.R. | (See 4) | 293,500 |
| TEMP. Bridge | (See 4) | 840,000 |
| REMOVAL TEMP. BR. | (" ) | 150,000 |
| PAVEMENT (TEMP) | (" ) | 1,140,000 |
| SHLD (TEMP) | (" ) | 690,000 |
| MARKINGS TEMP | (See 5) | 9,050 |
| Remove Temp G.R. | (See 4) | 77,000 |
| Police (MOT) | (Used Phase Est) | 156,000 |
| MOT | (Used Phase Est) | 500,000 |
| | | 5,363,050 |

TYPICAL SECTIONS

* ONE LANE Sect *
4 - 12 - 8
LENGTH = 12,000

* TWO LANE *
4 - 11 - 11 - 4
L = 3,000

* THREE LANE *
4 - 11 - 11 - 11 - 4
L = 4,200

* Bridge TEMP *
10 - 11 - 11 - 10
L = 200'

CALC's

EMB ℄ Assume 2:1 Side Slopes with G.R. ℄ @ $9/c.y.
1) 1000 x 12 x $\frac{30+80}{2}$ = 660,000/27 = 25,000
2) 2000 ( " ) = 1,320,000/27 = 49,000
3) 3600' x 14' x 50' = 2,520,000/27 = 93,500
167,500 x 9/c.y.
= 1,507,500

# VALUE ENGINEERING RECOMMENDATION # VE-5

## CALCULATIONS

ESTIMATE CALCS

① BRIDGE (TEMP)
42 W x 200 L x 100/SF = $840,000

② REMOVE (TEMP BR = L.S. - $150,000

③ TEMP PAVE @ $30/S.Y. SF

| | | |
|---|---|---|
| One Ln | 12000 x 11 = | 132,000 |
| 2 Ln = | 22 x 3000 = | 66,000 |
| 3 Ln = | 33 x 4200 = | 138,600 |
| | Sub = | $338,000 SF |

C = 338,000 SF / 9 Est. Provided
= 38,000 S.Y. x $30/S.Y.
= $1,140,000

④ TEMP SHLD @ $30/S.Y. (W) x (L) SF

| | | |
|---|---|---|
| One Ln = | 12 x 12,000 = | 144,000 |
| Two Ln = | 8 x 3,000 = | 24,000 |
| 3 Ln = | 8 x 4,200 = | 34,000 |
| | Sub = | 202,000 SF |

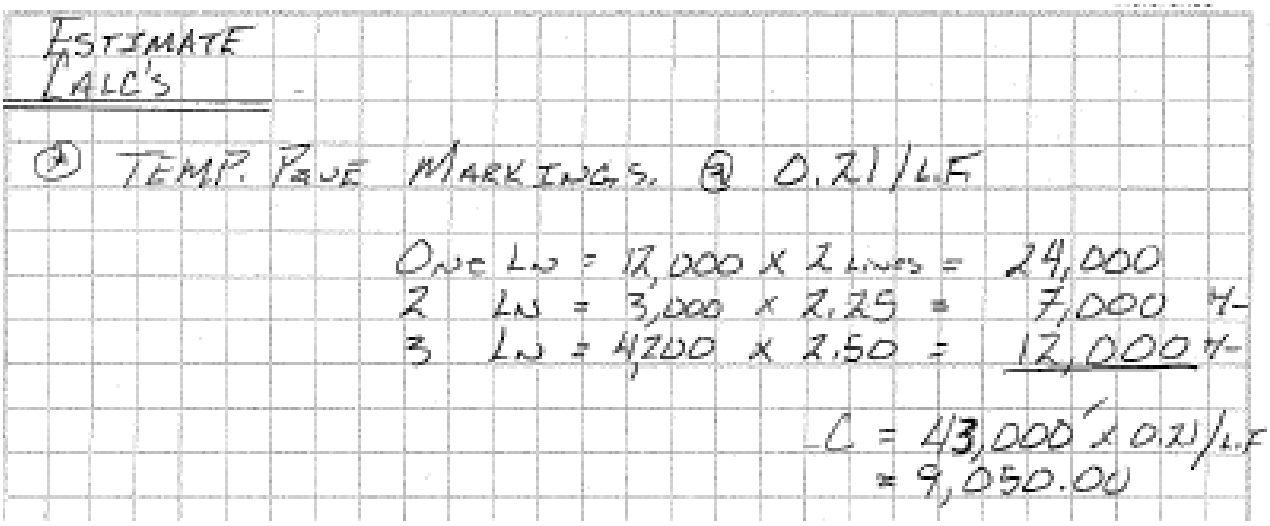
C = 202,000 / 9 Est. Provided
= 23,000 x $30/S.Y.
= $690,000

⑤ TEMP GR. @ $7.64/L.F.
L = (12,000 + 3000 + 4200)(2 sides)
= 38,400 x 7.64
= $293,500

⑥ REMOVE TEMP GR @ $2.00/L.F.
= 38,400 x 2 sides of Road
= 77,000

## VALUE ENGINEERING RECOMMENDATION # VE-5

## CALCULATIONS



# VALUE ENGINEERING RECOMMENDATION # VE-5

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| MOT Savings | LS | 12,775,000 | 1 | 1 | $12,775,000 | | |
| MOT Additional Costs | LS | 5,363,000 | 1 | | | 1 | $5,363,000 |
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| | | | | | | | |
| Subtotal | | | | | $12,775,000 | | $5,363,000 |
| Contingency | @ | 10.00% | | | $1,277,500 | | $536,300 |
| Total | | | | | $14,052,500 | | $5,899,300 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-6

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Relocate the Extreme Park from the existing location to the north side of I-64 near the intersection of Clay/Campbell and River Road.

**ORIGINAL DESIGN:**
The current design keeps Extreme Park in its current location. Ramp 4 profile is adjusted to provide clearance over the park requiring a bridge over the park. This also requires grade adjustments for Ramp 42. Witherspoon is moved to the north, under Ramp 4, 6, 9 and 42.

**RECOMMENDED CHANGE:**
Relocate the Extreme Park from the existing location to the north side of I-64 near the intersection of Clay/Campbell and River Road. This would allow Ramp 4 to be built on embankment in lieu of an elevated structure.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $3,279,000 | | $3,279,000 |
| RECOMMENDED DESIGN | $721,000 | | $721,000 |
| ESTIMATED SAVINGS OR (COST) | $2,558,000 | $0 | $2,558,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-6

**ADVANTAGES:**

- Shorten bridge 65-31
- Would allow alignment of Witherspoon Street to be shifted south reducing or eliminating several bridges and ramps
- Improves Witherspoon Street connection along the north side of Butchertown thus tying the area together better
- A new rebuild park could be bigger and better

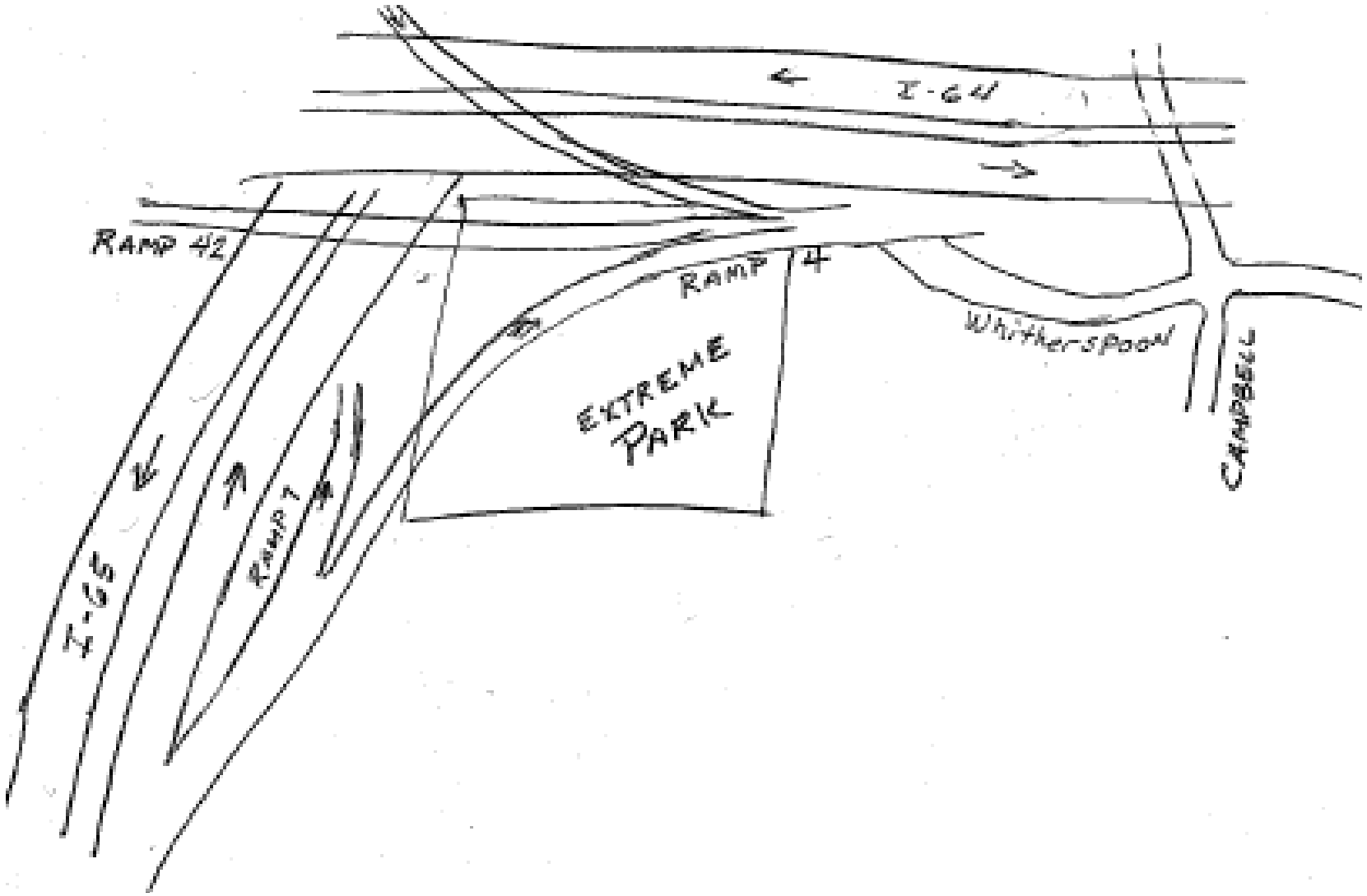
**DISADVANTAGES:**

- Relocate Extreme Park
- Political issues associated with moving the park

**JUSTIFICATION:**
Relocating Extreme Park to a location north of I-64 will keep the park near the existing park and neighborhood without impacting other neighborhoods. The relocation of the park allows for lowering the profile grade of Ramp 4 and Ramp 42 and the shortening of bridge 65-31. The VE team suggests selling this idea to the Extreme Park people by offering them a new, larger piece of property along with $500,000 to reconstruct a bigger and better facility within the new Riverfront Park area.

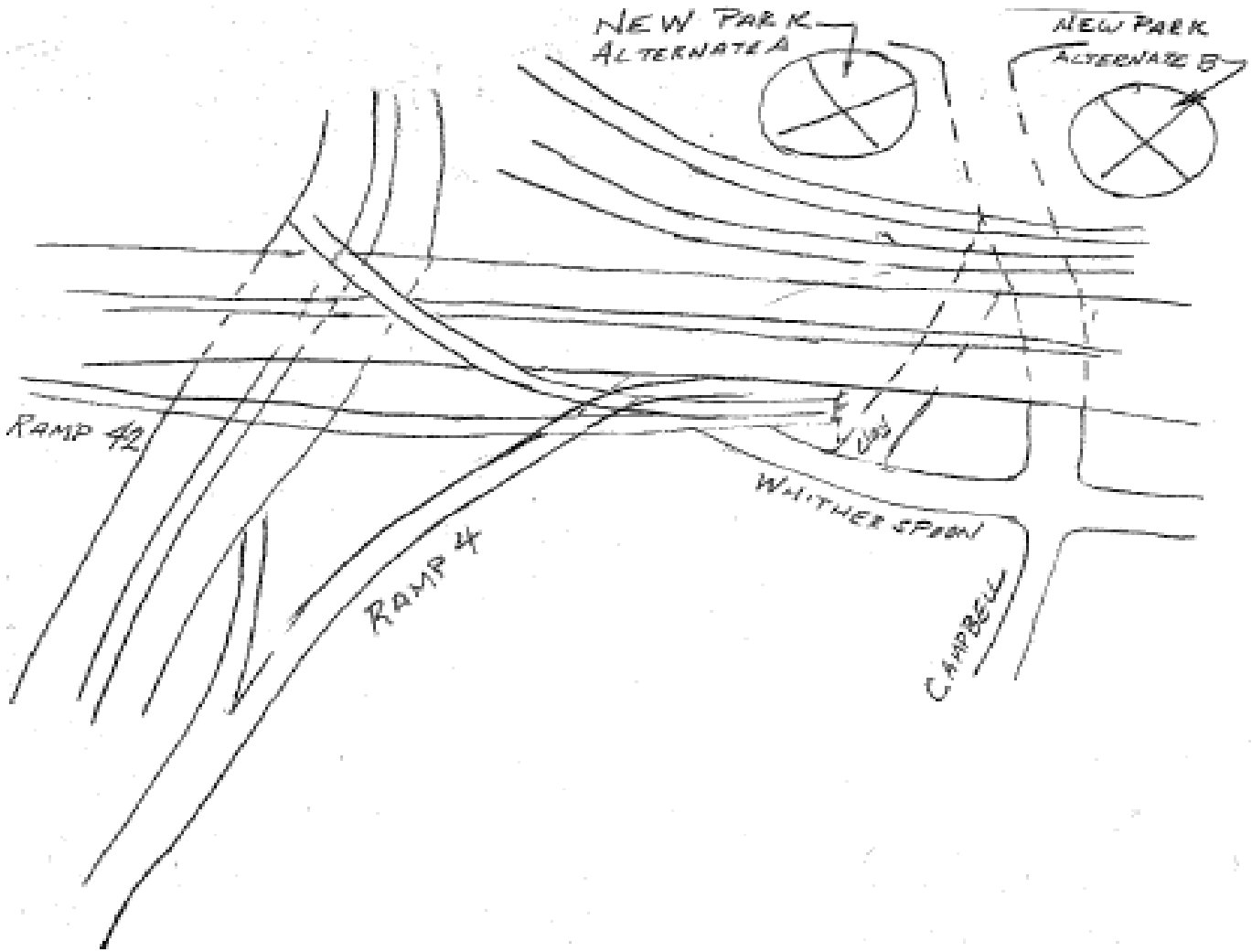
## VALUE ENGINEERING RECOMMENDATION # VE-6

### SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-6

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-6

### CALCULATIONS

BRIDGE 65-31

APPROXIMATE WIDTH = 72 S.Y.

LENGTH TO REDUCE BRIDGE = 300'

S.F. = 300' x 72 = 21,600 SF

ADDITIONAL PAVEMENT

300' x (2 lanes + shoulders) =

300' x 44' = 13,200 SF

13,200/9 = 1470 SY

# VALUE ENGINEERING RECOMMENDATION # VE-6

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Relocation of Extreme Park | LS | 500,000 | 7 | | | 1 | $500,000 |
| Bridge 65-31 | SF | 138.00 | 1 | 21,600 | $2,980,800 | | |
| Pavement | SY | 106.00 | 1 | | | 1,467 | $155,502 |
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| | | | | | | | |
| Subtotal | | | | | $2,980,800 | | $655,502 |
| Contingency | @ | 10.00% | | | $298,080 | | $65,550 |
| Total | | | | | $3,278,880 | | $721,052 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-7

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Relocate Witherspoon Street to south of Ramp 42 between N. Preston Street and Campbell Street.

**ORIGINAL DESIGN:**
Witherspoon Street at N. Preston is south of I-64/Ramp 21. Witherspoon goes east under I-65 and numerous ramps to the east side of I-65, where it swings to the north under Ramps 6, 9 and 42 to miss the Extreme Park. Witherspoon intersects Clay Street under Ramp 6. Ramp 42 goes over Clay Street just south of Witherspoon Street. As it continues east Witherspoon moves south under Ramps 6, 4, 4A, 9, 44 and 42 to the Witherspoon and Clay Street at-grade intersection.

**RECOMMENDED CHANGE:**
Begin the new alignment of Witherspoon at its proposed intersection with N. Preston Road. Align Witherspoon to the east, under I-65 approximately parallel to and south of Ramp 42. The new intersection of Clay and Witherspoon would be at-grade and south of Ramp 42. As described in other recommendations Clay Street would end at Witherspoon and not cross under Ramp 42. Witherspoon Street would continue east to the currently proposed intersection with Campbell Street.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $14,896,000 | | $14,896,000 |
| RECOMMENDED DESIGN | $523,000 | | $523,000 |
| ESTIMATED SAVINGS OR (COST) | $14,373,000 | $0 | $14,373,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-7

**ADVANTAGES:**

- Eliminate or shorten bridges for ramps 6, 4A, 4, 9, 44, 42
- Improve sight distance and safety along Witherspoon Street on the east side of I-65 to Campbell Road
- Ramp 42 would not need to go over Witherspoon under I-65, which would lower profile grades of I-65 and numerous ramps in the area of Ramp 42
- Lower the profile of Ramps 6, 4A, 4, 9, 44, and 42 from Clay Street east
- Provides a connecting road along the north side of Butchertown thus tying the area together and allowing improved access to the River Road area
- Improves sight distance and safety issues, particularly at the intersection of Clay Street and Witherspoon Street and the intersection of Campbell Street and Witherspoon Street

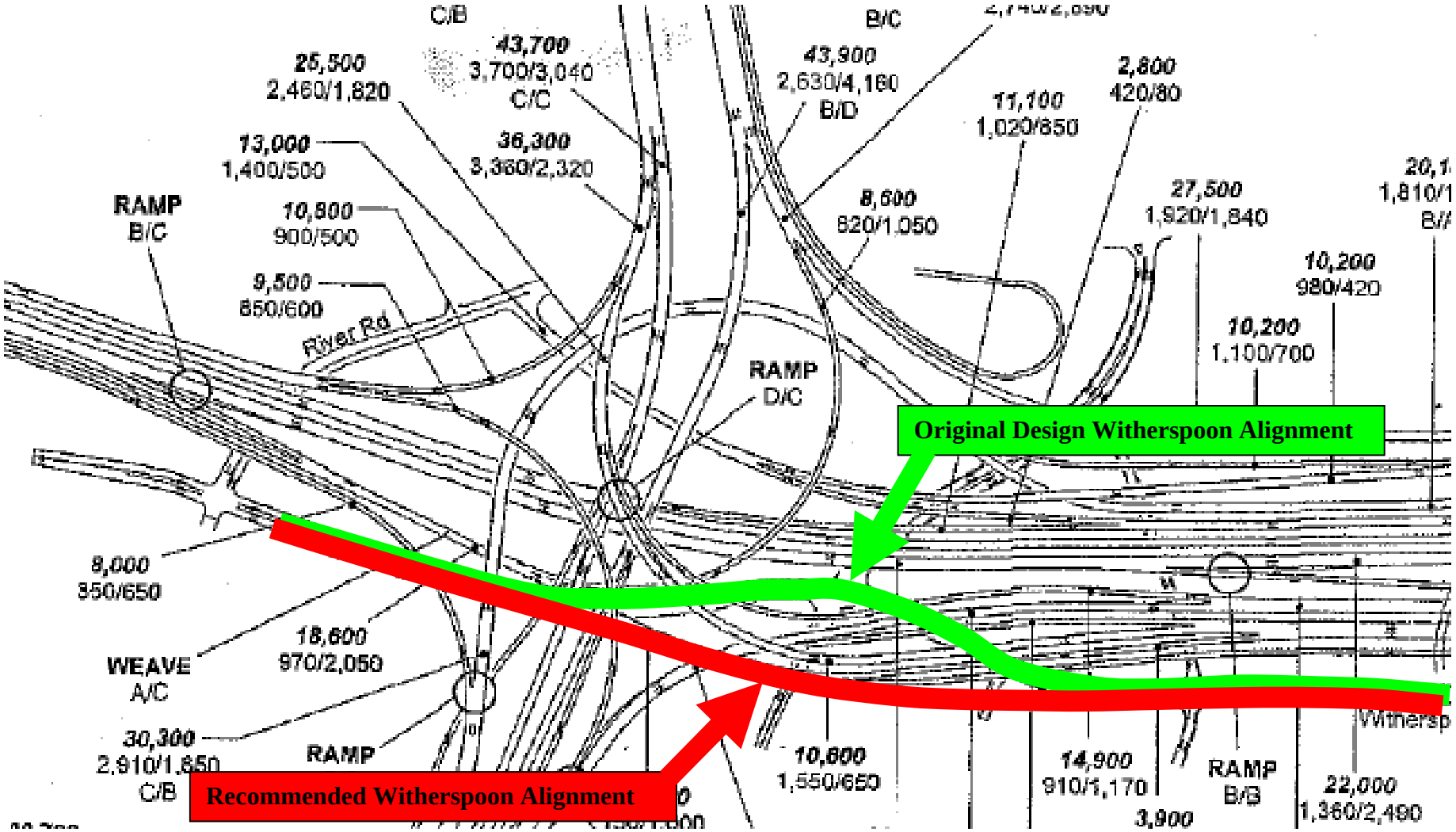
**DISADVANTAGES:**

- Requires relocation of the Extreme Park
- Clay Street would not extend north to River Road

**JUSTIFICATION:**
With the relocation of Extreme Park, Witherspoon Street could be moved to the south, outside of Ramp 42 as it goes under I-65 to Campbell Road. A significant number of bridges would be eliminated or shortened.

# VALUE ENGINEERING RECOMMENDATION # VE-7

## SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-7

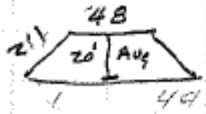
## CALCULATIONS

65-31 part 1 (See Extreme Park)

| | | | |
|---|---|---|---|
| 65-31 part 2 | - 500' | (72' wide) = | 36,000 SF |
| 65-24 -A | - 400' | (68' wide) = | 27200 SF |
| 65-6 | - 100' | (44' wide) = | 4400 SF |
| | - 100' | | |
| 3rd - 4 | - 400' | (40' wide) = | 16,000 SF |
| 3rd - 6 | - 300' | (32' wide) = | 9600 SF |
| 3rd - 7 | - 300' | (32' wide) = | 9600 SF |

Clay St. Pavement Removal - 200' x (24+8') = 6400 SF
= 710 SY.

EMBANKMENT = 1800' x 3 = 600 yds




((48+128)/2) = 88 SY.

88 SY x 600 yds = 52,800 CY

# VALUE ENGINEERING RECOMMENDATION # VE-7

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 65-31 (Whitherspoon) | SF | 135.00 | 1 | 36,000 | $4,860,000 | | |
| Bridge 64-24 | SF | 135.00 | 1 | 27,200 | $3,672,000 | | |
| Bridge 65-6 | SF | 135.00 | 1 | 4,400 | $594,000 | | |
| Bridge 3rd-6 | SF | 115.00 | 1 | 9,600 | $1,104,000 | | |
| Bridge 3rd-4 | SF | 135.00 | 1 | 16,000 | $2,160,000 | | |
| Bridge 3rd-7 | SF | 115.00 | 1 | 9,600 | $1,104,000 | | |
| Pavement (Clay St.) | SY | 60.00 | 1 | 710 | $42,600 | | |
| Curb & Gutter (Clay) | LF | 13.40 | 1 | 400 | $5,360 | | |
| Embankment | CY | 9.00 | 7 | | | 52,800 | $475,200 |
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| Subtotal | | | | | $13,541,960 | | $475,200 |
| Contingency | @ | 10.00% | | | $1,354,196 | | $47,520 |
| Total | | | | | $14,896,156 | | $522,720 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-8

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Combine Clay Street with Campbell Street, and eliminate Clay Street from Witherspoon to Campbell while revising the Campbell Street alignment to follow the alignment of the railroad.

**ORIGINAL DESIGN:**
Clay Street runs from Witherspoon to River Road. Campbell intersects Clay under Ramp 32. Campbell runs adjacent to railroad from Witherspoon to Clay. These roads require approximately 7 bridges for Clay and 9 bridges for Campbell and the railroad.

**RECOMMENDED CHANGE:**
Eliminate Clay from Witherspoon to Campbell Street. Shorten or eliminate bridges over Clay. Re-align Campbell to parallel to the railroad and straighten Campbell and connect to River Road. This change will require coordination with the Butchertown Historic Preservation Plan group.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $15,791,000 | | $15,791,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $15,791,000 | $0 | $15,791,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-8

**ADVANTAGES:**

- Eliminates or shortens approximately 7 bridges.
- Eliminates 5213 SY of pavement, 770 SY of sidewalk, and 1380 LF of standard curb and gutter.
- Maintains visual access from Butchertown via Campbell Street
- Provides better street alignment under I-64
- Frees up additional property for park use or green space
- Reduces perpetual maintenance costs of the Kennedy Interchange bridge that are eliminated and/or shortened
- Reduce maintenance due to deletion of Clay Street

**DISADVANTAGES:**

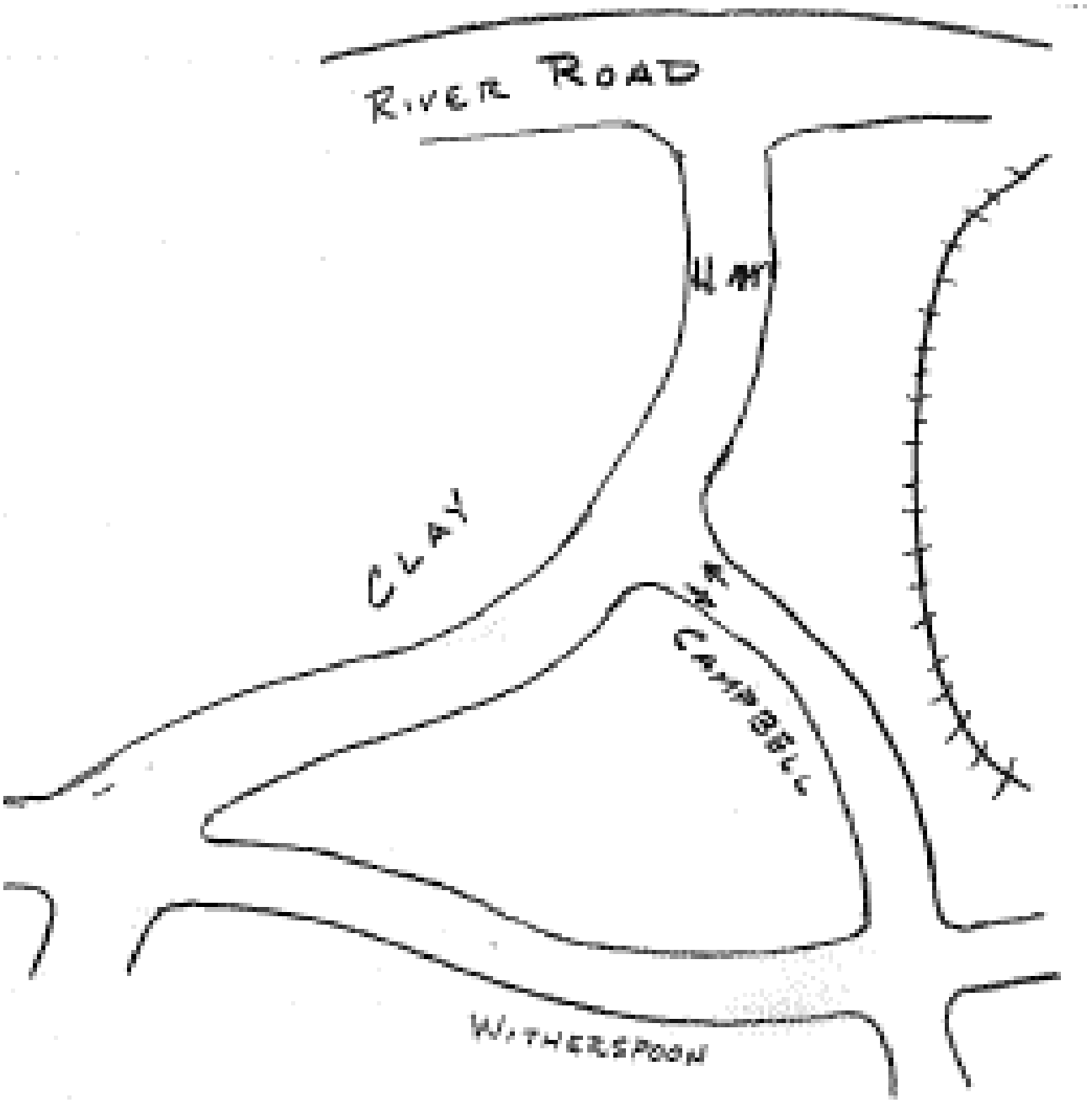
- Removes one access point to the river

**JUSTIFICATION:**

Clay Street and Campbell Street are in close proximity. The proposed alignment has Clay Street at a significant skew to I-64, and the Clay Street and Campbell Street intersection is under a ramp. Additionally the Clay Street intersection with Witherspoon is at a skew. Due to the skew on Clay Street the visual connectivity from the neighborhood south of I-64 to the river is very limited. Eliminating Clay Street from Witherspoon Street to River Road would have minimal impact on the connectivity and would eliminate or shorten numerous bridges.

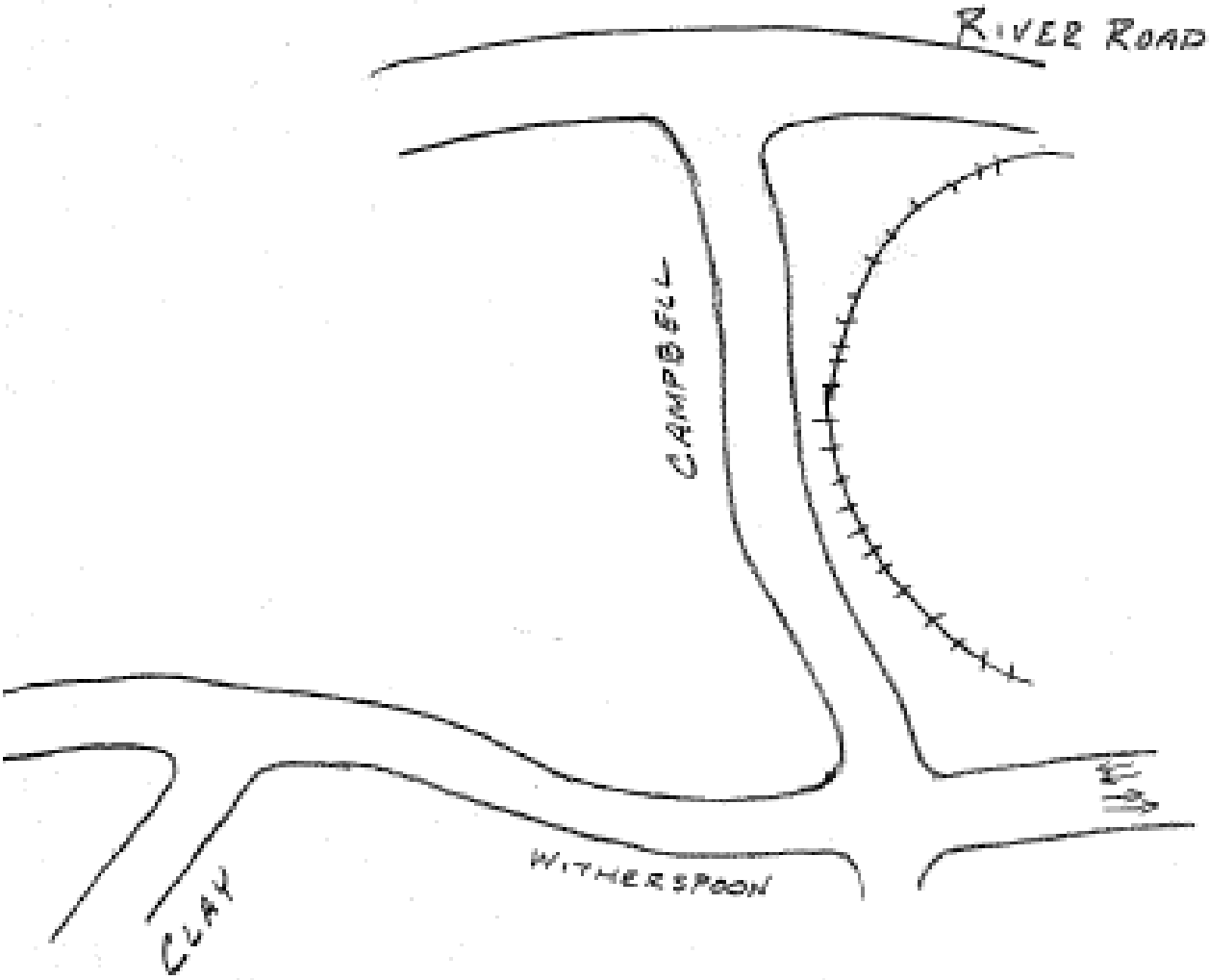
## VALUE ENGINEERING RECOMMENDATION # VE-8

### SKETCH OF ORIGINAL DESIGN



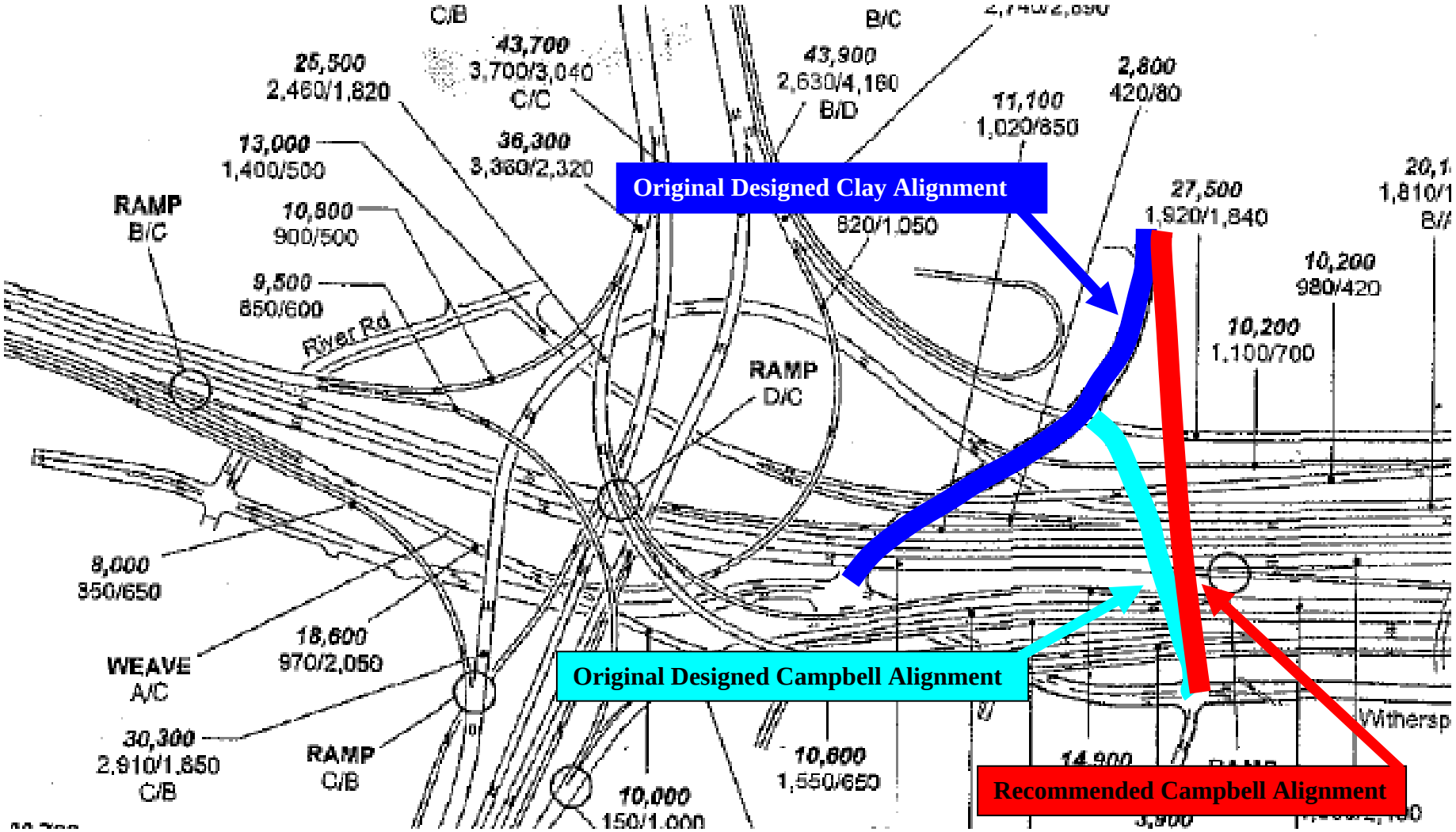
## VALUE ENGINEERING RECOMMENDATION # VE-8

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-8

## SKETCH OF RECOMMENDED DESIGN



# V VALUE ENGINEERING RECOMMENDATION # VE-8

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Pavement | SY | 60.00 | 7 | 5,213 | $312,780 | | |
| Curb & Gutter | LF | 13.40 | 7 | 1,380 | $18,492 | | |
| Bridge 64-7A | LS | 4,100,000 | 1 | 1 | $4,100,000 | | |
| Bridge 64-7B | LS | 1,800,000 | 1 | 1 | $1,800,000 | | |
| Bridge 71-10A | LS | 1,800,000 | 1 | 1 | $1,800,000 | | |
| Bridge 64-9 | LS | 1,700,000 | 1 | 1 | $1,700,000 | | |
| Bridge 64-88 | LS | 1,800,000 | 1 | 1 | $1,800,000 | | |
| Bridge 64-10 | LS | 1,500,000 | 1 | 1 | $1,500,000 | | |
| Bridge BS-6 | LS | 1,300,000 | 1 | 1 | $1,300,000 | | |
| Concrete Sidewalk 5' | SY | 31.00 | 7 | 770 | $23,870 | | |
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| Subtotal | | | | | $14,355,142 | | $0 |
| Contingency | @ | 10.00% | | | $1,435,514 | | $0 |
| Total | | | | | $15,790,656 | | $0 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-9

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Connect BL-3 to Frankfort Road to provide access to River Road from westbound I-64, eliminate Ramp 26B from Ramp 26 to River Road, and eliminate Ramp 34 from Ramp 34A to River Road.

**ORIGINAL DESIGN:**
Ramp 26B is an off-ramp from Ramp 26 (I-64 westbound) to River Road. Part of Ramp 34 is an off-ramp for southbound I-71.

**RECOMMENDED CHANGE:**
Provide a connection from westbound I-64 (BL-3) to Frankfort Road. Have southbound I-71 traffic exit at Ramp 31. Access to River Road will be by Frankfort Road. Eliminate Ramp 26B and Ramp 34 from Ramp 34A to River Road.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $19,021,000 | | $19,021,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $19,021,000 | $0 | $19,021,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-9

**ADVANTAGES:**

- Eliminate approximately 4,600 feet of ramp including Ramp 26B and part of 34
- Access to River Road will be maintained for southbound I-71 and westbound I-64
- Bridge 64-9 will be shortened and Bridge 71-10A will be deleted
- Bridges over ramps 26B and 34, such as I-64 can be shortened with the elimination of the ramps
- Access to the BL-1/Frankfort area will be improved

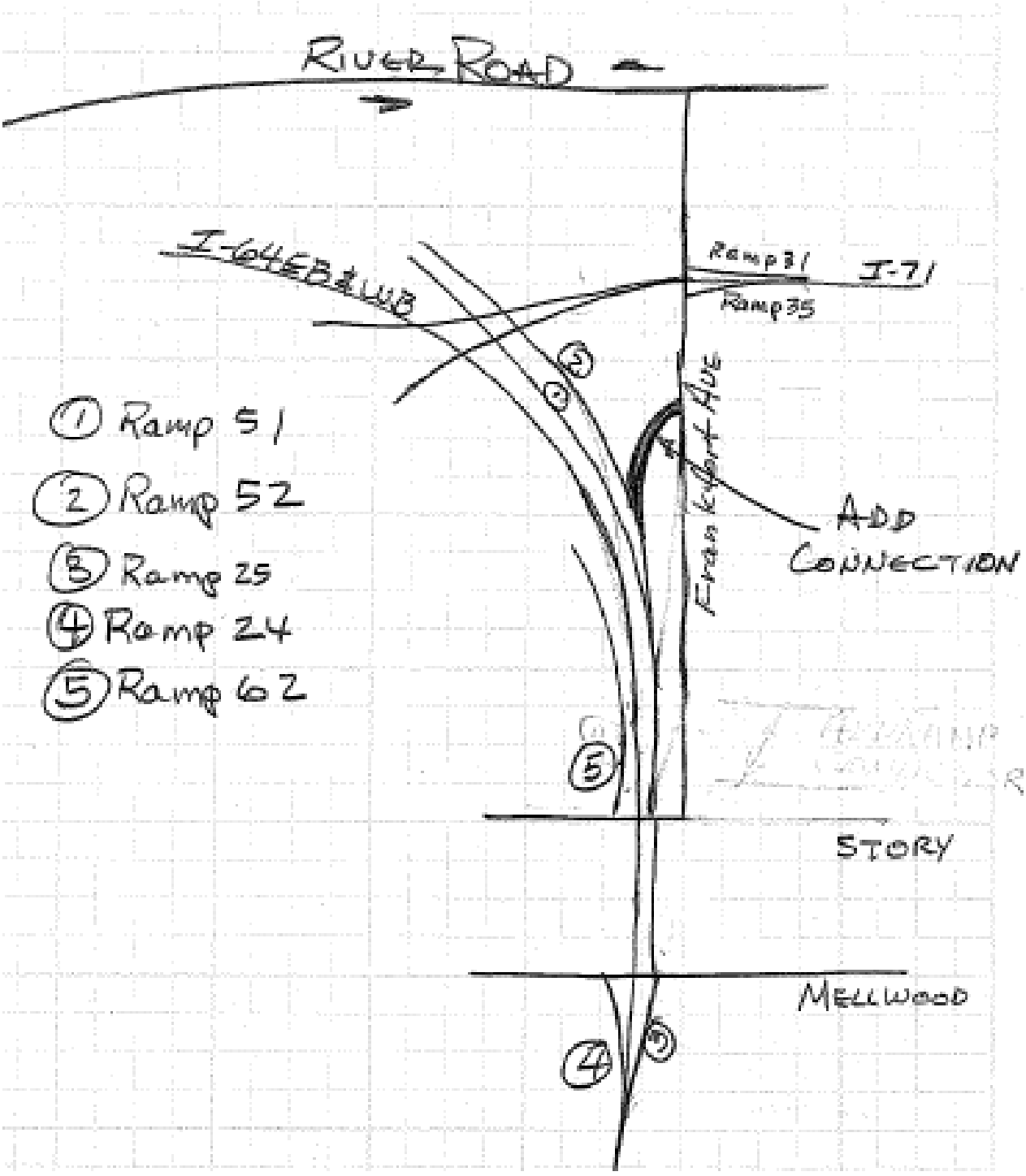
**DISADVANTAGES:**

- Traffic from I-71 and I-64 will access River Road 2,000 feet east of the proposed location

**JUSTIFICATION:**
Having traffic exit at Frankfort rather than further west at River Road on the west side of I-64 will eliminate 4,600 feet of ramp pavement and eliminates or shortens numerous bridges.

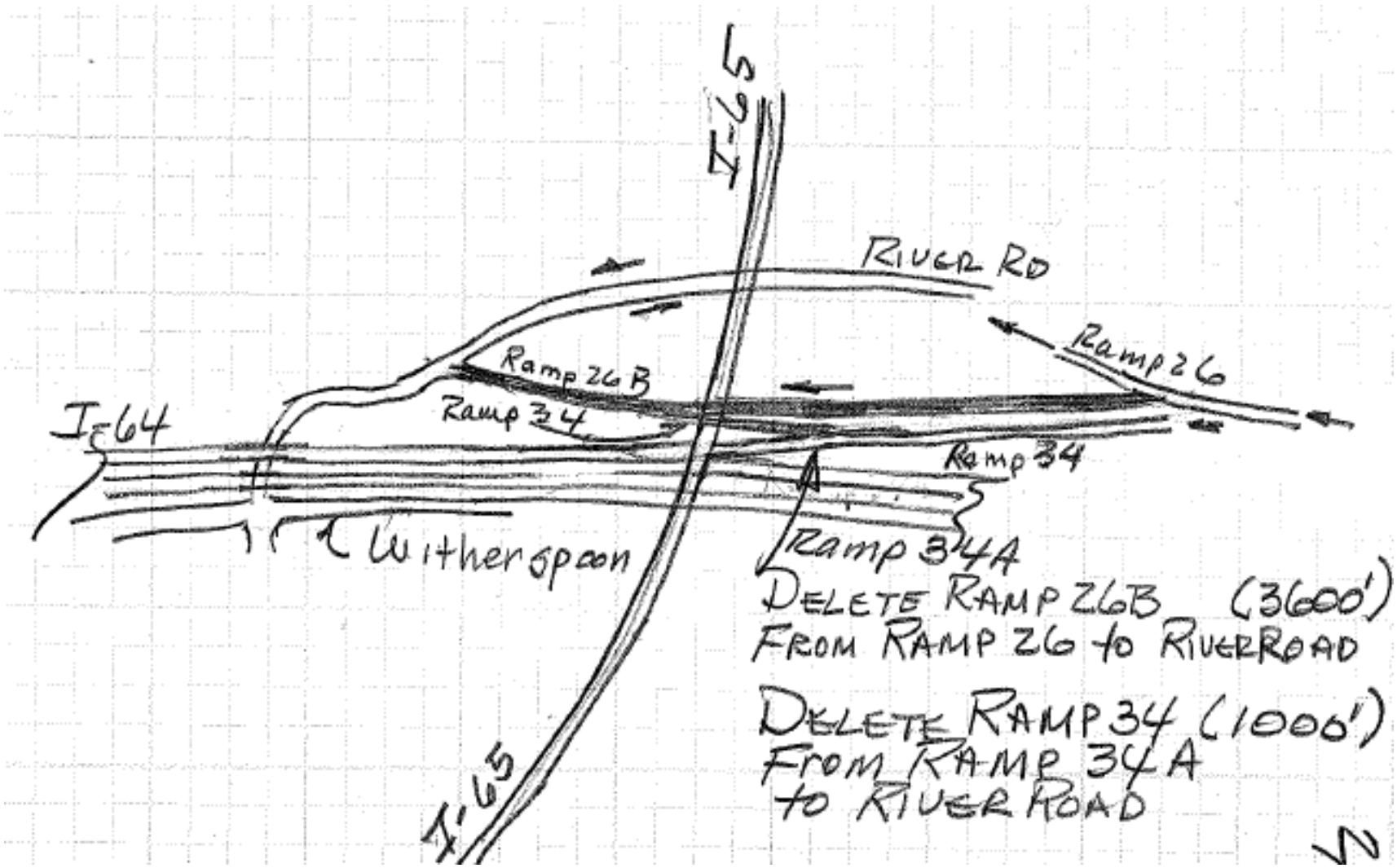
## VALUE ENGINEERING RECOMMENDATION # VE-9

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-9

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-9

### CALCULATIONS

RAMP 34

① PAVEMENT WIDTH (6'+15'+8' = 29' TOTAL)

LENGTH = 1000' x 29'/9
= 3200 S.Y. x ($60/S.Y.)
= $192,000

② DGA

L = 1,000 x 35'/9
= 3,900 S.Y. x 12" x 115/2000
= 2700 TONS.

③ (FULL DEPTH NO SHLD SEE TYPICAL)

④ TY A BARRIER = 2000 L.F.

Summary

| RAMP | PAVE S.Y. | SHLD S.Y. | DGA TON | BARRIER L.F. |
|---|---|---|---|---|
| 34 | 3200 | — | 2700 | 2000 |
| 26B | 9,600 | 8,000 | 12,400 | 7200 |
| TOTAL | = 12,800 | 8,000 | 15,100 | 7400 |

## VALUE ENGINEERING RECOMMENDATION # VE-9

### CALCULATIONS

RAMP Z6 B

* PAVEMENT & WIDTH AVE = 24'3
  LENGTH = 3600' x 24'/9
  = 9,600 S.Y.

@ SHOULDERS & WIDTH AVE = 20'3.
  Length = 3600 x 20/9
  = 8,000 S.Y.

@ DGA.
  Length = 3600 x 45'/9
  = 18,000 S.Y. x 12 x 115/2000
  = 12,400 Tons

2 Bridges EFFECTED

| | | | (Cost/L.F.) |
|---|---|---|---|
| 720 | 64-9 | (2/3 Delete) | |
| 820 | 71-10A | (Completely Delete) | |
| 65-25 | (280) | (200' Shorten) | 3,351,050 / 605 = 5,500/L.F. |
| 64-8 | (480) | (100' Shorten) | 9,852,750 / 1037 = 9,500/L.F. |
| 65-24 | (270) | (150' " ) | 10,086,750 / 784 = 12,800/L.F. |
| R-1 | (700) | (150' " ) | 5,614,615 / 615 = 9,100/L.F. |
| 65-15 | (670) | (200' " ) | 13,886,000 / 1505 = 9,200/L.F. |
| 3RD-5 | (540) | (150' " ) | 6,397,000 / 1255 = 5,100/L.F. |

# VALUE ENGINEERING RECOMMENDATION # VE-9

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Pavement | SY | 60.00 | 1 | 12,800 | $768,000 | | |
| Paved Shoulder | SY | 60.00 | 1 | 8,000 | $480,000 | | |
| DGA | | 16.48 | 1 | 15,100 | $248,848 | | |
| Concrete shoulder barrier Type A | LF | 190.00 | 1 | 7,400 | $1,406,000 | | |
| B71-10A | LS | 2,048,000.00 | 1 | 1 | $2,048,000 | | |
| B64-9 | LS | 6,568,000.00 | 1 | 0.67 | $4,400,560 | | |
| B65-25 | LF | 5,500.00 | 1 | 200 | $1,100,000 | | |
| B64-8 | LF | 9,500.00 | 1 | 100 | $950,000 | | |
| B5-24 | LF | 12,800.00 | 1 | 150 | $1,920,000 | | |
| B R-1 | LF | 9,100.00 | 1 | 150 | $1,365,000 | | |
| B65-15 | LF | 9,200.00 | 1 | 200 | $1,840,000 | | |
| B 3RD-5 | LF | 5,100.00 | 1 | 150 | $765,000 | | |
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| Subtotal | | | | | $17,291,408 | | $0 |
| Contingency | @ | 10.00% | | | $1,729,141 | | $0 |
| Total | | | | | $19,020,549 | | $0 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-10

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize left turn on to Frankfort Avenue so that BL 1 (Witherspoon Street westbound) lies parallel with BL-2 (Witherspoon Street eastbound) in lieu of running BL-1 under 3 bridges.

**ORIGINAL DESIGN:**
BL-1 connects Witherspoon Street to Ramp 31 and Frankfort Road intersection. BL-1 runs north from Witherspoon under I-71 east and westbound and westbound Ramp 32.

**RECOMMENDED CHANGE:**
Extend BL-1 to the east parallel to BL-2 to Frankfort Road. Improve the intersection at Frankfort and BL-1/BL-2 to provide turning movements. Also improve the Frankfort and Ramp 31 intersection to provide for turn movements.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $2,935,000 | | $2,935,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $2,935,000 | $0 | $2,935,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-10

**ADVANTAGES:**

- Eliminate bridge 71-2B
- Eliminate Bridge 71-2AA
- Shorten Bridge CD3-1

**DISADVANTAGES:**

- Through traffic movement from Ramp 31 to Witherspoon will now be left turns

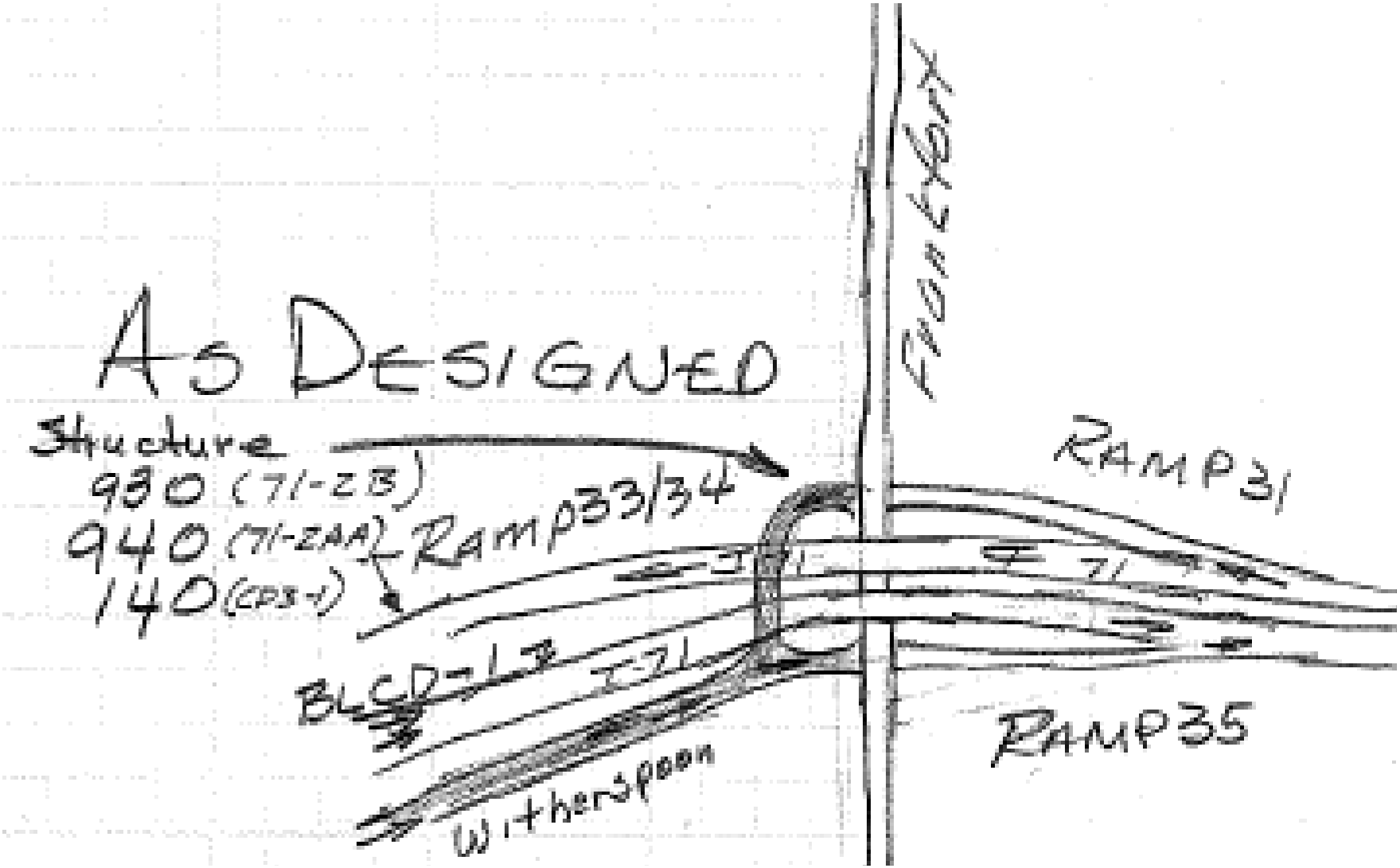
**JUSTIFICATION:**
The current BL-1 currently goes under I-71 and Ramp 32. Bridges are required for I-71 and Ramp 32. The relocation of BL-1 will eliminate or shorten 3 bridges. The traffic movement will be altered from a through movement to a left turn.

## VALUE ENGINEERING RECOMMENDATION # VE-10

## SKETCH OF ORIGINAL DESIGN

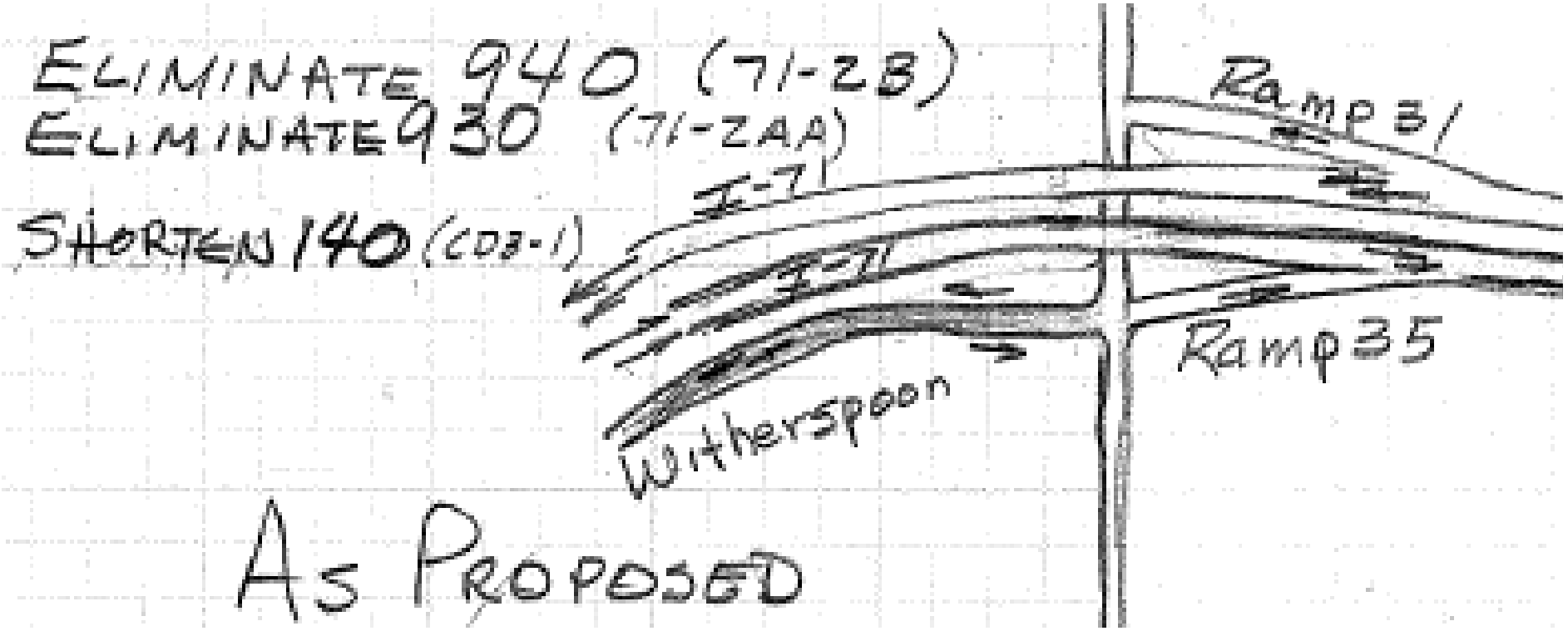
## VALUE ENGINEERING RECOMMENDATION # VE-10

### SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-10

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-10

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 71-2B | SF | 90.00 | 1 | 5,442 | $489,780 | | |
| Bridge 71-2AA | SF | 101.00 | 1 | 14,920 | $1,506,920 | | |
| Bridge CD3-1 | SF | 146.00 | 1 | 4,600 | $671,600 | | |
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| Subtotal | | | | | $2,668,300 | | $0 |
| Contingency | @ | 10.00% | | | $266,830 | | $0 |
| Total | | | | | $2,935,130 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-11

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
The ramp widths on the single lane ramps should be in compliance with Kentucky Transportation Cabinet policy and AASHTO policy on the geometric design for highways and streets (applies to Ramps 6, 51A, 52 24, 26).

**ORIGINAL DESIGN:**
The widths for the roadway on the various "one lane-one way" ramps are not consistent and in most cases provide a wider roadway than required by AASHTO and/or the KYTC normal practice. There may be a reason for the inconsistencies on the ramp widths which are not evident in this VE review.

**RECOMMENDED CHANGE:**
In a review of the AASHTO Green Book page 839, it is found that the ramp roadway required is for a one-way ramp on a tangent with provision for passing a stalled vehicle and with significant truck volume is 20'. The traveled way is a minimum of 14'. On curved alignments the width is the same for ramps with a 500' or greater radius.

A 2' offset each side is recommended; therefore the minimized width would be 24' to meet AASHTO standards. The information from those experienced in the practices of the KYTC indicate that the normal typical section on a "one lane-one way" ramp in Kentucky is 4-15-6 or a total of 29' plus 2' plus 2' offset to a barrier for a total width of 29'. The 29' width would be appropriate for ramp radii of 100' or greater. Use a 29' width from barrier face to barrier face.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $1,568,000 | | $1,568,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $1,568,000 | $0 | $1,568,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-11

**ADVANTAGES:**

- Ramps will have a constant width
- The deck area of the structure will be reduced
- There will be less of a tendency to drive in two lanes where ramp roadway widths are greater than 30 feet
- The ramps which are too wide can reduce safety if there is a tendency of the driver to try to use the ramp as two operating lanes
- May allow more room to locate and construct the interchange ramps where the bridge and overpasses are tightly located.
- Will allow more flexibility in developing tapers of merges and diverges of the various roadway features

**DISADVANTAGES:**

- None

**JUSTIFICATION:**
By using normally accepted designs which meet AASHTO and KYTC policy, the ramps will be narrower thereby reducing the width of embankments and structures. The width for the roadway on the narrow one lane-one way ramps are not consistent and in most cases provide a wider roadway than required by AASHTO and/or the KYTC normal practice.

## VALUE ENGINEERING RECOMMENDATION # VE-11

### CALCULATIONS

| RAMP | WIDTH | | LENGTH | SF |
|---|---|---|---|---|
| | As DESIGNED | REDUCE TO 29' | | |
| 4 | 33 | 4 | 830 | 3320 |
| 5 | 35 | 6 | 650 | 3900 |
| 6 | 35 | 6 | 2470 | 14800 |
| 7 | 33-35 | 4 | 1870 | 7500 |
| 8 | 31 | 2 | 1120 | 2200 |
| 33 | 33 | 4 | 3950 | 15800 |
| 34A | 31 | 2 | 1950 | 3900 |
| 43 | 35 | 6 | 970 | 5800 |
| | | | | 57,000 |

$25/SF x 57000 = $1,430,000

Combination - Roadway & Bridges

# VALUE ENGINEERING RECOMMENDATION # VE-11

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Ramp Bridges 4, 5, 6, 7, 8, 33, 34A, 3 | SF | 25.00 | 7 | 57,000 | $1,425,000 | | |
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| Subtotal | | | | | $1,425,000 | | $0 |
| Contingency | @ | 10.00% | | | $142,500 | | $0 |
| Total | | | | | $1,567,500 | | $0 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-12

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Merge Ramp 8 with Ramp 7 on westbound I-64 sooner to shorten Ramp 8 by 500 feet.

**ORIGINAL DESIGN:**
The original design shows Ramp 8 (one lane) using approximately 1,700 feet to merge into Ramp 7 (one lane). This is all a single structure that spans over the Great Lawn on the north side of the existing interstate I-64.

**RECOMMENDED CHANGE:**
The VE team recommends merging Ramp 8 with Ramp 7 on westbound I-64 sooner to shorten Ramp 8 by 500 feet.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $8,988,000 | | $8,988,000 |
| RECOMMENDED DESIGN | $8,295,000 | | $8,295,000 |
| ESTIMATED SAVINGS OR (COST) | $693,000 | $0 | $693,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-12

**ADVANTAGES:**

- Decrease the impact/canopy over the Great Lawn

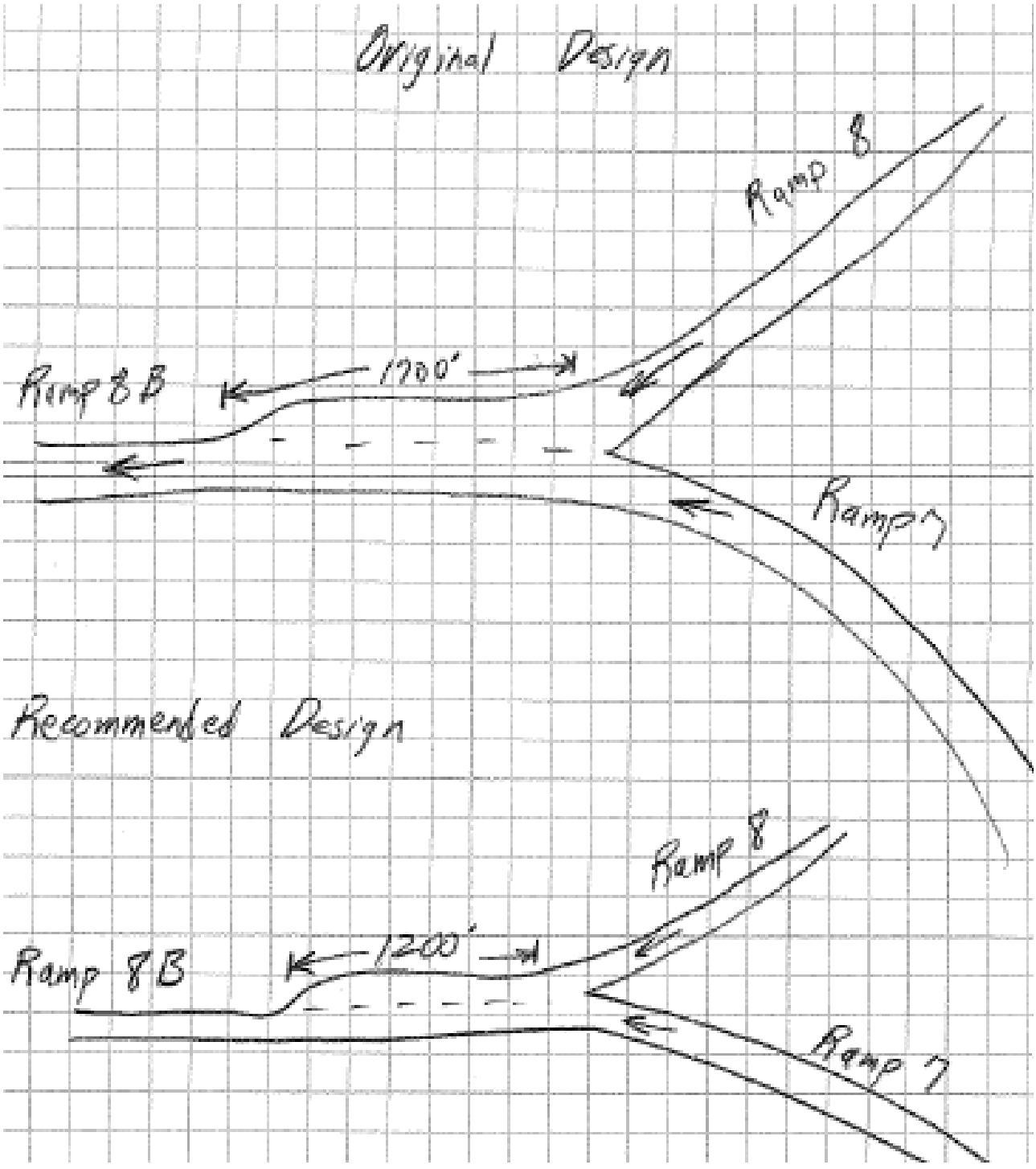
**DISADVANTAGES:**

- May increase conflict of traffic flow at the merge at Ramp 7 and Ramp 8

**JUSTIFICATION:**
Reducing the width of the bridge will save construction and future maintenance costs. A narrower bridge will reduce the impact on the Great Lawn. This recommendation shortens the 24 foot wide traveled way (two lanes) to a 15 foot wide traveled way (one lane) for a length of 500 feet. This reduces the bridge width by 9 feet. So 9 feet x 500 feet = 4,500 square feet of bridge will be eliminated. A 9 foot taper over a 500 foot length will not be perceptible to any body observing the structure from the Great Lawn.

## VALUE ENGINEERING RECOMMENDATION # VE-12

## SKETCH OF ORIGINAL AND RECOMMENDED DESIGNS



# VALUE ENGINEERING RECOMMENDATION # VE-12

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 390 | SF | 140.00 | 1 | 58,366 | $8,171,240 | 53,866 | $7,541,240 |
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| Subtotal | | | | | $8,171,240 | | $7,541,240 |
| Contingency | @ | 10.00% | | | $817,124 | | $754,124 |
| Total | | | | | $8,988,364 | | $8,295,364 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-13

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Revise, simplify, or eliminate Ramp 22.

**ORIGINAL DESIGN:**
Construct access from 2nd Street downtown to the north and east with connections to I-65 northbound, I-71 northbound, I-64 eastbound, and Story Avenue (1.5 miles east of Second Street). Ramps from I-64 eastbound to I-65 are separated to allow the local access to be inserted between them. Approximately one mile of the access connection will be a single-lane ramp and one-half mile will be an auxiliary lane.

**RECOMMENDED CHANGE:**
Keep traffic on the local street system and direct to other access points. Omit the ramps and auxiliary lanes. Shift the I-64 eastbound to I-65 southbound ramp to be immediately adjacent to the I-64 eastbound to I-65 northbound ramp.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $33,058,000 | | $33,058,000 |
| RECOMMENDED DESIGN | $3,609,000 | | $3,609,000 |
| ESTIMATED SAVINGS OR (COST) | $29,449,000 | $0 | $29,449,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-13

**ADVANTAGES:**

- Reduce bridge area by 206,000 SF
- Reduce retaining wall area by 7,000 SF
- Reduce area of the bridge that is over the Great Lawn
- Reduced right-of-way

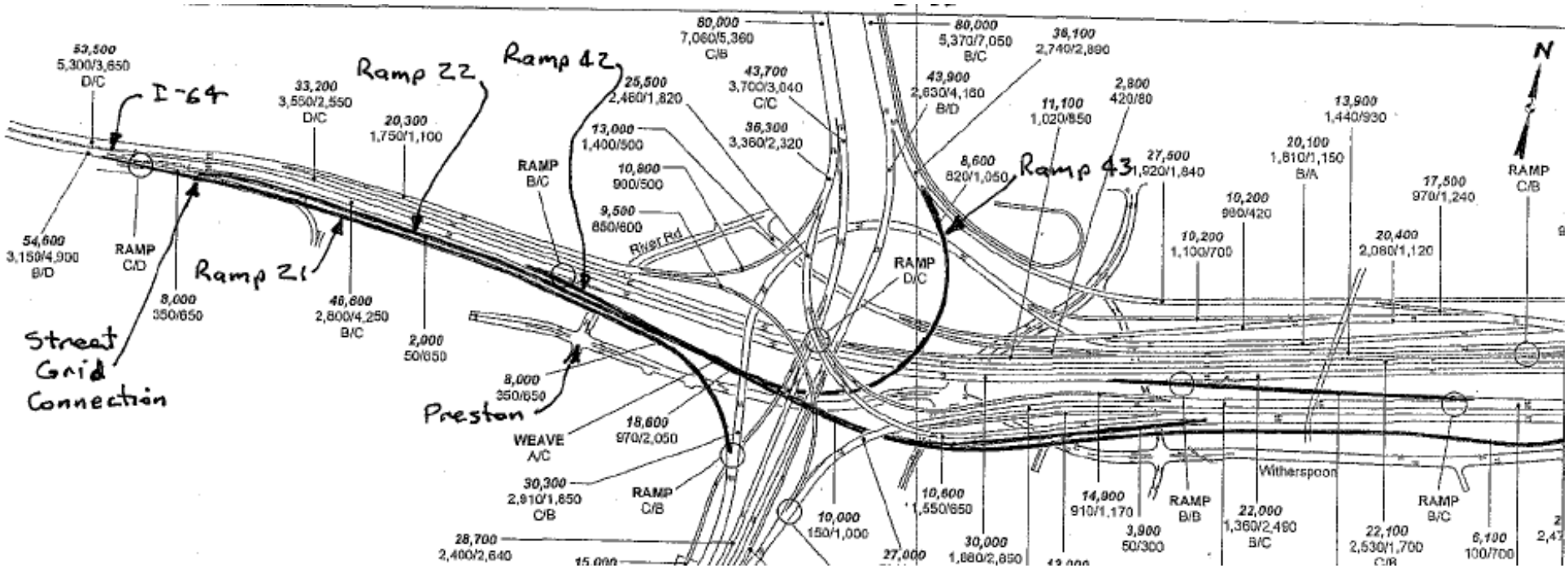
**DISADVANTAGES:**

- 2000 ADT will be diverted to the other streets

**JUSTIFICATION:**
The ramp from 2nd Street is one of the lowest volume ramps in the project, but extends approximately 1.5 miles. Surface streets could be used to accommodate the traffic more efficiently. Also, making this change would reduce the impact of the project on the Great Lawn. The VE Team recommends that this change be made.

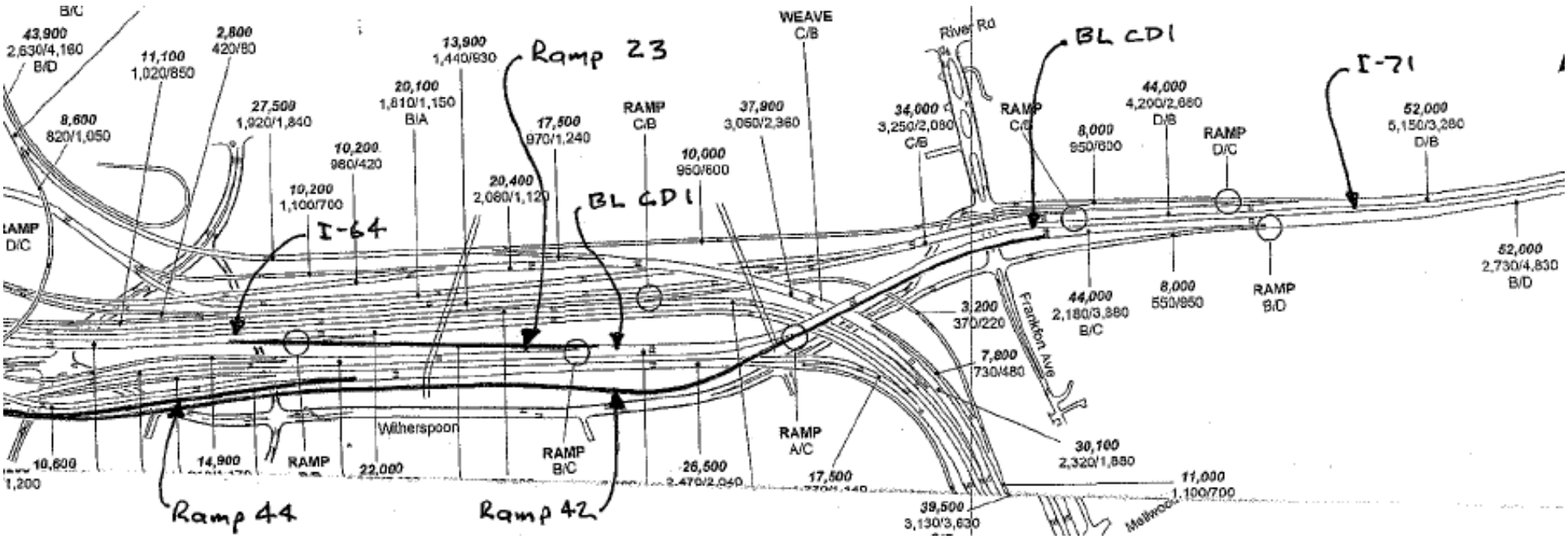
# VALUE ENGINEERING RECOMMENDATION # VE-13

## SKETCH OF ORIGINAL DESIGN



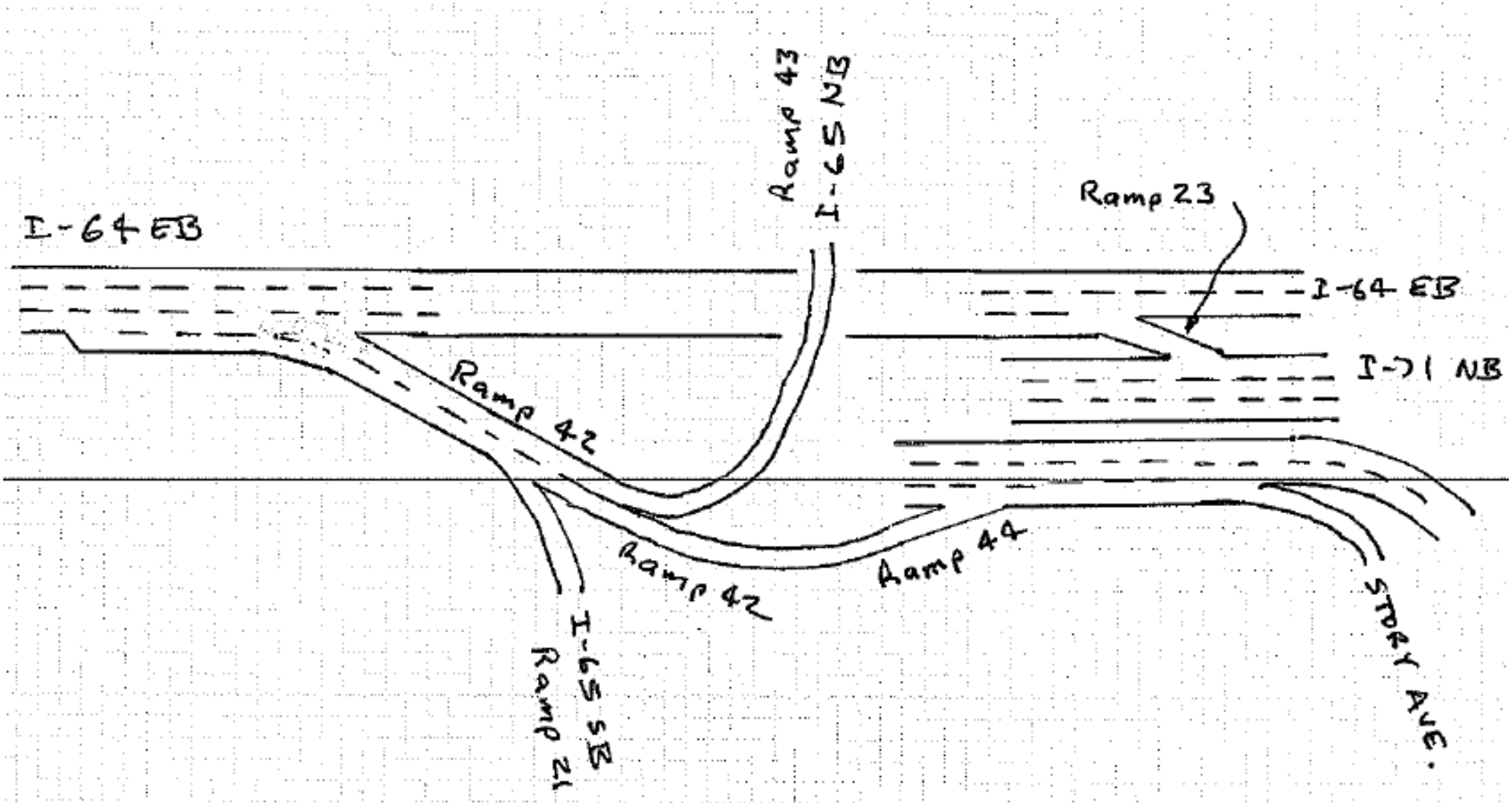
# VALUE ENGINEERING RECOMMENDATION # VE-13

## SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-13

### SKETCH OF RECOMMENDED DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-13

### CALCULATIONS

ELIMINATE 350' OF ENDS / WALLS & PAVEMENT
(A) FROM RAMP Z2 FROM N 2ND TO 1ST PROPOSED BRIDGE PIER

(1) ELIMINATE BRIDGE FROM RAMP Z2 FROM PROP. BRIDGE PIER TO 80' EAST OF PRESTON
$7,392,000 1650' X 32' = 52,800 ft² @ 140/ft²

(2) ELIMINATE BRIDGE FROM ~~PIER~~ RAMP #21 TAPER FROM WEST END PROJECT
$715,500 650' × (3.5' + 12.8')/2 = 5300 ft² @ 135/ft²

(3) ELIMINATE BRIDGE FROM RAMP Z1 FROM END OF TAPER TO 80' EAST OF PRESTON
$7,616,000 1700' X 32' = 54,400 ft² @ 140/ft²

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(4) ADD BRIDGE TAPER FOR REALIGN RAMP Z1
($526,500) (0 + 12)/2 × 650 = 3900 ft² @ 135/ft²

(5) ADD BRIDGE FOR REALIGN RAMP Z1 ~~FROM~~ FROM END TAPER TO 80' EAST OF PRESTON
($2,754,000) 1700 × 12 = 20,400 @ 135/ft²

(A)
$420,000


WALL 350 × 20 × 1/2 × 2 WALL = 7000 ft² WALL @ 60/ft²

$3735


350 × 32 ÷ 27 = 415 C.Y. @ 9 MATERIAL

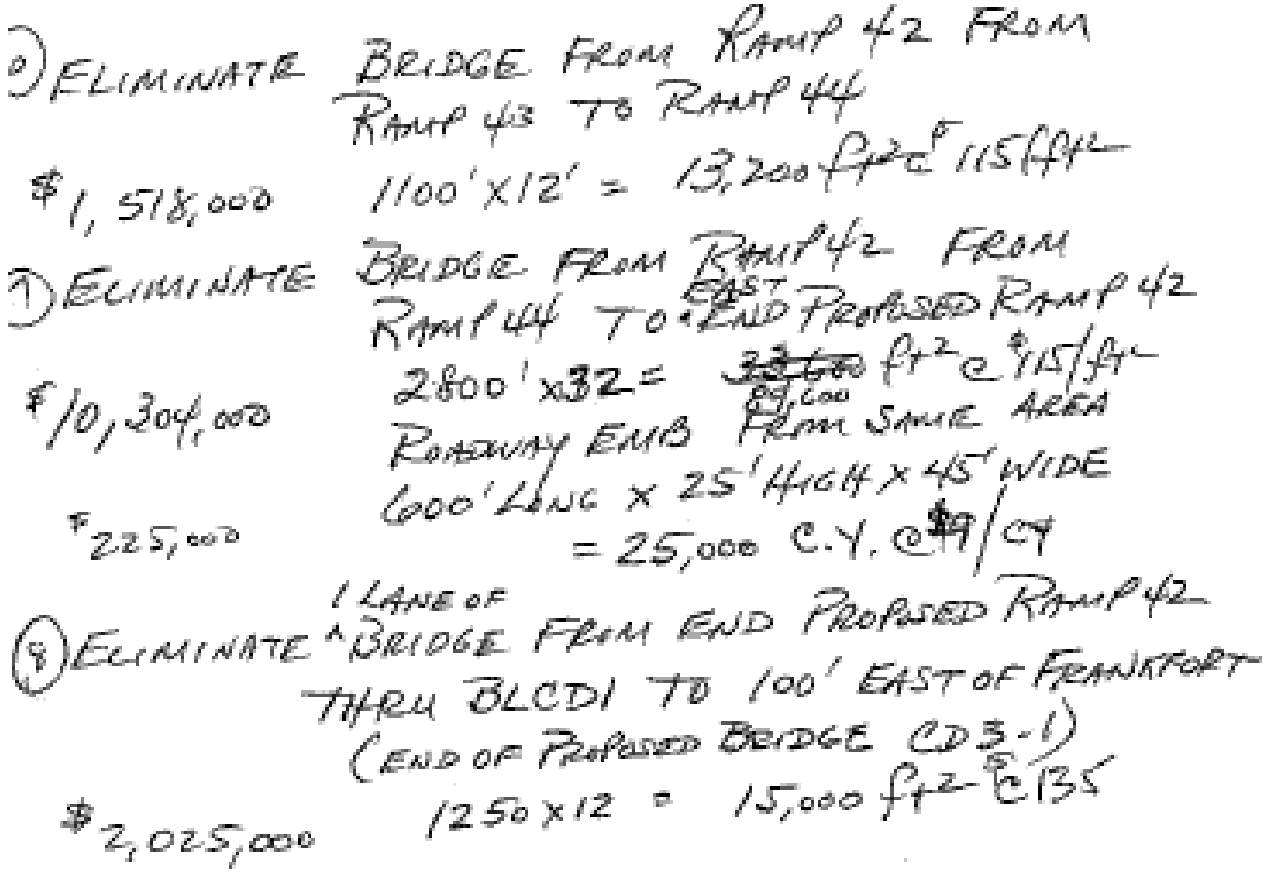
$58,500

350 × 30 ÷ 9 = 1170 S.Y. @ 50 PAVEMENT

URS Corporation

## VALUE ENGINEERING RECOMMENDATION # VE-13

### CALCULATIONS



# VALUE ENGINEERING RECOMMENDATION # VE-13

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| Bridge/Area | | | | Num of Units | Total $ | Num of Units | Total $ |
| 1 | SF | 140.00 | 1 | 52,800 | $7,392,000 | | |
| 2 | SF | 135.00 | 1 | 5,300 | $715,500 | | |
| 3 | SF | 140.00 | 1 | 54,400 | $7,616,000 | | |
| 4 | SF | 135.00 | 1 | | | 3,900 | $526,500 |
| 5 | SF | 135.00 | 1 | | | 20,400 | $2,754,000 |
| 6 | SF | 115.00 | 1 | 13,200 | $1,518,000 | | |
| 7 | SF | 115.00 | 1 | 89,600 | $10,304,000 | | |
| 8 | SF | 135.00 | 1 | 15,000 | $2,025,000 | | |
| | | | | | | | |
| Retaining Wall | | | | | | | |
| Wall (A) | SF | 60.00 | 1 | 7,000 | $420,000 | | |
| Embankment (A) | CY | 9.00 | 1 | 415 | $3,735 | | |
| Pavement (A) | SY | 50.00 | 1 | 1,170 | $58,500 | | |
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| | | | | | | | |
| Subtotal | | | | | $30,052,735 | | $3,280,500 |
| Contingency | @ | 10.00% | | | $3,005,274 | | $328,050 |
| Total | | | | | $33,058,009 | | $3,608,550 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-14

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Decrease the number of lanes on Ramp 26 generally from I-64 westbound to I-65 southbound.

**ORIGINAL DESIGN:**
Ramp 26 from I-64 westbound to I-65 southbound is generally three lanes wide. As entrance and exit ramps are encountered, the ramp widens to four lanes at one point.

**RECOMMENDED CHANGE:**
Beginning at the point where I-71 southbound and I-64 westbound exit ramps combine to go to I-65 southbound, revise the I-64 westbound ramp to be an entrance to Ramp 26 in lieu of an add lane. Continue on Ramp 26 with only two basic lanes past the addition of Ramp 10 from I-64 eastbound. In the section where the I-65 southbound exit Ramp 10 connects with the Ramp 11 to go to Jefferson Street, use only three-lanes, with two lanes exiting to Jefferson and one lane connecting with I-65 southbound.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $5,039,000 | | $5,039,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $5,039,000 | $0 | $5,039,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-14

**ADVANTAGES:**

- One-half mile of structures can be 12 feet narrower
- One-half mile of 12-foot width of roadway and embankment can be eliminated
- The Ramp entering I-65 southbound can be a single-lane ramp in lieu of a two-lane ramp

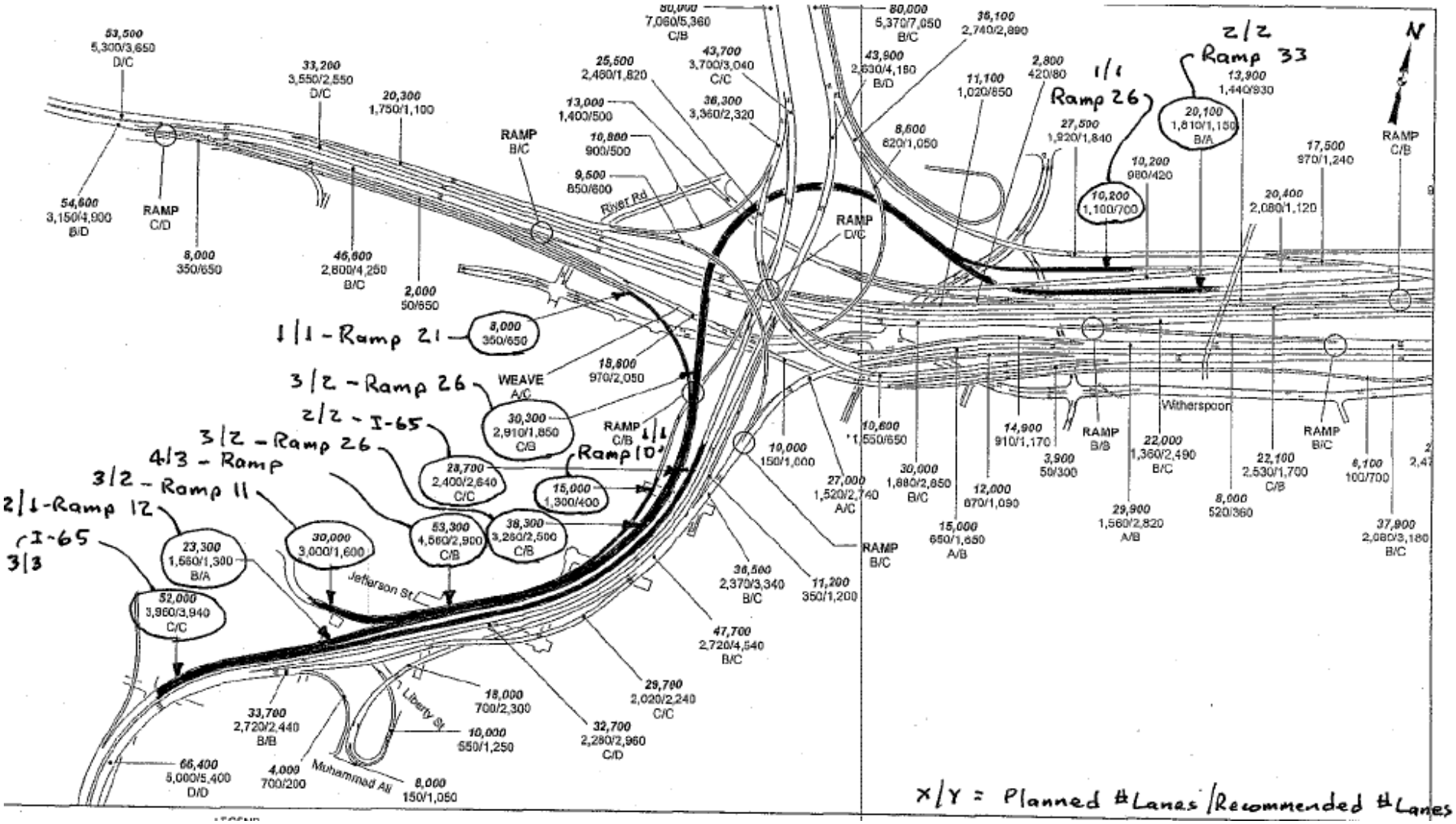
**DISADVANTAGES:**

- Less reserve capacity for incident management

**JUSTIFICATION:**
All of the traffic movements that were provided in the original design are maintained by the recommended changes. One-half mile of bridges and one-half mile of roadway on embankment are eliminated. Using these changes, the volumes are predicted to be less than 1,650 VPHPL, which are believed to provide an acceptable level of service.

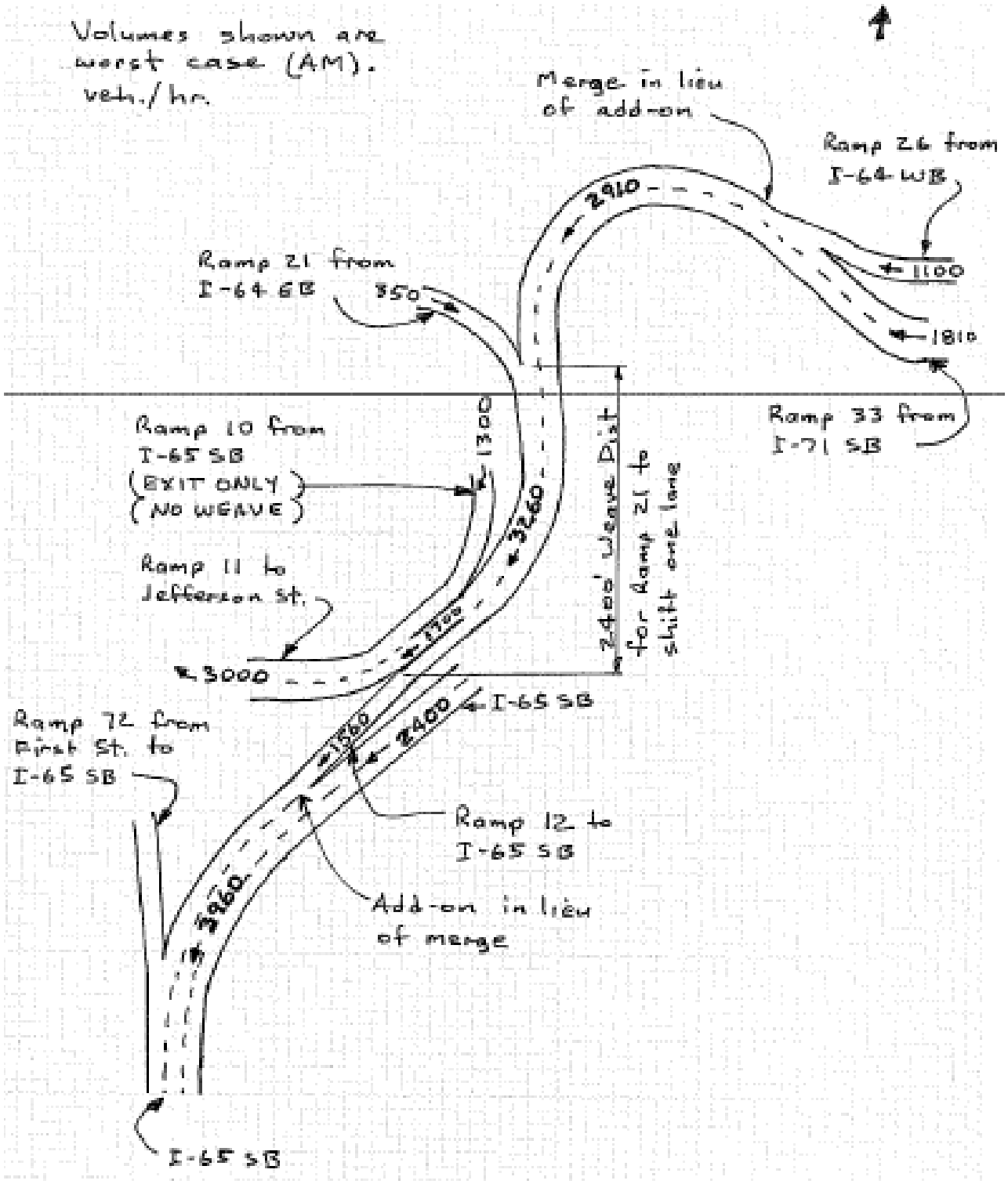
# VALUE ENGINEERING RECOMMENDATION # VE-14

## SKETCH OF RECOMMENDED DESIGN



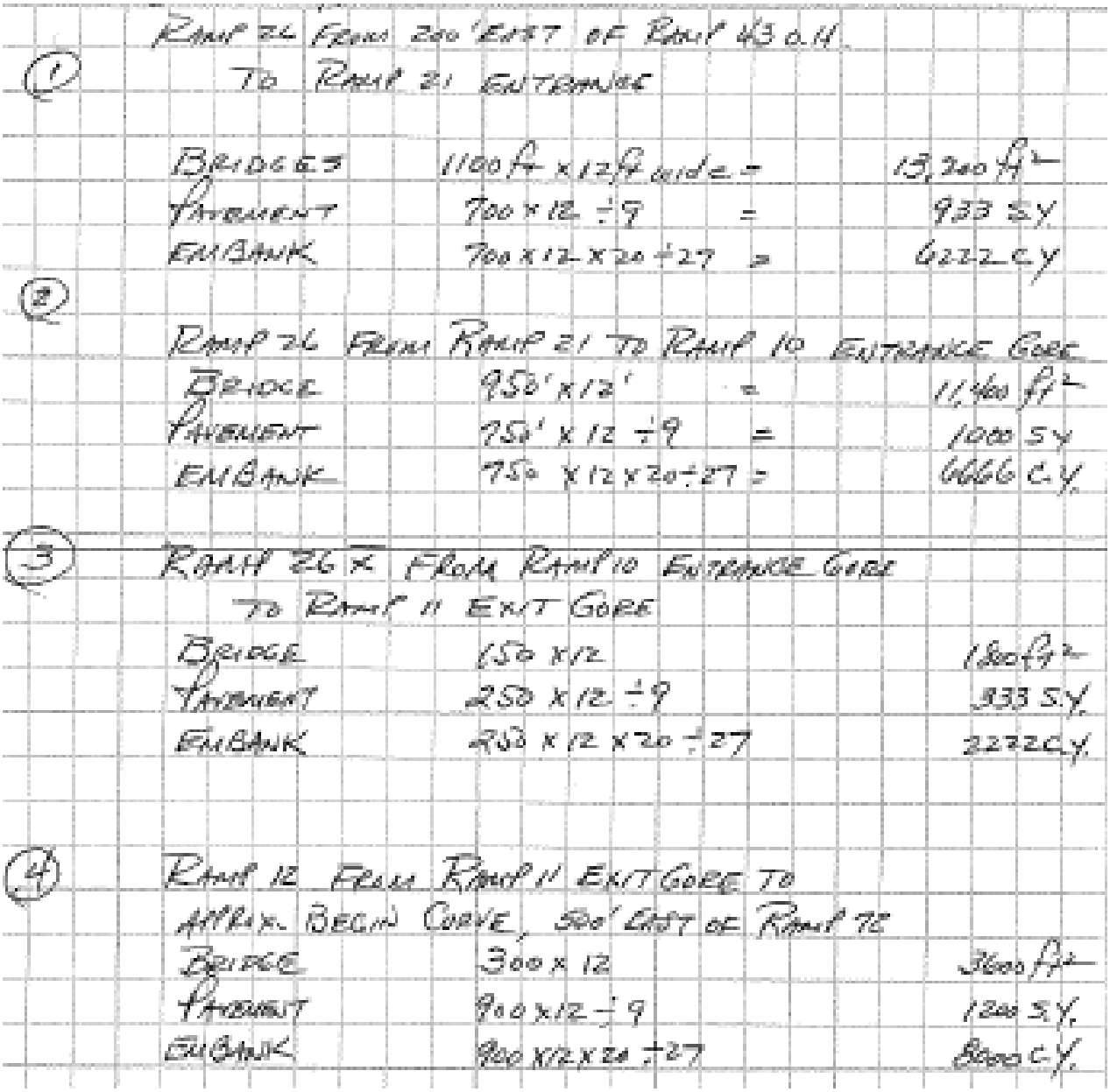
## VALUE ENGINEERING RECOMMENDATION # VE-14

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-14

## CALCULATIONS



(1) RAMP 2L FROM 200' EAST OF RAMP 43 OH TO RAMP 21 ENTRANCE

| | | |
|---|---|---|
| BRIDGES | 1100 ft x 12 ft wide = | 13,200 ft² |
| PAVEMENT | 700 x 12 ÷ 9 = | 933 SY |
| EMBANK | 700 x 12 x 20 ÷ 27 = | 6222 CY |

(2) RAMP 2L FROM RAMP 21 TO RAMP 10 ENTRANCE GORE

| | | |
|---|---|---|
| BRIDGE | 950' x 12' = | 11,400 ft² |
| PAVEMENT | 750' x 12 ÷ 9 = | 1000 SY |
| EMBANK | 750 x 12 x 20 ÷ 27 = | 6666 CY |

(3) RAMP 2GX FROM RAMP 10 ENTRANCE GORE TO RAMP 11 EXIT GORE

| | | |
|---|---|---|
| BRIDGE | 650 x 12 | 1800 ft² |
| PAVEMENT | 250 x 12 ÷ 9 | 333 SY |
| EMBANK | 950 x 12 x 20 ÷ 27 | 2222 CY |

(4) RAMP 12 FROM RAMP 11 EXIT GORE TO APPROX. BEGIN CURVE, 500' EAST OF RAMP 7E

| | | |
|---|---|---|
| BRIDGE | 300 x 12 | 3600 ft² |
| PAVEMENT | 900 x 12 ÷ 9 | 1200 SY |
| EMBANK | 900 x 12 x 20 ÷ 27 | 8000 CY |

# VALUE ENGINEERING RECOMMENDATION # VE-14

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge | | | | | | | |
| 1 | SF | 140.00 | 1 | 13,200 | $1,848,000 | | |
| 2 | SF | 140.00 | 1 | 11,400 | $1,596,000 | | |
| 3 | SF | 140.00 | 1 | 1,800 | $252,000 | | |
| 4 | SF | 140.00 | 1 | 3,600 | $504,000 | | |
| | | | | | | | |
| Pavement | | | | | | | |
| 1 | SY | 50.00 | 7 | 933 | $46,650 | | |
| 2 | SY | 50.00 | 7 | 1,000 | $50,000 | | |
| 3 | SY | 50.00 | 7 | 333 | $16,650 | | |
| 4 | SY | 50.00 | 7 | 1,200 | $60,000 | | |
| | | | | | | | |
| EMB | | | | | | | |
| 1 | CY | 9.00 | 1 | 6,222 | $55,998 | | |
| 2 | CY | 9.00 | 1 | 6,666 | $59,994 | | |
| 3 | CY | 9.00 | 1 | 2,222 | $19,998 | | |
| 4 | CY | 9.00 | 1 | 8,000 | $72,000 | | |
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| | | | | | | | |
| Subtotal | | | | | $4,581,290 | | $0 |
| Contingency | @ | 10.00% | | | $458,129 | | $0 |
| Total | | | | | $5,039,419 | | $0 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-15

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Eliminate the construction to the west end of River Road, on the north side of the interstate.

**ORIGINAL DESIGN:**
The current design relocates approximately 1,000 to 1,100 feet of River Road from north Preston Street to just past the tie down point of Ramp 26B. There is a slight improvement to River Road in geometry and capacity.

**RECOMMENDED CHANGE:**
Do not reconstruct River Road from North Preston Street to Ramp 26B.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $396,000 | | $396,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $396,000 | $0 | $396,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-15

**ADVANTAGES:**

- Eliminates new roadway, curb and gutter, and sub-grade material
- Reduces the construction schedule
- Reduces the overall cost of the project by a small amount
- Reduces traffic control needs
- Does not impact the Great Lawn

**DISADVANTAGES:**

- May require different span arrangement for bridges 390, 630, 165, and 660
- May impact pier locations for bridges 390, 630, 165, and 660

**JUSTIFICATION:**

Eliminating the improvements to the West End of River Road, north of the Interstate will reduce the construction schedule and will reduce traffic control on River Road. It will also slightly simplify the construction phasing of the project as well as the traffic control needs. Span arrangements or pier locations for bridges 390, 630, 165, and 660 could be modified to accommodate leaving River Road as-is.

# VALUE ENGINEERING RECOMMENDATION # VE-15

## SKETCH OF RECOMMENDED DESIGN

# VALUE ENGINEERING RECOMMENDATION # VE-15

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Roadway | SY | 60.00 | 7 | 6,000 | $360,000 | | |
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| Subtotal | | | | | $360,000 | | $0 |
| Contingency | @ | 10.00% | | | $36,000 | | $0 |
| Total | | | | | $396,000 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-16

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Eliminate the new bridges over the Great Lawn and use rehabilitated and widened existing bridges.

**ORIGINAL DESIGN:**
Construct a new bridge over the Great Lawn that allows for more use of the Great Lawn, better visibility of the Great Lawn, better visibility in the Great Lawn, and is more aesthetically pleasing than the existing bridge.

**RECOMMENDED CHANGE:**
Utilize existing structures over the Great Lawn by rehabilitating and widening them to accommodate new ramp weaves.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $53,242,000 | | $53,242,000 |
| RECOMMENDED DESIGN | $31,945,000 | | $31,945,000 |
| ESTIMATED SAVINGS OR (COST) | $21,297,000 | $0 | $21,297,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-16

**ADVANTAGES:**

- Eliminates 3 new bridges
- Considerably reduces the construction schedule
- Reduces the overall cost of the project
- May reduce traffic control needs

**DISADVANTAGES:**

- Not aesthetically pleasing
- Renders portion of Great Lawn to be not as useful
- Will not be popular with the general public nor the politicians
- Will leave a substructure in place that is starting to age

**JUSTIFICATION:**

Eliminating the new bridges over the Great Lawn will considerably reduce the construction schedule and will reduce overall costs of the project. It will also simplify the construction phasing of the project as well as the traffic control needs. Four new structures can be either eliminated or greatly reduced in length. The existing structures are showing some age, but with deck replacements taking place along with the widening, improvements can be made to the existing structures.

# VALUE ENGINEERING RECOMMENDATION # VE-16

## CALCULATIONS

Bridge 630 is 1922 feet in length
All of it can be eliminated and the existing bridge can be widened
Bridge cost is $31,803,800

Bridge 165 costs are not given, but $140 per square foot is assumed
Bridge is approximately 1730 feet in length
Bridge is approximately 32 feet in width
1730 X 32 X 140 = $7,750,400

Bridge 660 costs are not given, but $140 per square foot is assumed
Bridge is approximately 1975 feet in length
Bridge is approximately 32 feet in width
1975 X 32 X 140 = $8,848,000

Cost of the three bridges across the Great Lawn is approximately $48 million

Assuming that superstructure costs are approximately 50% of structure costs, and that some substructure work will be required to widen the existing bridges, approximately 40% of bridge costs can be eliminated. 60% of bridge costs will remain.

48,000,000 X .40 = $19,200,000

# VALUE ENGINEERING RECOMMENDATION # VE-16

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 630 | SF | 140.00 | 7 | 227,170 | $31,803,800 | | |
| Bridge 165 | SF | 140.00 | 7 | 55,360 | $7,750,400 | | |
| Bridge 660 | SF | 140.00 | 7 | 63,200 | $8,848,000 | | |
| Rehab existing bridges | SF | 70.00 | 7 | | | 345,730 | $24,201,100 |
| Substructure widening | SF | 140.00 | 7 | | | 34,573 | $4,840,220 |
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| Subtotal | | | | | $48,402,200 | | $29,041,320 |
| Contingency | @ | 10.00% | | | $4,840,220 | | $2,904,132 |
| Total | | | | | $53,242,420 | | $31,945,452 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-17

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Eliminate the bridges over the Great Lawn and use embankment instead.

**ORIGINAL DESIGN:**
Construct a new bridge over the Great Lawn that allows for more use of the Great Lawn, better visibility of the Great Lawn, better visibility in the Great Lawn, and is more aesthetically pleasing than the existing bridge.

**RECOMMENDED CHANGE:**
Place embankment across the Great Lawn and eliminate 3 bridges (630, 165, and 660) and part of a 4$^{th}$ bridge (390).

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $62,231,000 | | $62,231,000 |
| RECOMMENDED DESIGN | $7,920,000 | | $7,920,000 |
| ESTIMATED SAVINGS OR (COST) | $54,311,000 | $0 | $54,311,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-17

**ADVANTAGES:**

- Eliminates 3 bridges and part of a 4th bridge
- Reduces long term maintenance costs
- Considerably reduces the construction schedule
- Reduces the overall cost of the project
- Reduces traffic control needs

**DISADVANTAGES:**

- Not aesthetically pleasing
- Renders portion of Great Lawn to be useless
- Will not be popular with the general public nor the politicians
- Will require additional fill material

**JUSTIFICATION:**
Eliminating the bridges over the Great Lawn will considerably reduce the construction schedule and will reduce overall costs of the project. It will also simplify the construction phasing of the project as well as the traffic control needs. Four structures can be either eliminated or greatly reduced in length.

# VALUE ENGINEERING RECOMMENDATION # VE-17

## CALCULATIONS

Bridge 390 is 1531.48 feet in length
1191.15 feet of length can be eliminated
Bridge costs are $140 per square foot
49 feet X 1191.15 feet X 140 = $8,171,289

Bridge 630 is 1922 feet in length
All of it can be eliminated
Bridge cost is $31,803,800

Bridge 165 costs are not given, but $140 per square foot is assumed
Bridge is approximately 1730 feet in length
Bridge is approximately 32 feet in width
1730 X 32 X 140 = $7,750,400

Bridge 660 costs are not given, but $140 per square foot is assumed
Bridge is approximately 1975 feet in length
Bridge is approximately 32 feet in width
1975 X 32 X 140 = $8,848,000

Cost of bridges across the Great Lawn is approximately $57 million

Embankment Costs
$9.00 per cubic yard
Assume embankment width of 300 feet on average
Assume embankment height of 25 feet on average
Assume embankment length of 2000 feet on average
9 X 300 X 25 X 2000/27 = $5,000,000

Roadway Costs
Pavement, sub-grade, drainage, etc. approximately $1,200,000

Total savings is approximately $57,000,000 - $5,000,000 - $1,200,000 = $50,800,000

# VALUE ENGINEERING RECOMMENDATION # VE-17

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 390 | SF | 140.00 | 7 | 58,366 | $8,171,289 | | |
| Bridge 630 | LS | 31,803,800 | 7 | 1 | $31,803,800 | | |
| Bridge 165 | SF | 140.00 | 7 | 55,360 | $7,750,400 | | |
| Bridge 660 | SF | 140.00 | 7 | 63,200 | $8,848,000 | | |
| Embankment | CY | 9.00 | 7 | | | 555,556 | $5,000,000 |
| Roadway Costs | LS | 1,200,000 | 7 | | | 1 | $1,200,000 |
| Culverts under embankment | LS | 500,000 | 7 | | | 2 | $1,000,000 |
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| Subtotal | | | | | $56,573,489 | | $7,200,000 |
| Contingency | @ | 10.00% | | | $5,657,349 | | $720,000 |
| Total | | | | | $62,230,838 | | $7,920,000 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-18

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Analyze local street grid to determine if certain streets can be closed permanently, such as South Jackson, thereby reducing the number of bridges/structures.

**ORIGINAL DESIGN:**
Existing local street network is maintained, for the most part, during construction, and after construction including South Jackson.

**RECOMMENDED CHANGE:**
Close certain existing local streets, during construction, and after construction including Jackson Street, to minimize some of the interstate structures that are being constructed over the local street network.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $4,597,000 | | $4,597,000 |
| RECOMMENDED DESIGN | $550,000 | | $550,000 |
| ESTIMATED SAVINGS OR (COST) | $4,047,000 | $0 | $4,047,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-18

**ADVANTAGES:**

- Eliminates part of one bridge and one box culvert
- Considerably reduces the construction schedule for I-65 and ramps 2, 3, 10, and 26
- Reduces the overall cost of the project
- Reduces traffic control needs and phasing
- Reduces long term maintenance

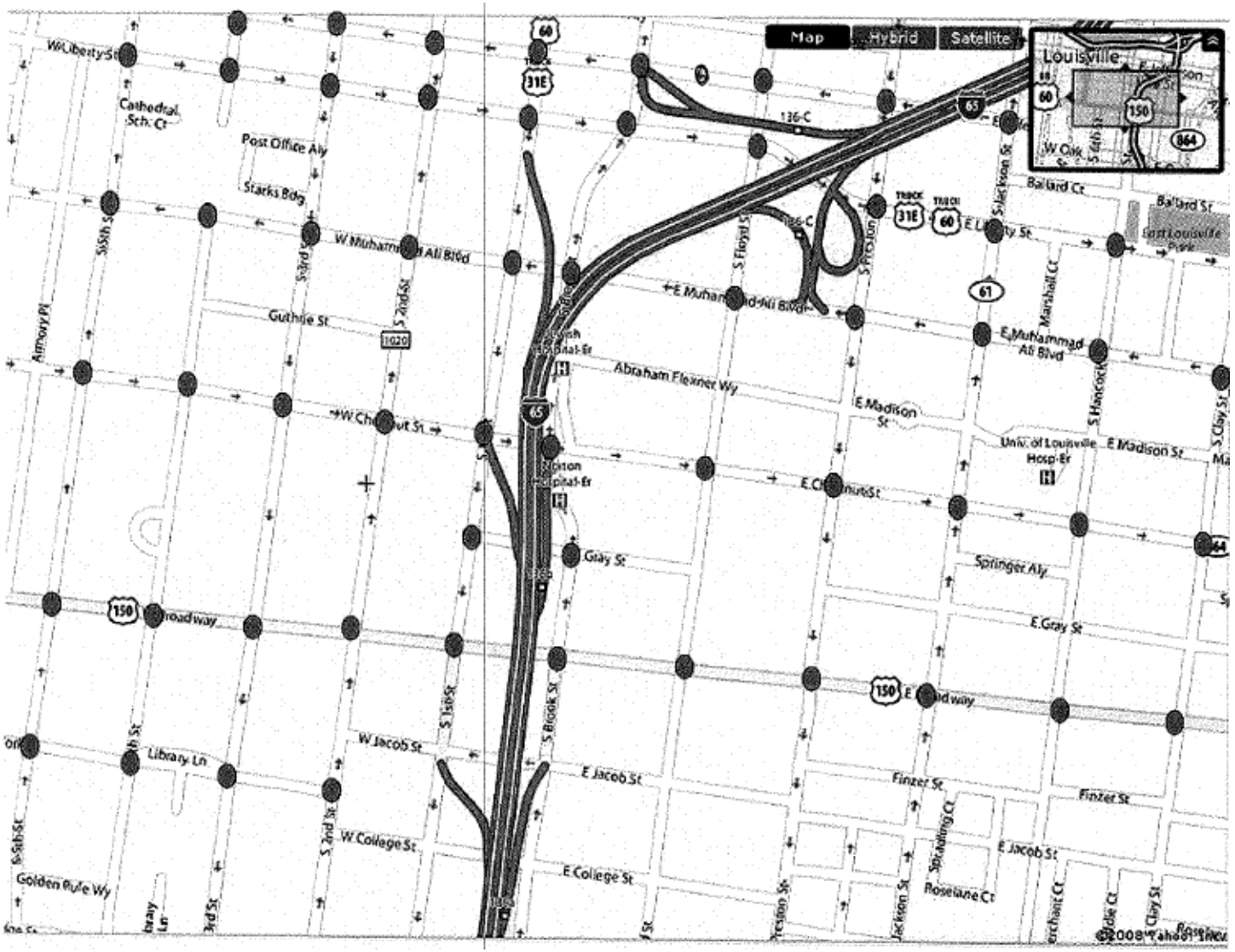
**DISADVANTAGES:**

- Eliminates a local street near the hospital complex
- Traffic would have to use Floyd Street or South Clay Street which are 2 blocks away
- Will not be popular with some local users
- Will require additional fill material

**JUSTIFICATION:**
Eliminating parts of 2 new structures over South Jackson Street will considerably reduce the construction schedule and will reduce overall costs of the project. It will also simplify the construction phasing of the project as well as the traffic control needs. Two new structures can be either eliminated or reduced in length. The existing street grid has 2 way streets on either side of South Jackson, 2 blocks away. South Jackson carries very little traffic north of East Muhammad Ali Boulevard, which houses the hospital complexes. Closing this street would not put an undue burden on Floyd Street, or South Clay Street.

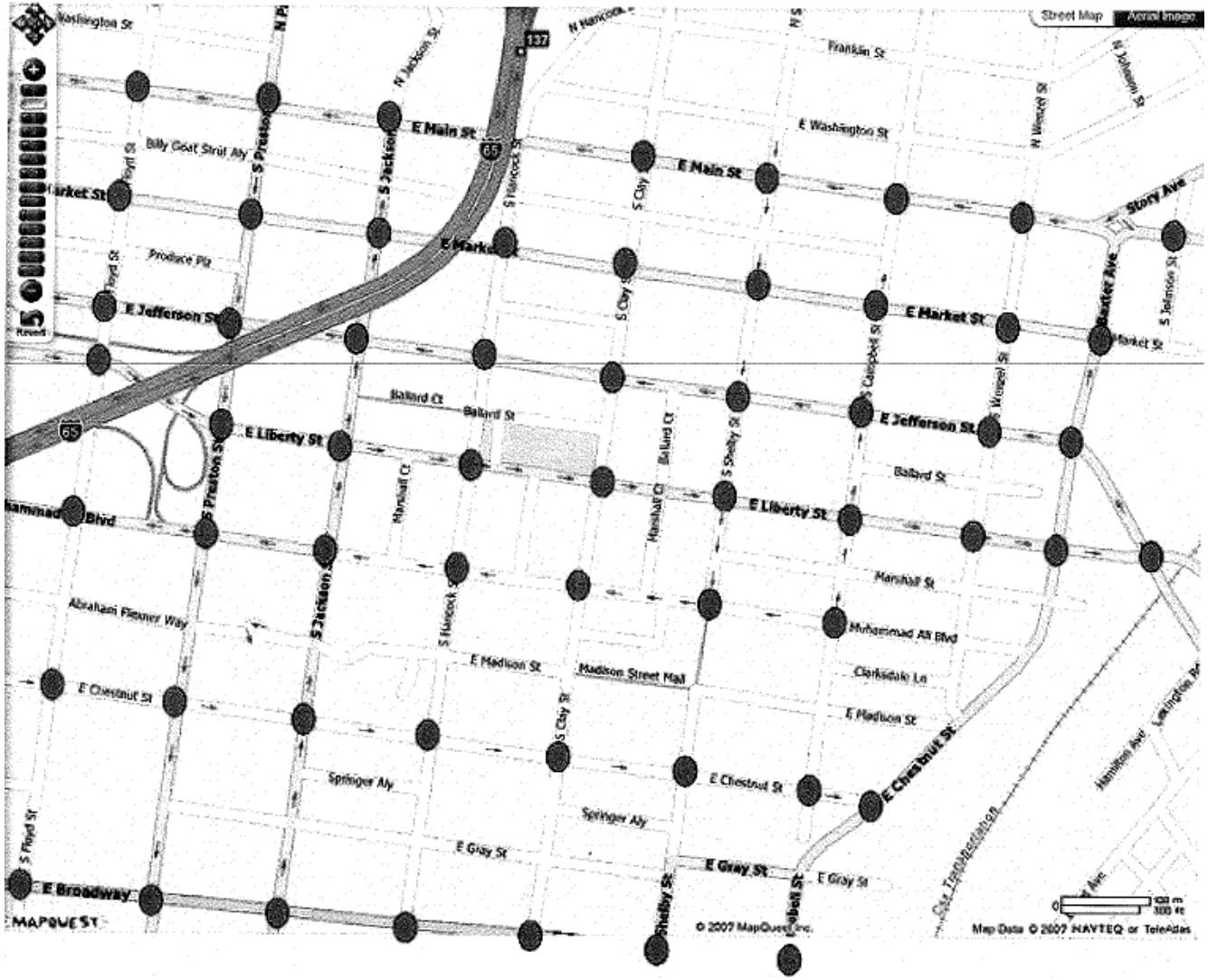
# VALUE ENGINEERING RECOMMENDATION # VE-18

## SKETCH OF EXISTING CONDITIONS



# VALUE ENGINEERING RECOMMENDATION # VE-18

## SKETCH OF EXISTING CONDITIONS



# VALUE ENGINEERING RECOMMENDATION # VE-18

## CALCULATIONS

Bridge 440 is 127 feet in length
All of it can be eliminated and embankment used instead
Bridge cost is 37,670 square feet at $90 per square foot which equals $3,390,300.

Bridge 760 is approximately 933 feet in length
Approximately 127 feet in length can be eliminated
Bridge is approximately 46 feet in width
Bridge cost is assumed to be $135 per square foot
127 X 46 X 135 = $788,670.

Cost of the two structures to maintain traffic on South Jackson Street is approximately $4.2 million.

Embankment Costs
$9.00 per cubic yard
Assume embankment width of 165 feet on average
Assume embankment height of 25 feet on average
Assume embankment length of 200 feet on average
9 X 200 X 25 X 200/27 = $333,333

Roadway Costs
Assume $60 per square yard
125 X 200 / 9 X 60 = $167,000

Total Savings = 4,200,000 – 333,333 – 167,000 = $3.7 million

# VALUE ENGINEERING RECOMMENDATION # VE-18

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 440 | SF | 90.00 | 7 | 37,670 | $3,390,300 | | |
| Bridge 760 | SF | 135.00 | 7 | 5,842 | $788,670 | | |
| Embankment | CY | 9.00 | 7 | | | 37,000 | $333,000 |
| Roadway Costs | SY | 60.00 | 7 | | | 2,778 | $166,680 |
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| | | | | | | | |
| Subtotal | | | | | $4,178,970 | | $499,680 |
| Contingency | @ | 10.00% | | | $417,897 | | $49,968 |
| Total | | | | | $4,596,867 | | $549,648 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-19

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Design utility corridor within freeway footprint between I-65 and I-64.

**ORIGINAL DESIGN:**
Utilities are shown in Part 4 of the project plans. The ones that travel between I-65 and I-64 primarily along Adams are summarized below:

1. 2 24" Force Mains
2. 18" to 30" Sanitary Sewer
3. 8" Water
4. 6" Gas
5. 8" Sanitary
6. Electric Transmission Lines

The treatment of these utilities is not addressed in any of the material provided to the value engineering team.

**RECOMMENDED CHANGE:**
Use the open area between I-64 EB and Ramp 6/BL CD1 to install a utility corridor. This utility corridor will originate at the proposed intersection of Witherspoon and Clay. It will travel east within the aforementioned area. This will include traveling under Ramp 23. It will then travel under the BL CD1 structure and into the Witherspoon ROW. The utility corridor will continue in the Witherspoon ROW to Frankfort Avenue.

The utility corridor includes bringing the transmission lines that are currently aerial into encased underground conduit. An option is to keep these transmission lines as aerial and run in this same utility corridor.

Access to the utility corridor from the east would be from a drive with a locked gate from the Witherspoon and Clay intersection. Access from the west would be from a drive with a locked gate near the Witherspoon and Buchanan intersection.

# VALUE ENGINEERING RECOMMENDATION # VE-19

**ADVANTAGES:**

- Moves aerial electrical transmission lines either underground or as aerial away from the Butchertown area
- Eliminates the meandering of utility corridor along Witherspoon as it curves out towards the Butchertown area
- Eliminates the use of valuable riverfront property on the north side of proposed LA ROW

**DISADVANTAGES:**

- Utility corridor will cross under Ramp 23 at an extreme skew
- Access to utilities within a limited access freeway area is problematic
- The corridor travels from City owned ROW on Witherspoon to LA ROW and back to City owned ROW at Buchanan and along Witherspoon

**JUSTIFICATION:**

The value engineering team was debriefed by the design team on Monday, January 28, 2008. We were told that the relocation of the utilities had not been addressed. In our opinion, this issue needed to be addressed by our team.

We were also told that the treatment of the aerial transmission lines had not been determined. The Butchertown residents have expressed concerns about the final locations of the lines and would prefer not to have them within the confines of their historic district or within their visual reference.

Finally, the north side of the relocated freeway system between I-65 and I-64 is supposed to revert to private development. We concluded that this may also be a politically undesirable location for a utility corridor, although it is a technically viable location.

The VE team did not attempt to estimate cost savings for this recommendation, because a clear determination and cost for the original design was not available at the time of the VE study.

# VALUE ENGINEERING RECOMMENDATION # VE-20

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Consolidate the construction of I-64 from Third Street (or POB) to Payne (or POE) to minimize duration.

**ORIGINAL DESIGN:**
The VE team received information showing I-64 being constructed part-width and in multiple construction packages. This highway will be constructed over the entire length of the project, with initial construction on the east leg in Construction Package 1 and final construction on the curves at I-71 in Construction Package 13. Based on the durations provided, that is a total of almost 14 years of construction on I-64 between Third Street and Payne.

**RECOMMENDED CHANGE:**
The value engineering team proposes to consolidate the actual construction of I-64 between Third Street and Payne. The recommended consolidation is suggested as follows:

1. Build I-64 easterly of I-71 as shown in proposed Construction Package 1. Delay this construction package if funding for remainder of I-64 work is at issue.
2. Start construction of I-64 between I-65 and I-71. This includes starting with moving utilities and then commencing with construction of I-64 mainline. This must include at least some tie-ins on the south side from I-65 to I-64 and I-71.
3. Build I-64 outside ramps 7, 8, 21, 22, and 42 with tie-ins to I-65 north and south of I-64. Stage this work so that it does not directly impact existing traffic.
4. Close I-64 west of I-65 and build the Great Lawn structures.
5. As the Great Lawn structures are nearing completion, build Ramp 26/33 with temporary connection to existing W to N ramp that tie into the existing Kennedy Bridge. This ramp will also need to tie to the new Ramp 21 coming in from I-64 EB. Avoid impacting traffic or closing the I-64 WB to I-65 SB movement.
6. Connect I-64 under I-65 and open to traffic.

In order to limit the amount of work that is directly related to I-64 included above, determine some of the movements that can be delayed within the I-64 zone between I-65 and I-71. Build these movements after I-64 mainline is done. The main idea is to provide a new I-64 through movement in a shorter duration. The VE team recommends that the work west of I-65 be delayed if a temporary connection of I-65 ramps and I-64 through movement at River Road is possible.

This option may include the elimination of the temporary I-64 bridges over future Witherspoon because the duration of construction would be shortened, therefore providing the option of using Campbell to Clay to River as an alternate access for Butchertown.

# VALUE ENGINEERING RECOMMENDATION # VE-20

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $293,018,000 | | $293,018,000 |
| RECOMMENDED DESIGN | $277,332,000 | | $277,332,000 |
| ESTIMATED SAVINGS OR (COST) | $15,686,000 | $0 | $15,686,000 |

**ADVANTAGES:**

- Limit duration of construction impacts on I-64 travelers
- Provide new and simpler I-64 geometry and movements in a shorter duration
- Improves one of the worst aspects of the existing interchange quicker
- Consolidate construction packages to focus on one interstate
- Disengages I-64 work from the I-65 river crossing completion date
- Possible elimination of the temporary bridges over future Witherspoon

**DISADVANTAGES:**

- Funding limitations may not allow for this plan.
- MOT conflicts within the I-64 and I-65 interchange may prevent this plan
- Existing infrastructure that cannot be removed may prevent this plan
- Closures of I-64 are required, some of which may be long term
- Movements at I-64 and I-65 will require closure

**JUSTIFICATION:**
This method can still use smaller Construction Packages as proposed in the *.pdf titled "2070619_Construction_Packages" that includes 14 construction packages. The impetus is to shorten the duration of time on I-64 itself and more quickly improve the poor geometrics under I-65. This will likely have more severe impacts on traffic while the construction is ongoing, but this reduces the length of time that construction is ongoing. This also will provide a better, wider, and safer freeway sooner than proposed. This has value to the motoring public, but this value is hard to quantify.

# VALUE ENGINEERING RECOMMENDATION # VE-20

## CALCULATIONS

Estimated 70% time savings with total closure equals an approximate 35% savings in contract administration

Estimated 70% time savings with total closure equals 10% reduction in construction costs

Original design costs include 20% for engineering and contingency, assume 10% is for engineering

Total savings due to the above assumptions is 13.5% for each package where total closure is implemented

# VALUE ENGINEERING RECOMMENDATION # VE-20

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| I-64 total closures | | | | | | | |
| Const. Package 1 | LS | 37,000,000 | 1 | 1 | $37,000,000 | 1.000 | $37,000,000 |
| Const. Package 4 | LS | 63,000,000 | 1 | 1 | $63,000,000 | 1.000 | $63,000,000 |
| Const. Package 8 | LS | 76,000,000 | 1 | 1 | $76,000,000 | 1.000 | $76,000,000 |
| Const. Package 12 | LS | 88,000,000 | 1 | 1 | $88,000,000 | 0.865 | $76,120,000 |
| | | | | | | | |
| Eliminate temporary bridges and diversions over Witherspoon | | | | | | | |
| Bridge 8010 | LS | 720,000 | 1 | 1 | $720,000 | | |
| Bridge 8030 | LS | 660,000 | 1 | 1 | $660,000 | | |
| Roadwork | LS | 1,000,000 | 7 | 1 | $1,000,000 | | |
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| Subtotal | | | | | $266,380,000 | | $252,120,000 |
| Contingency | @ | 10.00% | | | $26,638,000 | | $25,212,000 |
| Total | | | | | $293,018,000 | | $277,332,000 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-21

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Use freeway closures in lieu of maintaining two lanes on each freeway.

**ORIGINAL DESIGN:**
The MOT on this project includes the maintenance of two lanes of traffic in each direction on I-64, I-71, and I-65. This is dictated in a DRAFT document dated February 14, 2005 titled "Kennedy Interchange: Maintenance of Traffic Design Criteria Report".

All other verbal and written information that the value engineering team has been given to date seems to include the maintenance of two lanes of traffic on each freeway most of the time.

**RECOMMENDED CHANGE:**
Close a leg or entire length of each freeway during construction of that segment. This may include the following scenarios depending on the limits of proposed construction:

1. I-64 south of I-71
2. I-64 west of I-65
3. I-64 from 3rd Street to Payne
4. I-65 south of I-64
5. I-71 east of I-64

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $514,000,000 | | $514,000,000 |
| RECOMMENDED DESIGN | $444,610,000 | | $444,610,000 |
| ESTIMATED SAVINGS OR (COST) | $69,390,000 | $0 | $69,390,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-21

**ADVANTAGES:**

- Expedite project completion by approximately 70%
- Reduce the impact of construction on travelers
- Maximize workspace available to contractor to increase productivity
- Reduce overall congestion resulting from construction
- Improve safety for workers and travelers
- Reduces MOT signing requirements
- May reduce crashes
- Results in a smoother roadway
- Improve public sentiment

**DISADVANTAGES:**

- Funding limitations may not allow for larger construction projects required to justify freeway closures
- City/county agencies and personnel often need to be convinced of the feasibility of implementing a full closure strategy and the potential benefits that can be realized
- Full closure projects are typically done on an accelerated schedule. Contractor and supplier ability to provide adequate amounts of resources (materials, equipment, crew) to maintain an accelerated pace must be assessed
- Meeting the project completion deadline is particularly important when using full closure since this is often highly publicized as the date when the road will re-open
- Impacts to business or entertainment venues can be a factor
- Full closure projects are often scheduled on a 24-hour work basis, so there is potential for impacts to local residents, including noise and light pollution
- Increases to traffic densities on alternate routes must be assessed, planned for, and managed. Depending on available alternate routes, there is a potential need for capacity improvements and operational enhancements that may require additional funding and coordination during the planning and programming phases.

**JUSTIFICATION:**
The value engineering team feels that closing individual legs of freeways is possible because the Louisville area includes interconnected freeways that can serve as long detours. In addition to these long detours, the local county/city road network can likely handle non-detoured traffic exiting the closed freeway and distribute the traffic. This has been experienced by other areas when closing freeways. Louisville recently closed the west leg of I-64 for 30 days.

We consulted the document "Full Road Closure for Work Zone Operations – A Cross Cutting Study" by the FHWA dated August 2003. This provided other project examples and some of the advantages and disadvantages to using this option.

# VALUE ENGINEERING RECOMMENDATION # VE-21

## DISCUSSION CONTINUED

Examples of how each of the closures might work are shown below. The construction packages that are referenced are from a *.pdf titled "2070619_Construction_Packages" where the project is split into 14 segments:

I-64 south of I-71
The construction of this segment of the project is included in Construction Package #1. The closure of I-64 in this area would begin on the south end at Grinstead. The first interim completion date for I-64 might be to complete from south end of construction to Mellwood along with the proposed Mellwood on- and off-ramps. The full completion of this segment would follow.

I-64 west of I-65
The construction of this segment of the project is included in Construction Packages #4, #8, and #12. The closure of I-64 in this area would begin on the west end at 9th Street and would extend to I-65. As stated earlier, a similar closure was applied in 2007.

I-64 from I-65 to I-71
The construction of this segment is included throughout many of the Construction Packages. The most significant issue with this plan is the connection of the relocated I-64 under I-65. On the other hand, the most advantageous reason for this plan is that making the new connection of I-64 will disrupt the existing primary I-64 through movement anyway, therefore justifying the necessity for closure.

Because many of the I-65 to and from I-64 movements will also be disrupted, accommodation for those movements must be made. Therefore most of the new movements at I-65 and I-71 that include bridges should be constructed prior to closing the freeway. The plan needs to include the allowance for I-65 movements to I-71 and I-64 to the east.

I-65 south of I-64
The construction of this segment (excluding some of the new movements on the outsides of the existing footprint south of the interchange) is included both prior to any of the construction packages and then in Construction Package #10. The closure for this segment on the south would be at the East Chestnut exit and on the north would be at I-64.

I-71 east of I-64
The construction of this segment is included in Construction Packages #2, #7, and #9. The closure of I-71 would begin at I-64 on the west and at the Zorn Avenue interchange approximately ¾ mile east of the project.

# VALUE ENGINEERING RECOMMENDATION # VE-21

## CALCULATIONS

Estimated 70% time savings with total closure equals approximate 35% savings in contract administration

Estimated 70% time savings with total closure equals 10% reduction in construction costs

Original design costs include 20% for engineering and contingency, assume 10% is for engineering

Total savings due to the above assumptions is 13.5% for each construction package

# VALUE ENGINEERING RECOMMENDATION # VE-21

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| I-64 total closures | | | | | | | |
| Const. Package #1 | LS | 37,000,000 | 1 | 1 | $37,000,000 | 0.865 | $32,005,000 |
| Const. Package #4 | LS | 63,000,000 | 1 | 1 | $63,000,000 | 0.865 | $54,495,000 |
| Const. Package #8 | LS | 76,000,000 | 1 | 1 | $76,000,000 | 0.865 | $65,740,000 |
| Const. Package #12 | LS | 88,000,000 | 1 | 1 | $88,000,000 | 0.865 | $76,120,000 |
| | | | | | | | |
| I-65 total closure | | | | | | | |
| Pre-const. package | LS | 60,000,000 | 1 | 1 | $60,000,000 | 0.865 | $51,900,000 |
| Const. Package #10 | LS | 74,000,000 | 1 | 1 | $74,000,000 | 0.865 | $64,010,000 |
| | | | | | | | |
| I-71 total closure | | | | | | | |
| Const. Package #2 | LS | 39,000,000 | 1 | 1 | $39,000,000 | 0.865 | $33,735,000 |
| Const. Package #7 | LS | 28,000,000 | 1 | 1 | $28,000,000 | 0.865 | $24,220,000 |
| Const. Package #9 | LS | 49,000,000 | 1 | 1 | $49,000,000 | 0.865 | $42,385,000 |
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| Subtotal | | | | | $514,000,000 | | $444,610,000 |
| Contingency | @ | 0.00% | | | $0 | | $0 |
| Total | | | | | $514,000,000 | | $444,610,000 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-22

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Use contractor quality control and warranties in lieu of total KYTC construction inspection.

**ORIGINAL DESIGN:**
The standard method for overseeing transportation projects is to use total construction inspection on all elements of the project. The cost for engineering administration and total construction inspection can approach 10% of total construction. The current estimate for construction inspection on this project is over 6% of total construction cost.

**RECOMMENDED CHANGE:**
Use contractor quality control and warranties to alleviate total construction inspection.

The contractor quality control replacement should rely upon "pay for performance" criteria where payment is not made until quality assurance verifies the quality control.

The contractor warranties are meant to complement the immediate quality control and ensure the long term durability of the product. They serve as a significant financial incentive for the contractor to pursue quality control efforts and provide the long term durability.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $60,919,000 | | $60,919,000 |
| RECOMMENDED DESIGN | $56,045,000 | | $56,045,000 |
| ESTIMATED SAVINGS OR (COST) | $4,874,000 | $0 | $4,874,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-22

**ADVANTAGES:**

- Responsibility for quality resides with the Contractor, who has direct control of the quality
- The quality control costs are controlled by the low-bid or best value process rather than being part of QBS system where costs are generally not controlled
- Provides a two-layer (i.e. "checks and balances") system where quality control and quality assurance reside with different contractual parties rather than both quality control and quality assurance residing with the KYTC
- Eliminates the conflicts/arguments/blame where the contractor may claim that the KYTC is complicit with quality issues because of their total construction inspection
- Shifts risk of providing a quality product to the contractor
- May provide a higher quality product if applied and implemented properly

**DISADVANTAGES:**

- This method requires well written and thorough specifications in the original contract that will force quality through the quality control process
- Requires severe penalties that must be enforced when necessary (i.e. removal of significant portions of work if quality is not met)
- Requires rigorous quality assurance program on the part of KYTC where reduction of quality control is offset by increase in quality assurance
- Time needed after project completion to ensure product performance
- Warranty guidelines must be reasonable and enforceable
- Additional staffing required for warranty monitoring
- Financing of warranties

**JUSTIFICATION:**

The transportation industry has been migrating towards increasing the quality control responsibilities of the Contractor. This has mostly been limited to the quality control of materials where independent quality assurance testing can verify the material quality. This replaces the model where all quality responsibilities reside with the Engineer. The materials where this change has had the most impact include concrete and HMA. The KYTC itself has pursued contractor quality control, in fact a study was written and published in an ASCE Journal of Professional Issues in Engineering Education and Practice in September of 2003.

This model is also required in design-build contracts. Because design-build contracts have become more prevalent, this model has a lot of precedent. The specifications and contract language that has been used successfully in the past can be applied to this project.

# VALUE ENGINEERING RECOMMENDATION # VE-22

## CALCULATIONS

The actual construction inspection estimate is approximately 6% of total construction

Assume that 1/3 of construction inspection is direct quality control with 25% savings realized if those quality control costs are shifted from QBS to low bid or best value environment, therefore 0.5% savings to construction contract or 1/12 or 8% savings on construction inspection

# VALUE ENGINEERING RECOMMENDATION # VE-22

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Construction Inspection | LS | 55,380,713 | 1 | 1 | $55,380,713 | 0.920 | $50,950,256 |
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| Subtotal | | | | | $55,380,713 | | $50,950,256 |
| Contingency | @ | 10.00% | | | $5,538,071 | | $5,095,026 |
| Total | | | | | $60,918,784 | | $56,045,282 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-23

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Use steel plate girder bridges in lieu of steel tub girders throughout this project.

**ORIGINAL DESIGN:**
The original bridge superstructure designs include "concrete tub" and "steel box girders" (the top of the steel box is actually the deck slab). Steel tub girders are provided for all curved bridges and for all straight bridges exceeding 130 feet.

**RECOMMENDED CHANGE:**
Use steel plate girder bridges instead of steel tub girders. Provide a façade to provide an aesthetically pleasing appearance and to hide the deck drainage and/or utilities.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $75,352,000 | | $75,352,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $75,352,000 | $0 | $75,352,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-23

**ADVANTAGES:**

- Local experience for erection/fabrication
- Highly redundant which increases safety
- All details visible for inspection compared to the tub which requires interior inspection of interior fracture critical details
- Increased competition
- Least structure depth
- Drainage and utilities can be hidden
- Lowest Cost
- Can accommodate aesthetic treatments (façade, etc.)
- Steel plate girders are not fracture critical and tub girders are

**DISADVANTAGES:**

- More surface for paint compared to tub
- Provides roosting areas for pigeons and other birds
- Less aesthetically pleasing than the smooth exterior surface of steel tubs

**JUSTIFICATION:**
The critical Structure Type Recommendations (Report Dates 7/27/2005) indicates that a premium of $15 per square feet over all bridge deck area will be realized due to the use of steel tub girders. This alone is nearly 14% of the cost of the bridges and 7% of the total project cost of this section. Moreover the report refers to the need to provide structure depth greater than would otherwise be required and that these deeper structures were used to set the profile. This results in a hidden cost for approach roadway embankment as well as increases in superstructure heights and subsequent costs. The effect is even more than implied by the type study recommendations report because the main structure depth of 60 inches is correlated to a 150 feet span for the steel girder (span/30 = 5' or 60"), however this limit is for a simple span bridge. In fact, the maximum span for a continuous girder (based on the distance between the inflection points) for a 60 inch girder is nearly 250 feet because 0.6 (250)/30 = 5 feet = 60 inches.

In other words all continuous girders with spans less than 250 feet could have a girder depth less than 60 inches and therefore a lower profile than could be provided using steel tub girders. Based on a rough estimate of 750,000 SY of pavement of the job, lowering the fill by one foot would result in a savings of 750,000 SY x 0.333 CY/SY = 250,000 CY of embankment and therefore a savings of 250,000 CY x $9/CY = $ 2,250,000.

# VALUE ENGINEERING RECOMMENDATION # VE-23

## DISCUSSION CONTINUED

The average maximum span appears to be in the 150 feet range with corresponding maximum allowable steel depth of 3 feet, i.e. 2 feet less than a minimum required for steel tubes. Therefore, a 1-2 feet embankment reduction appears very feasible.

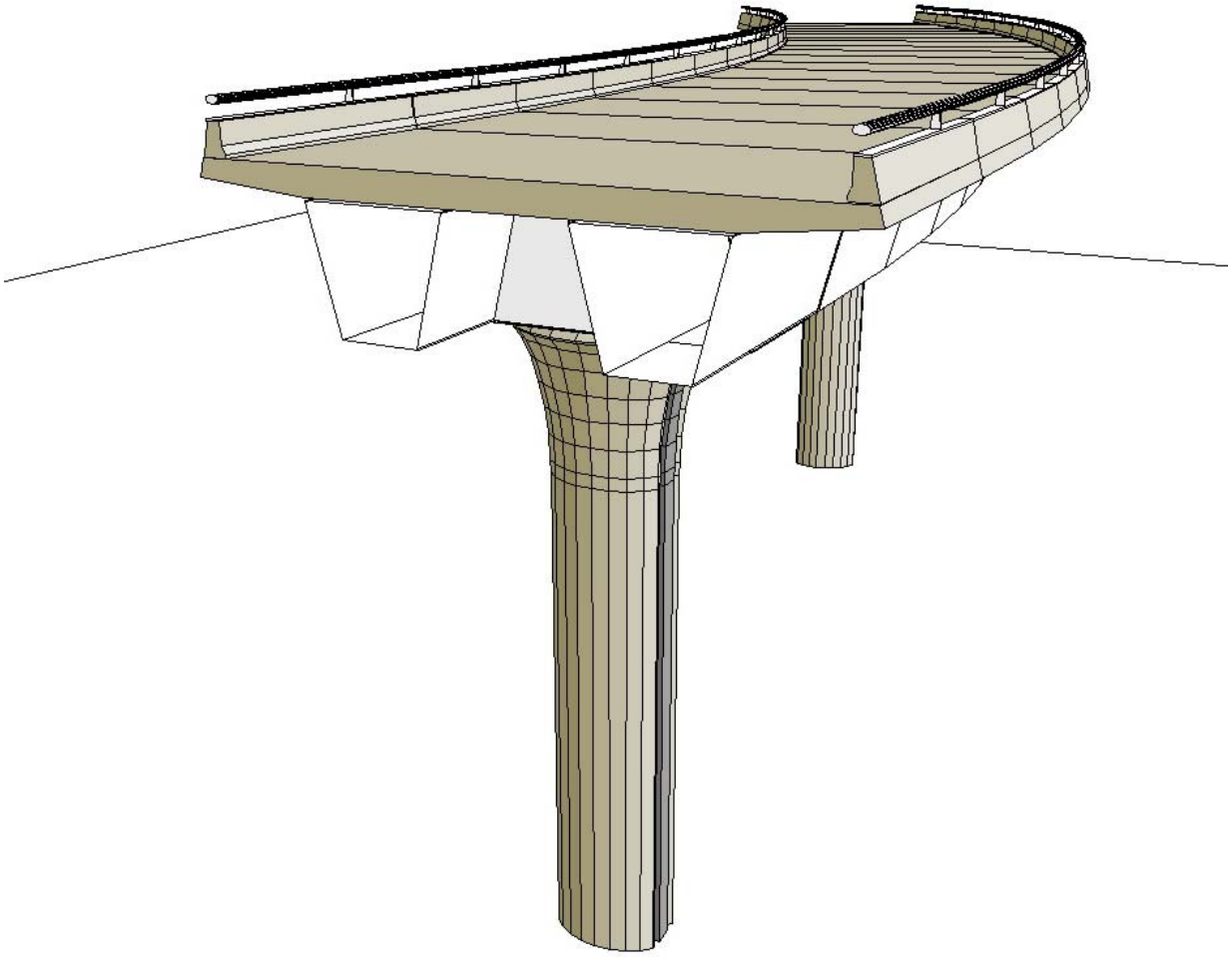
In addition by their nature, the tubs are fracture critical and many of the fracture critical elements require inspection from the inside of the girders. The additional torsional capacity is of little value when two or more tubs are used. On the contrary, plate girders are highly redundant and easily inspected. They can provide minimum structural depth, and especially in situations where ramps are stacked, they will provide the least overall height and result in the biggest reduction of the "hidden" costs (i.e. increased substructure and embankment costs). Neglecting the hidden costs, this change would reduce the project cost by $68.5 million while increasing the safety of the system.

**15/(135-15) = 13.6% increase say 14%**
**14% ($489,296,500) = $68,501,510**

The cost of providing a decorative façade would decrease this savings; however, with the information currently available, the VE team was not able to determine the number of square feet of decorative façade required. Considering the reduction in embankment costs and allowing a cost of 1 million dollars for the façade, the net savings associated with using plate girders in lieu of tub girders will exceed $70 million.

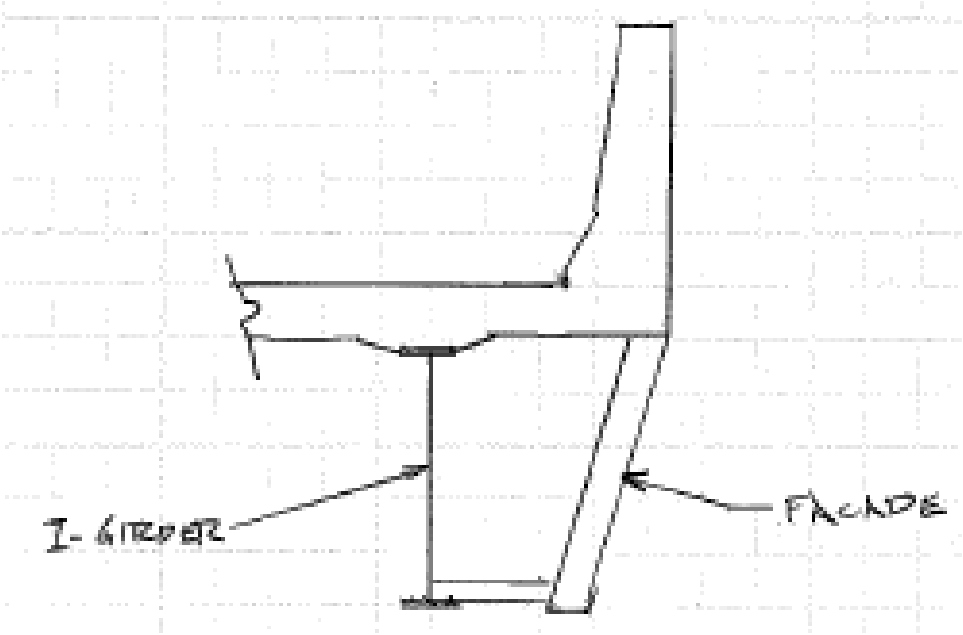
# VALUE ENGINEERING RECOMMENDATION # VE-23

## SKETCH OF ORIGINAL DESIGN

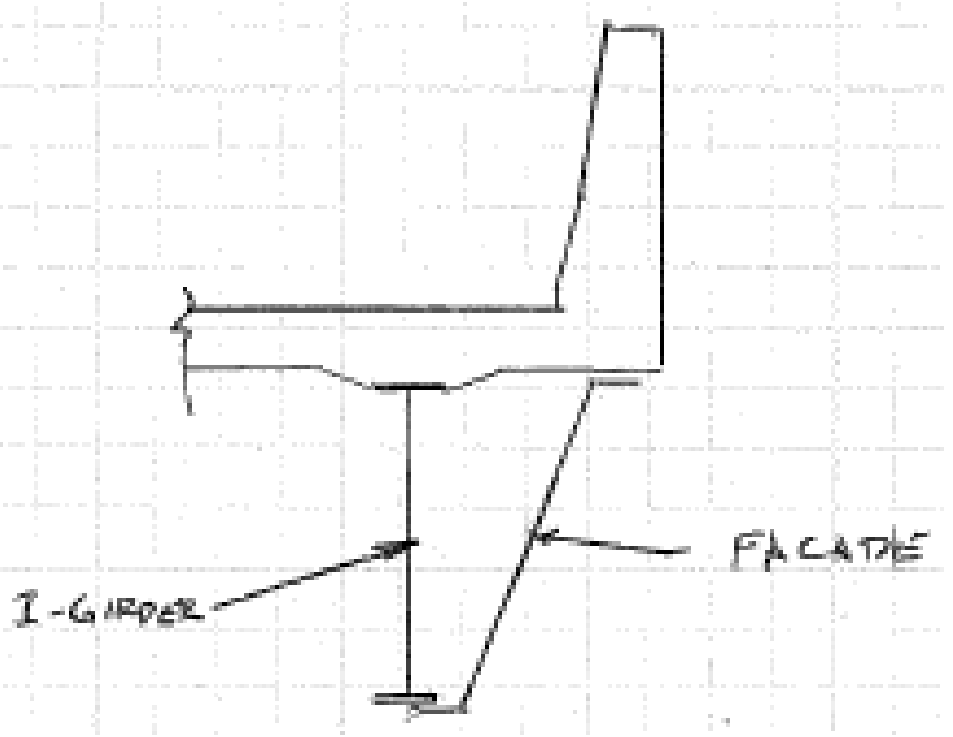


## VALUE ENGINEERING RECOMMENDATION # VE-23

### SKETCH OF RECOMMENDED DESIGN




Or



# VALUE ENGINEERING RECOMMENDATION # VE-23

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Cost of tub girders | LS | 68,501,510 | 7 | 1 | $68,501,510 | | |
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| | | | | | | | |
| Subtotal | | | | | $68,501,510 | | $0 |
| Contingency | @ | 10.00% | | | $6,850,151 | | $0 |
| Total | | | | | $75,351,661 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-24

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Maintain constant width for bridges B64-2, B64-15, B71-10 and B65-24A in lieu of having the bridge width conform to the roadway geometry.

**ORIGINAL DESIGN:**
The following bridges vary in width as follows according to the available information:
B64-2: Total length of 831 ft. with width varying from 35.8 ft to 32.2 ft.
B64-15: Total length of 70 ft. with width varying from 86'-2" to 85'-4" (10")
B71-10: Total length of 246 ft. with width varying from 47.0 ft. to 49.8 ft.
B65-24A: Total length of 1344 ft. with width in Span 1 varying from 37.1 ft. to 38.0 ft.

**RECOMMENDED CHANGE:**
The following bridges can be configured with constant bridge widths set as follows:
B64-2: 35.8 ft.
B64-15: 86'-2"
B71-10: 49.8 ft.
B65-24A: 38.0 ft.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $407,000 | | $407,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $407,000 | $0 | $407,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-24

**ADVANTAGES:**

- Simplify deck placement by having screed machine set to a constant width
- Simplify girder bracing geometry, thus saving fabrication cost and less chance for fabrication and erection

**DISADVANTAGES:**

- Slight increase bridge deck area

**JUSTIFICATION:**
The bridges should be configured to have a constant bridge width set to the largest width needed over the length of the bridge. This would simplify the construction of the bridge deck placement since the screed machine could be set to a constant width. Also, savings would be realized in steel fabrication costs by simplifying the girder bracing geometry in lieu of the bracing width varying between the girders. It would be less expensive to stripe the taper on the roadway using pavement markings. The increase in bridge deck area would be equal to or less than 5% since the variation in taper is not that much. This additional deck area would easily be offset with savings in steel fabrication cost and simplified deck placement cost.

# VALUE ENGINEERING RECOMMENDATION # VE-24

## CALCULATIONS

***Additional deck area to make bridges constant width***

| Bridge | Length Bridge | Area of deck ($ft^2$) | | % Increase |
|---|---|---|---|---|
| | | Tapered | Constant | |
| B64-2 | 831 | 28254 | 29750 | 5.3% |
| B64-15 | 70 | 6003 | 6032 | 0.5% |
| B71-10 | 246 | 11906 | 12251 | 2.9% |
| B65-24A (1) | 1344 | 50987 | 51072 | 0.2% |

***Cost Savings for making bridge widths constant***

| Bridge | Cost (2) | 5% savings | |
|---|---|---|---|
| B64-2 | $4,325,000 | $216,250 | |
| B64-15 | $505,000 | $25,250 | |
| B71-10 (3) | $1,370,000 | $68,500 | |
| B65-24A | $9,030,000 | $63,828 | See note (4) |
| Estimated Savings | | $373,828 | |
| | **Say** | **$370,000** | |

Notes:
(1) Assume variable end span is 190 ft. long with width varying from 37.1 ft to 38.0 ft.
(2) 2006 Joint Inspection Cost Estimate, Table 4.5.1
(3) Based on $115/SF since Joint Cost Estimate has bridge part of lump sum with 2 other bridges
(4) 5% savings based on pro-rated cost for Span 1 only (190 ft)

# VALUE ENGINEERING RECOMMENDATION # VE-24

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Modifying bridge geometry | LS | 370,000 | 7 | 1 | $370,000 | | |
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| Subtotal | | | | | $370,000 | | $0 |
| Contingency | @ | 10.00% | | | $37,000 | | $0 |
| Total | | | | | $407,000 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-25

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a 2-lane typical section with 6 feet bike lanes on Clay Street in lieu of a 4-lane typical section with 6 feet bike lanes.

**ORIGINAL DESIGN:**
The original design calls for a four-lane typical section with a varying flush median from 0-12 feet. The design also includes 6 feet bike lanes in each side of the road.

**RECOMMENDED CHANGE:**
The recommended change to the typical section would eliminate one lane in each direction. The new typical section would be one-lane in each direction with a median varying from 0-12 feet. The recommended typical will include 6 feet bike lanes and 5 feet sidewalks on each side.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $1,045,000 | | $1,045,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $1,045,000 | $0 | $1,045,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-25

**ADVANTAGES:**

- Reduces 5,600 SY of pavement
- Reduces 5,568 SF of bridge surface
- Reduces perpetual maintenance cost due to shortened bridges

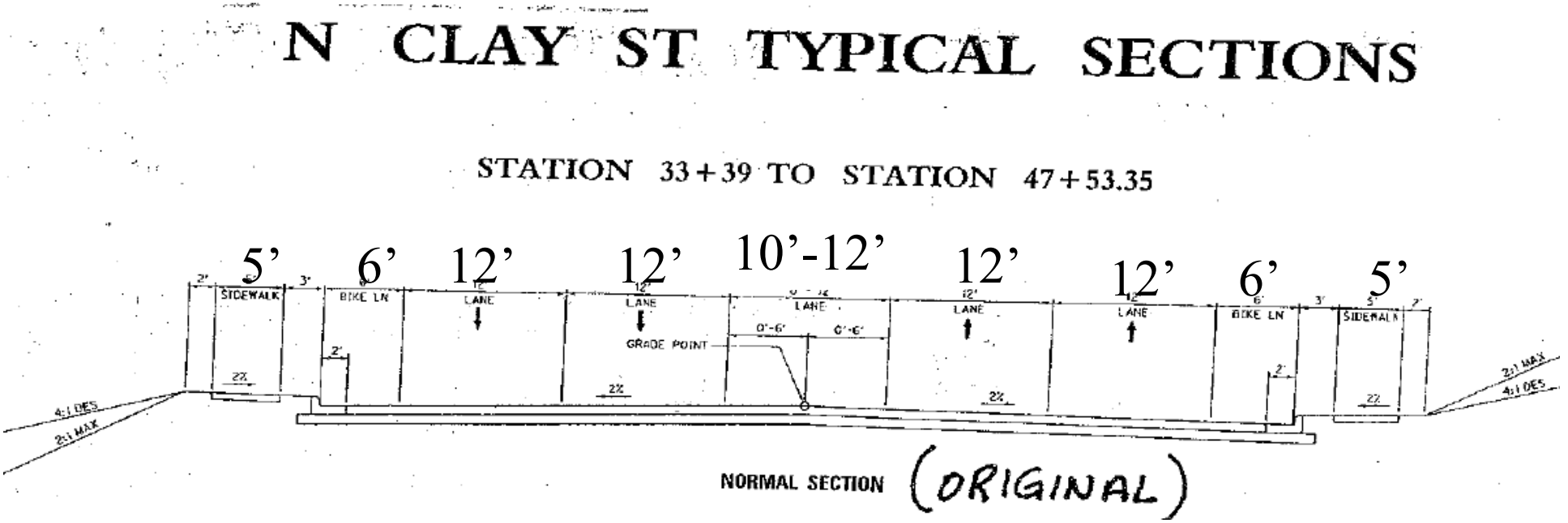
**DISADVANTAGES:**

- Reduces capacity from Clay Street that could be used in the long term

**JUSTIFICATION:**
The reduced typical section is justified for Clay Street since the ADT is less than 2,000. This ADT was taken from a recent traffic count performed by the city. Additionally, the reduction in the pavement and bridge area reduces the initial and long term cost commitments.

## VALUE ENGINEERING RECOMMENDATION # VE-25

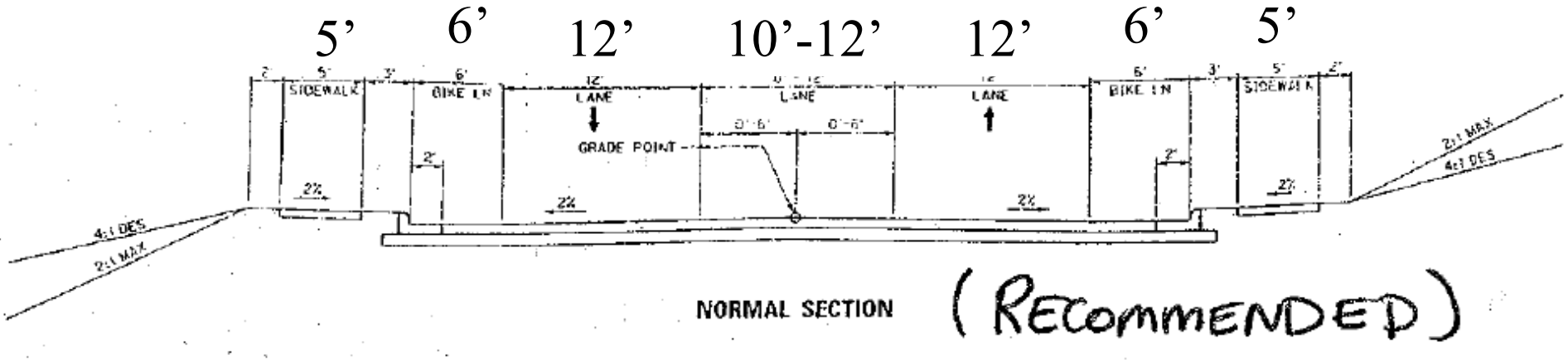
### SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING RECOMMENDATION # VE-25

### SKETCH OF RECOMMENDED DESIGN

STATION 33+39 TO STATION 47+53.35




NORMAL SECTION (RECOMMENDED)

## VALUE ENGINEERING RECOMMENDATION # VE-25

### CALCULATIONS

Station 33+39 to Station 47+53

Length = 1414'
Width Reduction = 24'

Pavement Area = (24) x (1414) ÷ 9
= 3770 SY

Unit price for payment = $ 60/SY

Cost Savings = (3770)(60) = $ 226,240

∴ Bridge Area

| Bridge # | Bridge Width | Width Reduction | Area |
|---|---|---|---|
| 64-10 (500) | 30' | 24' | 720 SF |
| 64-8A (880) | 44' | 24' | 1056 SF |
| 64-9 (720) | 42' | 24' | 1008 SF |
| 71-10A (820) | 32' | 24' | 768 SF |
| 64-7B (815) | 34' | 24' | 816 SF |
| 64-7A (805) | 50' | 24' | 1200 SF |
| | | Total = | 5568 SF |

Assum Bridge Cost = $ 130/SF

Cost Savings = (5568 SF) ($ 130/SF)
= $ 723,840

Total: $ 226,240 + $ 723,840 = $ 950,000

# VALUE ENGINEERING RECOMMENDATION # VE-25

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Pavement | SY | 60.00 | 1 | 3,770 | $226,200 | | |
| Bridge Surface | SF | 130.00 | 1 | 5,568 | $723,840 | | |
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| Subtotal | | | | | $950,040 | | $0 |
| Contingency | @ | 10.00% | | | $95,004 | | $0 |
| Total | | | | | $1,045,044 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-26

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Construct Frankfort Avenue as a 2-lane facility in lieu of a 4-lane facility with a median.

**ORIGINAL DESIGN:**
Construct Frankfort Avenue as a four lane facility with a median. This requires tapering the existing two-lane without a median to a three-lane with a 12 foot median and sidewalk, and further taper to four-lane with a smaller median, but add bike lanes. Then taper to four-lane with up to a 40 foot median

**RECOMMENDED CHANGE:**
Construct the entire length of Frankfort Avenue as a two-lane facility with a right-turn lane for the entrance ramp to Ramp 35 and right-turn to River Road from northbound Frankfort Avenue. Also, construct a left turn lane to Ramp 35 from southbound Frankfort Avenue.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $291,000 | | $291,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $291,000 | $0 | $291,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-26

**ADVANTAGES:**

- Reduces the amount of pavement required
- Reduces the construction time, thereby enhancing traffic management
- Reduces the future roadway maintenance activities (example: sweeping, de-icing)
- Allows for movements onto Ramp 35 without disrupting Frankfort Avenue
- Allows easier traffic crossing because of reduced width
- Allows for areas outside of the travel-way for aesthetics
- Allows for the bike path and sidewalk to be further from the roadway for safety

**DISADVANTAGES:**

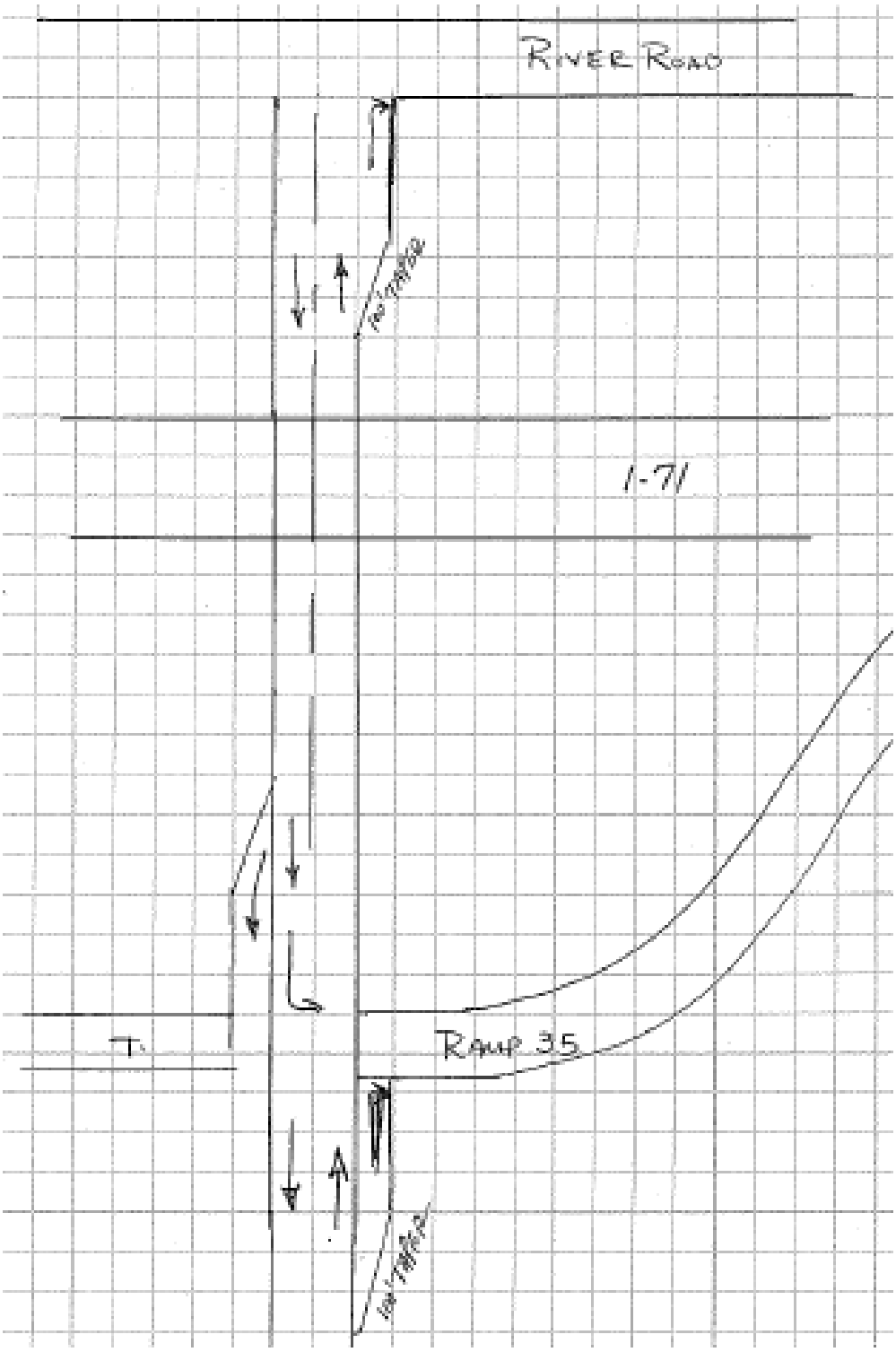
- Reduces the potential or future capacity of Frankfort Avenue
- May reduce aesthetic appeal from Boulevard type appearance to typical two-lane

**JUSTIFICATION:**

The VE team suggests reducing Frankfort Avenue to a more traditional two-lane facility with outside turn pockets at Ramp 35 and River Road. It appears this road has been widened to improve the aesthetic appeal of this "gateway", but the VE team feel the multiple oblong medians will likely cause traffic issues. A 2-lane facility can be just as aesthetically pleasing as a 4-lane facility.

# VALUE ENGINEERING RECOMMENDATION # VE-26

## SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-26

## CALCULATIONS

| | | | |
|---|---|---|---|
| 1)AREA | STA 14 + 37 to 18+44.2 | C+G 2x407 | 814 LF |
| | Eliminate Avg. 5' Median | Pave ○ | ○ |
| | Eliminate 2 curb and gutter | Median 85'x407'÷9 | 226s.y. |
| 2)AREA | STA 18+44.2to 22+50 | C+G 2x406 | 812 LF |
| | Eliminate 15' Median (Avg.) | Pave 1 ½ x 12'x406 ÷9 | 812s.y. |
| | Eliminate 2 C+G | Median 15x406÷9 | 676s.y. |
| | Eliminate 1 ½ -12' lane (Avg.) | | |
| 3)AREA | STA 22+50 to 25+50 | C+G 2x300 | 600 LF |
| 3) | Eliminate 8' Median | Pave 2x12'x300÷9 | 800s.y. |
| | Eliminate 2 C+G | Median 8x300÷9 | 267s.y. |
| | Eliminate 2-12' lanes | | |
| 4)AREA | STA 25+50 to 33 +275 | C+G 2x777.5 | 1555 LF |
| | Eliminate 30' Median (Avg.) | Pave 2x12x777.5÷9 | 2,073s.y. |
| | Eliminate 2 C+G | Median 30x777.5÷9 | 2,592s.y. |
| | Eliminate 2-12' lanes | | |
| 5)Right-turn to Ramp 35 from Frankfort Avenue northbound | | | |
| | 100' Taper (0 to 12') | Pave {(0+12) ÷2 }x 100÷9 | 67s.y. |
| | 150' Storage (12') | 12x150 ÷9 | 200s.y. |
| 6)Right-turn to River Road from Frankfort Avenue northbound | | | |
| | 100' Taper (0 to 12') | Pave {(0+12) ÷2 }x 100÷9 | 67s.y. |
| | 150' Storage (12') | 12x150 ÷9 | 200s.y. |
| 7)Left turn to Ramp 35 from Frankfort Avenue | | | |
| | 100' Taper (0-12') | Pave {(0+12) ÷2 }x 100÷9 | 67s.y. |
| | 200' Storage (12') | 200x12÷9 | 267s.y. |

# VALUE ENGINEERING RECOMMENDATION # VE-26

## CALCULATIONS

| ITEM (AREA) | UNITS | COST/ UNIT | ORIGINAL | UNITS REC | REVISED COST |
|---|---|---|---|---|---|
| **PAVEMENT** | | | | | |
| 1 | ○ | 60SY | ○ | ○ | ○ |
| 2 | 812 | 60SY | 48,720 | ○ | ○ |
| 3 | 800 | 60SY | 48,000 | ○ | ○ |
| 4 | 2073 | 60SY | 124,380 | ○ | ○ |
| 5 | ○ | 60SY | ○ | 267 | 16,020 |
| 6 | ○ | 60SY | ○ | 267 | 16,020 |
| 7 | ○ | 60SY | ○ | 334 | 20,040 |
| **C + G** | | | | | |
| 1 | 814 | 13.40LF | 10,908 | ○ | ○ |
| 2 | 812 | 13.40LF | 10,881 | ○ | ○ |
| 3 | 600 | 13.40LF | 8,040 | ○ | ○ |
| 4 | 1555 | 13.40LF | 20,837 | ○ | ○ |
| **MEDIAN** | | | | | |
| 1 | 226 | 12SY | 2712 | ○ | ○ |
| 2 | 676 | 12SY | 8112 | ○ | ○ |
| 3 | 267 | 12SY | 3204 | ○ | ○ |
| 4 | 2592 | 12SY | 31104 | ○ | ○ |
| **TOTAL** | | | 316,898 | | 52,080 |
| **DIFFERENCE** | | | | | **264,818** |

-Average Cost from MISC island barriers developed from 2006 average unit bid price list.

# VALUE ENGINEERING RECOMMENDATION # VE-26

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| 2-lanes versus 4-lanes on Frankfort Avenue savings | LS | 264,818 | 7 | 1 | $264,818 | | |
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| Subtotal | | | | | $264,818 | | $0 |
| Contingency | @ | 10.00% | | | $26,482 | | $0 |
| Total | | | | | $291,300 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-27

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Eliminate the proposed bike path and relocate to the old railroad bridge.

**ORIGINAL DESIGN:**
Construct a bike path from unknown origin to the eastside of the new northbound I-65 Ohio River Bridge. This path will require superstructure construction to achieve elevation difference from the ground level to the bridge. This option requires the northbound bridge to be 17 feet wider, with high barrier walls, or barriers with rails across the length of the superstructure. (Similar situation may occur on the Indiana side of the river)

**RECOMMENDED CHANGE:**
Eliminate the bike path as proposed, completely removing all associated elements required on the new I-65 northbound bridge structure. Construct a new bike path from the north side of River Road to the old railroad bridge via a ramp. (Similar situation may occur on the Indiana side of the Ohio River)
The existing railroad structure would facilitate all bike path and pedestrian traffic that is proposed for the new I-65 northbound structure.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $44,705,000 | | $44,705,000 |
| RECOMMENDED DESIGN | $6,808,000 | | $6,808,000 |
| ESTIMATED SAVINGS OR (COST) | $37,897,000 | $0 | $37,897,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-27

**ADVANTAGES:**

- Eliminate the need for a wider new I-65 northbound structure
- Allows more continuous flow from the north side of River Road
- Allows for easier future expansion of a bike path through the area to existing lawn area and future park areas along the river
- Eliminates pedestrians and bikers from high speed interstate facility
- Provides utilization of the existing structure, now underutilize
- Moves ramp from the roadway construction area
- Allows for phasing to be inconsequential to building a ramp to the old bridge
- Allows the path to be usable, regardless of actual construction on interstates
- Allows for easy expansion of the bike path east-west along River Road to access and future park area

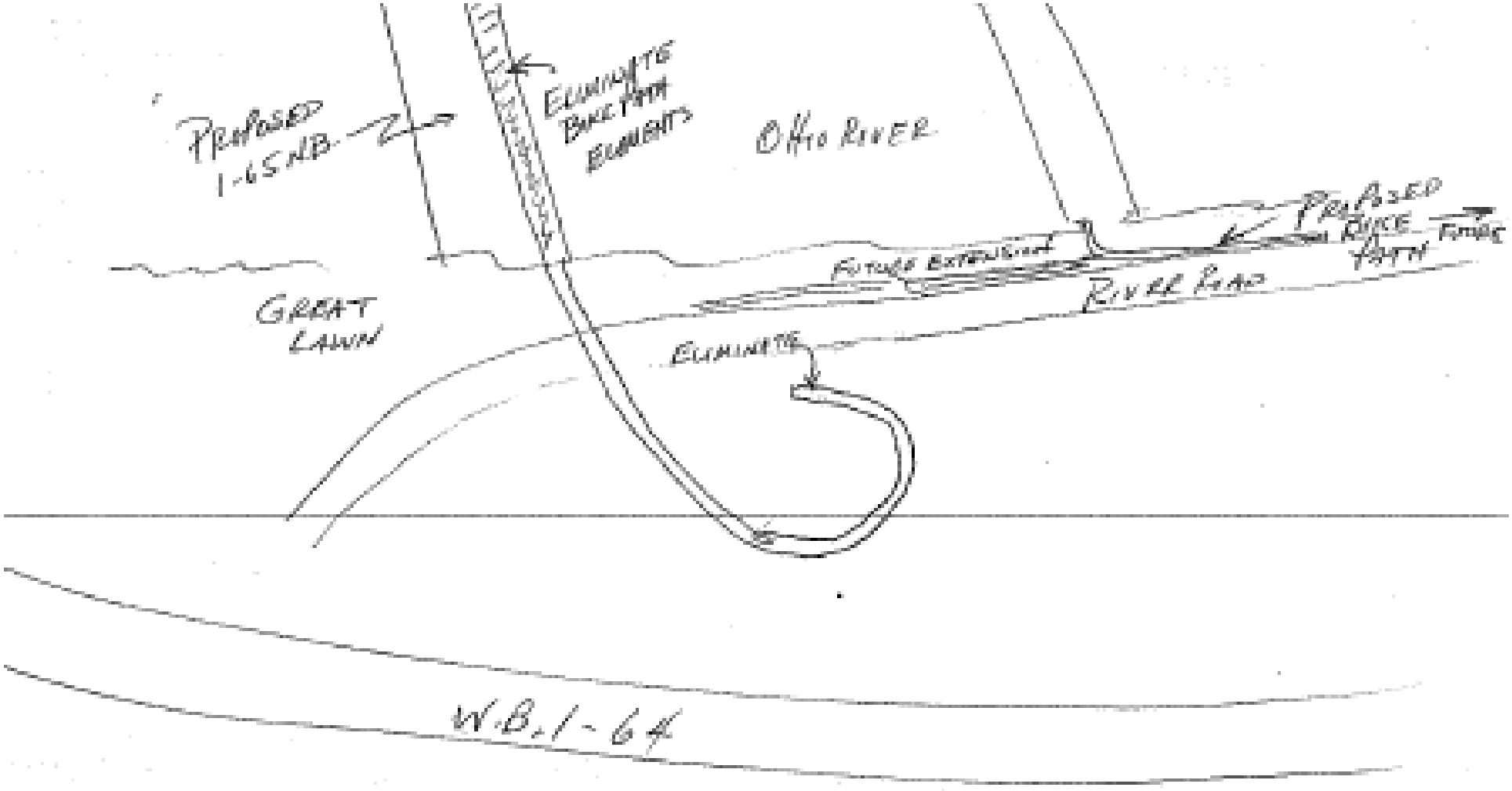
**DISADVANTAGES:**

- Requires utilizing an old structure which may require extra maintenance
- Path to old bridge may reduce usable "park" area north of River Road (example: under required structures)
- Requires old bridge rehab

**JUSTIFICATION:**
The construction of a bike path to the old bridge will shorten the time for a usable path across the Ohio River. The existing non-used bridge presents a viable alternative to the "no build" from the VE Group LLC Value Engineering Report, but keeps their recommendation of removing all associated structures from the new I-65 northbound

## VALUE ENGINEERING RECOMMENDATION # VE-27

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-27

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Bridge 5-6 | LS | 2,354,000 | 1 | 1 | $2,354,000 | | |
| Roadway/Pave | LS | 423,594 | 1 | 1 | $423,594 | | |
| Path Element | LS | 2,700,527 | 1 | 1 | $2,700,527 | | |
| I-65 northbound x width | LS | 510 | 1 | 56,750 | $28,942,500 | | |
| Indiana Path | LS | 5,500,000 | 1 | 1 | $5,500,000 | | |
| Bridge 5-8 | LS | 720,000 | 1 | 1 | $720,000 | | |
| Rehab R/R | SF | 112 | 1 | | | 42,000 | $4,704,000 |
| South End Ramp Br | SF | 112 | 1 | | | 6,630 | $742,560 |
| North End Ramp Br | SF | 112 | 1 | | | 6,630 | $742,560 |
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| Subtotal | | | | | $40,640,621 | | $6,189,120 |
| Contingency | @ | 10.00% | | | $4,064,062 | | $618,912 |
| Total | | | | | $44,704,683 | | $6,808,032 |

*Cost estimate originally developed by the VE Group, LLC VE Study

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-28

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Provide a conventional reinforced earth wall outside of CSD area.

**ORIGINAL DESIGN:**
Construct CSD walls throughout the project. Although many areas are deemed design sensitive, many areas are not.

**RECOMMENDED CHANGE:**
Eliminate the CSD walls wherever possible, and construct more conventional style earth walls.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $2,762,000 | | $2,762,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $2,762,000 | $0 | $2,762,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-28

**ADVANTAGES:**

- Minimizes construction time for wall construction
- Reduces maintenance structure required

**DISADVANTAGES:**

- May not be aesthetically pleasing

**JUSTIFICATION:**
Increased construction and maintenance activities have been deemed appropriate through sensitive design areas. Many areas of the project have not been so designated. Constructing more typical earth walls will reduce construction time and minimize or eliminate many maintenance activities for the life of the project.

# VALUE ENGINEERING RECOMMENDATION # VE-28

## CALCULATIONS

| Structure # | MSE/CSD | Std. Reinforce | Difference |
|---|---|---|---|
| IW64-8 | 831,400 | 665,000 | 166,300 |
| IW64-20 | 530,300 | 424,200 | 106,100 |
| W71-1 | 693,000 | 554,400 | 138,600 |
| W71-5 | 216,200 | 173,000 | 43,200 |
| W71-3 | 101,400 | 81,100 | 20,300 |
| W71-4 | 498,700 | 399,000 | 99,700 |
| W71-7 | 700,000 | 560,000 | 140,000 |
| IW64-4 | 96,000 | 76,800 | 19,200 |
| W65-12 | 1,174,000 | 939,500 | 234,900 |
| W65-9 | 1,275,100 | 1,020,000 | 255,100 |
| W65-7 | 277,800 | 222,200 | 55,600 |
| W65-7.1 | 83,800 | 67,000 | 16,800 |
| W65-6 | 206,700 | 165,400 | 41,300 |
| IW64-2 | 707,800 | 566,200 | 141,600 |
| W64-6 | 515,900 | 412,700 | 103,200 |
| IW64-11 | 526,100 | 420,900 | 105,200 |
| IW64-1 | 430,100 | 344,100 | 86,000 |
| W64-7 | 188,800 | 151,000 | 37,800 |
| W65-12.3 | 52,200 | 41,800 | 10,400 |
| W65-10.1 | 89,500 | 71,600 | 17,900 |
| W65-9.2 | 36,200 | 29,000 | 7,200 |
| W65-9.1 | 84,200 | 67,400 | 16,800 |
| W65-12.2 | 79,000 | 63,200 | 15,800 |
| W65-12.1 | 566,800 | 453,400 | 113,400 |
| W71-2 | 1,266,700 | 1,013,400 | 253,300 |
| W64-3 | 377,000 | 301,600 | 75,400 |
| W64-5 | 452,600 | 362,100 | 90,500 |
| W65-1 | 733,200 | 586,600 | 146,600 |
| TWG5-1 | 116,500 | 93,200 | 23,300 |
| TWG5-1A | 76,000 | 60,800 | 15,200 |
| W65-2 | 540,000 | 432,000 | 108,000 |
| TWG5-2 | 47,000 | 37,600 | 9,400 |
| TWG5-3 | 133,500 | 106,800 | 26,700 |
| **TOTAL** | | | **2,510,800** |

# VALUE ENGINEERING RECOMMENDATION # VE-28

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Conventional reinforced earth wall savings | LS | 2,510,800 | 7 | 1 | $2,510,800 | | |
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| Subtotal | | | | | $2,510,800 | | $0 |
| Contingency | @ | 10.00% | | | $251,080 | | $0 |
| Total | | | | | $2,761,880 | | $0 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-29

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Reduce length of the project by stopping new construction on I-64 just south of the Mellwood exit.

**ORIGINAL DESIGN:**
Refurbish I-64 south of Mellwood exit and taper/ transition traffic to existing/ proposed lane widths.

**RECOMMENDED CHANGE:**
Reduce length of project and maintain geometrics required in adding or dropping lanes.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $556,000 | | $556,000 |
| RECOMMENDED DESIGN | $0 | | $0 |
| ESTIMATED SAVINGS OR (COST) | $556,000 | $0 | $556,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-29

**ADVANTAGES:**

- Reduce length of work zone
- Reduce future maintenance associated with median barrier wall and enclosed drainage system
- Provide resource for other projects
- Shorten exposure of the construction crews to traffic hazards

**DISADVANTAGES:**

- Possible eliminate resurfacing project in this segment

**JUSTIFICATION:**
Stopping the new construction of I-64 south of Mellwood will provide resources for other phases of proposed or other projects. It will also eliminate future maintenance cost for this area.

# VALUE ENGINEERING RECOMMENDATION # VE-29

## CALCULATIONS

I-64 "REFURBISH" SEGMENT.

* FROM RAMP #24 TOWARDS BEG. +/- 2000'
* SHORTEN +/- 1800'

CALC'S →

* PAVEMENT
  EST: 1800' x 30'/9 = 6000 S.Y.
  COST = 60/S.Y. x 6,000 S.Y.
  = $360,000
* DGA
  COST: 6000 S.Y. x $5/TON x 6" x 115#/1000
  = $30,000
* B-WALL
  COST: 1800 L.F. x $50/EA
  = $90,000
* MISC: STAKE, EROSION, DRAINAGE, CLEAR/GRUB
  = 480,000 x 5%
  = $24,000

TOTAL = $500,000

# VALUE ENGINEERING RECOMMENDATION # VE-29

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Pavement | SY | 60.00 | 1 | 6,000 | $360,000 | | |
| DGA | Ton | 15.00 | 1 | 2,100 | $31,500 | | |
| Barrier wall | LF | 50.00 | 1 | 1,800 | $90,000 | | |
| Miscellaneous | LS | 24,000.00 | 7 | 1 | $24,000 | | |
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| Subtotal | | | | | $505,500 | | $0 |
| Contingency | @ | 10.00% | | | $50,550 | | $0 |
| Total | | | | | $556,050 | | $0 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-30

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a retaining wall on the north side (Ohio River side) of Ramp 32 in lieu of a 2:1 slope and right-of-way fence.

**ORIGINAL DESIGN:**
Allow slope of Ramp 32 to run out at a 2:1 slope. Access to the ramp and the interchange would be prohibited by right-of-way fence along toe of slope area. Due to high visibility and aesthetics this area will be well landscape.

**RECOMMENDED CHANGE:**
In applicable areas create a retaining wall with height up to 30'. Utilize walls as barrier in lieu of right-of-way fence. Create more accessible area for future use.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $2,220,000 | | $2,220,000 |
| RECOMMENDED DESIGN | $693,000 | | $693,000 |
| ESTIMATED SAVINGS OR (COST) | $1,527,000 | $0 | $1,527,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-30

**ADVANTAGES:**

- Reduce maintenance cost in the future for inevitable landscaping in highly visible locations
- Reduce need for embankment material on project
- Increase flood plain storage area
- Increase “usable” area for future recreation or development

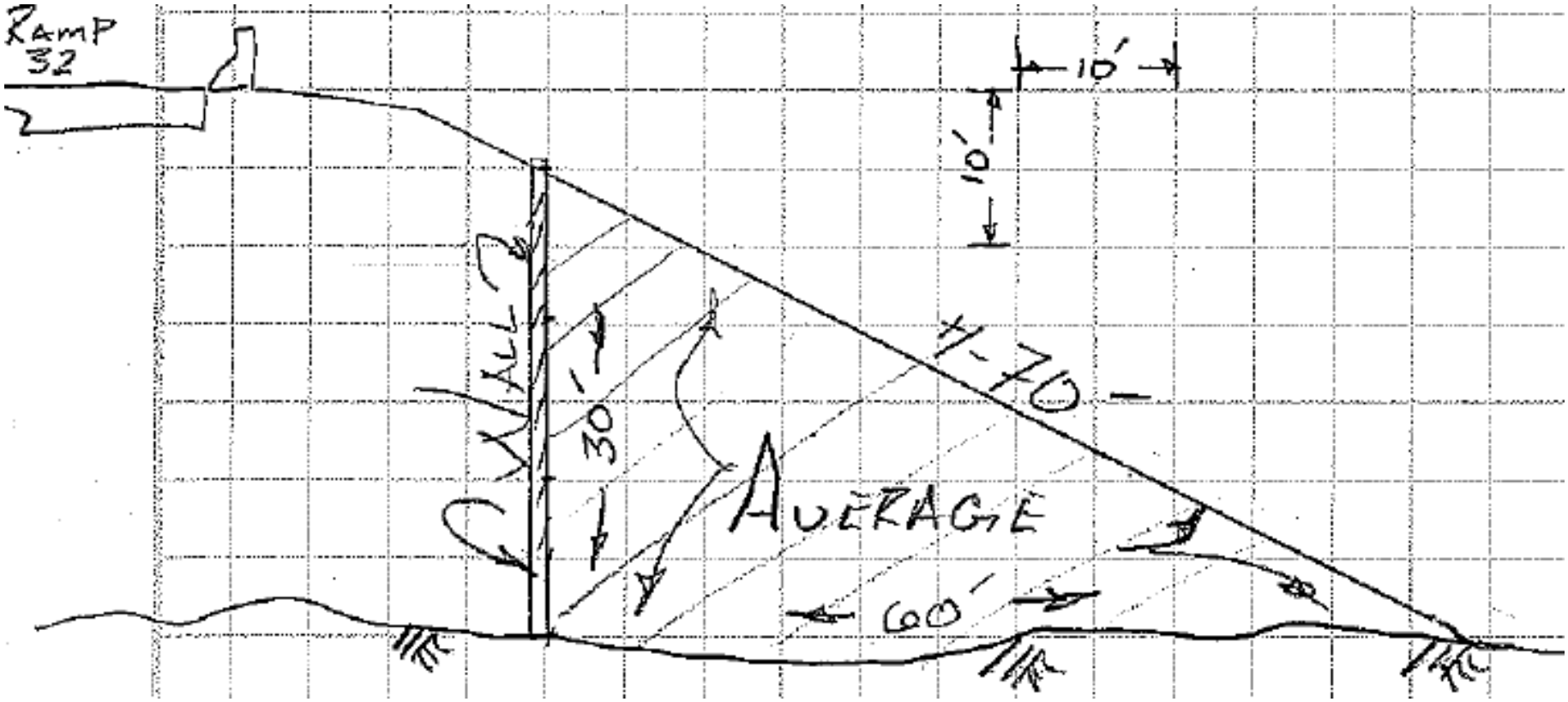
**DISADVANTAGES:**

- Remove palette for landscaping possibilities

**JUSTIFICATION:**
Utilizing retaining walls increases available “usable” area along the river front area. Maintenance cost in future slope repair and landscaping issues would be reduced. Also it would eliminate the amount of landscaping that would be mandated due to high visibility location, which would cause expenditure of future maintenance funds on aesthetic.

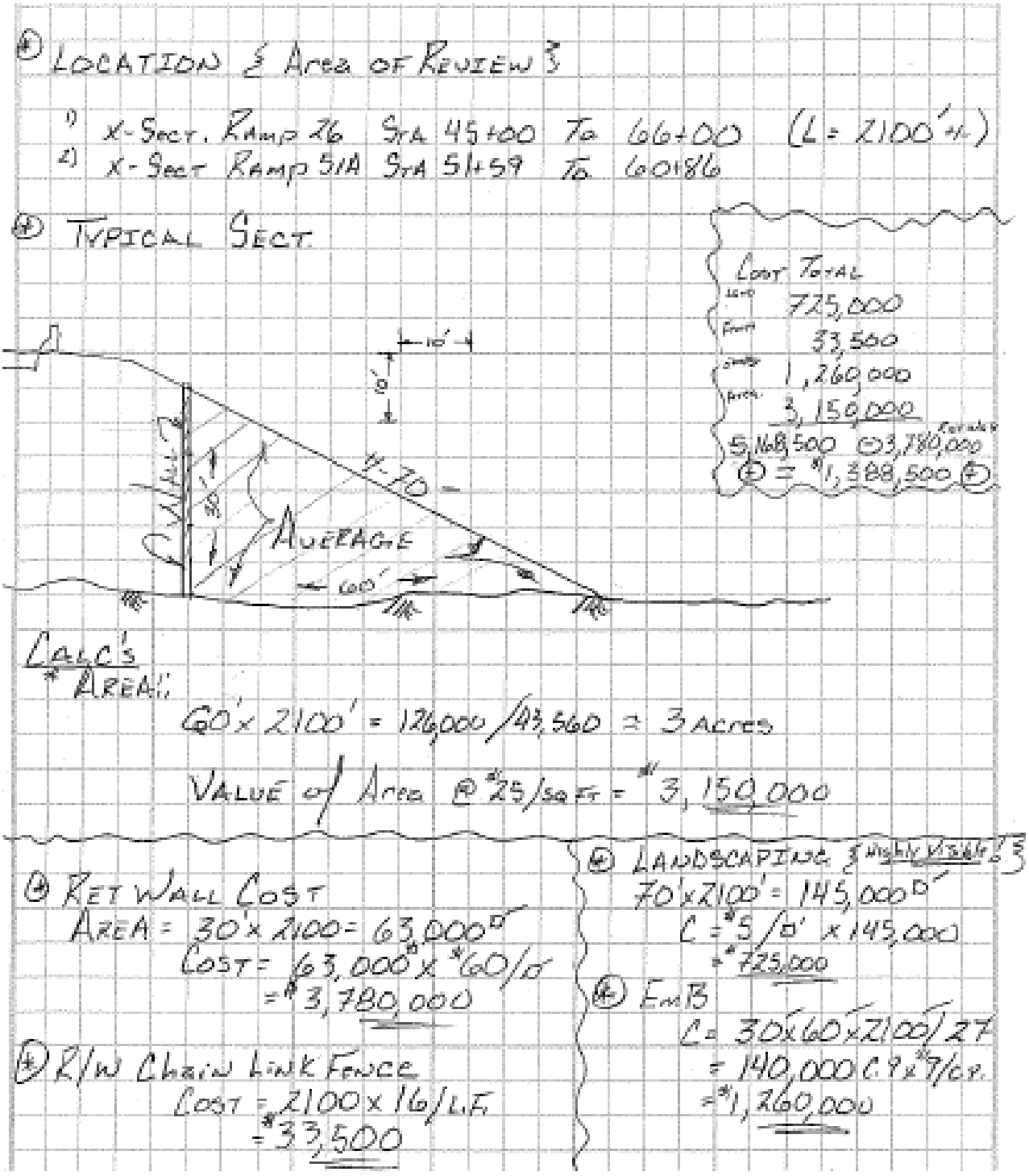
## VALUE ENGINEERING RECOMMENDATION # VE-30

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING RECOMMENDATION # VE-30

## CALCULATIONS



# VALUE ENGINEERING RECOMMENDATION # VE-30

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| EMB | CY | 9.00 | 1 | 140,000 | $1,260,000 | | |
| Retaining Wall | SF | 60.00 | 1 | | | 63,000 | $3,780,000 |
| Chain Link Fence | LF | 16.00 | 1 | 2,100 | $33,600 | | |
| Landscaping | SF | 5.00 | 7 | 145,000 | $725,000 | | |
| Sell Excess R/W | SF | 25.00 | 7 | | | -126,000 | -$3,150,000 |
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| Subtotal | | | | | $2,018,600 | | $630,000 |
| Contingency | @ | 10.00% | | | $201,860 | | $63,000 |
| Total | | | | | $2,220,460 | | $693,000 |

SOURCE CODE:
1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

# VALUE ENGINEERING RECOMMENDATION # VE-31

PROJECT: OHIO RIVER BRIDGES, SECTION 1 - KENNEDY INTERCHANGE
LOCATION: LOUISVILLE, KENTUCKY:
STUDY DATE: JANUARY 28 - FEBRUARY 1, 2008

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize the existing bridges and/or proposed bridge in lieu of utilizing temporary bridge T-12 during construction phasing.

**ORIGINAL DESIGN:**
Construct T-12 as a temporary structure during phasing, while structure 71-0 is constructed permanently.

**RECOMMENDED CHANGE:**
Utilize existing deck substructures and substructures along with crossovers to maintain traffic in order to reconstruct the proposed bridges.

| SUMMARY OF COST ANALYSIS | | | |
|---|---|---|---|
| | First Cost | O & M Costs (Present Worth) | Total LC Cost (Present Worth) |
| ORIGINAL DESIGN | $2,820,000 | | $2,820,000 |
| RECOMMENDED DESIGN | $1,271,000 | | $1,271,000 |
| ESTIMATED SAVINGS OR (COST) | $1,549,000 | $0 | $1,549,000 |

# VALUE ENGINEERING RECOMMENDATION # VE-31

**ADVANTAGES:**

- Eliminate the need for the temporary bridge
- Expedite construction at this location

**DISADVANTAGES:**

- Extend necessity of the current substructure beyond its initial design life

**JUSTIFICATION:**
This recommendation suggests evaluating the grade of the existing structures where bridge T-12 is proposed. It is assumed that the temporary structure will be only 6" higher than the existing grade. The VE team recommends trying to maintain the existing grade, so the existing bridge can be utilized in lieu of requiring a temporary bridge. This will expedite completion of the project. This will cause a weave through a crossover which may produce a calming effect to travelers as they enter the major construction zone.

# VALUE ENGINEERING RECOMMENDATION # VE-31

## CALCULATIONS

Structure T-12 (8110) <VE ESTIMATED>

Current Br. Info [to be determined]

W = 4' shld + 48' Deck + 4' shld = 54'
= 54' x 150'
= 8100 sf x $100/sf
= 810,000

Structure 71-D (920) @ 1,754,000
<Est provided Structure Sheet>

Typical Ultimate Constr @ Site

~Per Direction~

Design 12' shld – 12' ln – 12' ln – 12' shld
Current 2' – 12' – 12' – 2'


28' EL [and] Mech 64' [and] 28' EL

Est. = 150' Length x 70' new Mech.
= 10,500 sf x $80/sf Super. = 840,000
= 10,500 x $30/sf Sub = 315,000
= $1,155,000

Notes:
Est Shr Br. Date Provided VE 11/31/08
TS09 (Typical Used)
X50034 (X-Sect Used)

# VALUE ENGINEERING RECOMMENDATION # VE-31

## COST ESTIMATE - FIRST COST

| Cost Item | Units | $/Unit | Source Code | Original Design | | Recommended Design | |
|---|---|---|---|---|---|---|---|
| | | | | Num of Units | Total $ | Num of Units | Total $ |
| Temp Br (8110) | LS | 810,000 | 7 | 1 | $810,000 | | |
| Bridge 71-0 | LS | 1,754,000 | 1 | 1 | $1,754,000 | | |
| Reconstruct Existing Bridge | LS | 1,155,000 | 7 | | | 1 | $1,155,000 |
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| Subtotal | | | | | $2,564,000 | | $1,155,000 |
| Contingency | @ | 10.00% | | | $256,400 | | $115,500 |
| Total | | | | | $2,820,400 | | $1,270,500 |

SOURCE CODE: 1 Project Cost Estimate
2 CES Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

## SECTION 3.2 – VE Team Design Comments

Design Comments are ideas that in the opinion of the team were good ideas, but for any number of reasons were not selected for development as VE recommendations. Design Comments can be notes to the owner or designer, a documentation of various thoughts that come up during the course of the study, a reference to possible problems, suggested items that might need further study, or questions that the owner and designer might want to explore. Some comments might relate to things of which the owner or designer is already aware. Because the study is done on a design in progress and as an independent team, the VE Team may not be aware of everything intended by the owner and designer. The following comments are presented with the intent that they may aid the design team in some way.

# VALUE ENGINEERING DESIGN COMMENT # DC-32

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Provide roadway system redundancy (Incident Management).

**COMMENTARY:**
The project cost is approximately one billion dollars. This project only allows traffic to flow in one direction. If a truck overturns, there is no allowance for re-routing traffic. When the existing Kennedy Bridge needs to be re-decked, there is no allowance to remove traffic from the existing bridge.

It is recommended that the provision be made for re-routing traffic on I-65, using median cross-over on the fill between Ramp 7 and Ramp 26. Also, the same provision needs to be made for east-west traffic, perhaps using BL-CD-1 and Ramp 33 and Ramp 34. These additions provide flexibility in the highway system, allowing maintenance and emergency services personnel additional options in dealing with incidents and disasters.

# VALUE ENGINEERING DESIGN COMMENT # DC-33

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Provide an alternative structure type for areas which are not aesthetically critical.

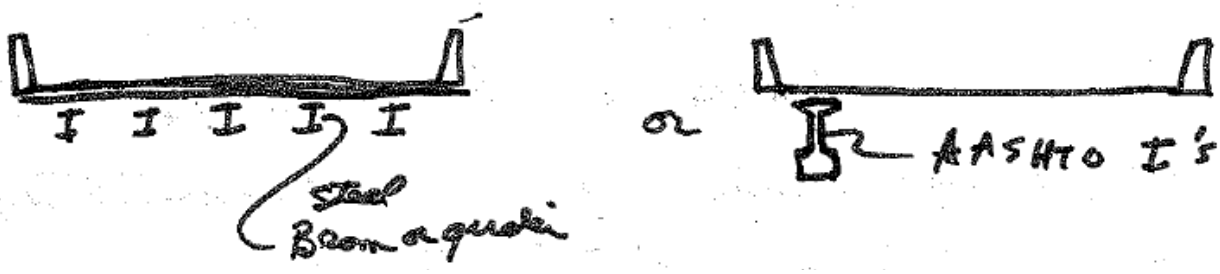
**COMMENTARY:**

Currently all structures are designed with trapezoidal beam shapes to provide a constant appearance throughout the corridor. However not all of the structures are in culturally or aesthetically critical locations. Moreover because the structures are not all visible at the same time, some variations in architectural appearance could be accommodated. Therefore we recommend that in areas away from the Great Lawn, consideration should be given to more conventional structures for this area, which because of simplicity and familiarity, will cost less than currently proposed. Specifically for straight structures with spans less than 100 feet consideration should be given to parallel steel beam or ASHTO I-beams. Similarly for spans greater than 100 feet or curved structures consideration should be given to steel curved I-girder bridges.

## VALUE ENGINEERING DESIGN COMMENT # DC-33

## SKETCH OF ORIGINAL AND RECOMMENDED DESIGN

Original Design




Recommended Design

# VALUE ENGINEERING DESIGN COMMENT # DC-34

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Modify the roadway geometrics to improve the bridge geometrics.

**COMMENTARY:**
Complex geometry, including superelevations, superelevation transitions, tapers, and slope changes (for example a ramp entering or exiting a bridge) can escalate the cost of a bridge by increasing construction complexity, fabrication costs, and by requiring additional materials.

Often small changes in the roadway geometry can move super transitions, spirals, and ramps off the structure. Prior to detail design, review the geometry at each bridge with complex elements to determine if the geometry can be revised to allow building a more economical structure. This suggestion could be implemented at bridges B65-31, B65-10 and many others.

# VALUE ENGINEERING DESIGN COMMENT # DC-35

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Use the railroad right-of-way for project construction easement.

**COMMENTARY:**
CSX Transportation owns property within the project area. Some of this property may not be used by CSX currently. Construction will take place close to this property. If the contractor could pay CSX one lump sum amount when the project starts, the contractor could use this property for the duration of the project. The property could be used for both a construction easement and for material storage. A $30,000 cost at the beginning of the project could lease about two acres of property.

# VALUE ENGINEERING DESIGN COMMENT # DC-36

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize at grade roundabout intersections along Witherspoon Street in lieu of signalized intersections.

**COMMENTARY:**
This comment recommends examining the use of roundabouts along Witherspoon Street at the intersections with River Road, Clay Street, Campbell Street, Buchanan Street, Adams Street, and Frankfort Avenue. Roundabouts provide a safe and effective method of handling traffic in moderate volume, low speed situations.

**ADVANTAGES:**

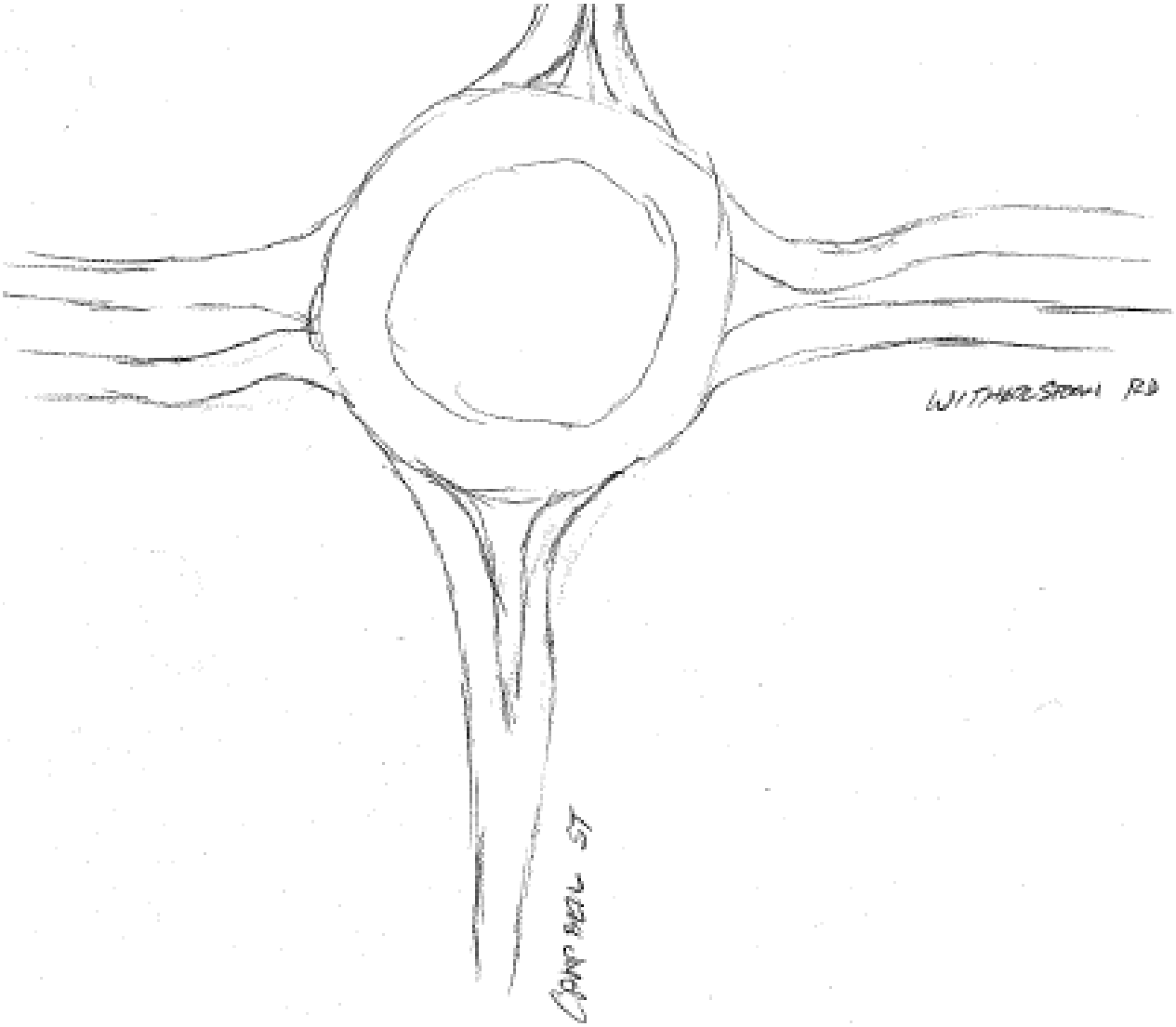
- No ongoing operations cost, as with a signal
- Provides a traffic calming effect
- Can be utilized as a gateway feature

**DISADVANTAGES:**

- Requires wide right-of-way at the intersection
- Difficult to build under traffic
- Driver learning process in areas where they are not common

## VALUE ENGINEERING DESIGN COMMENT # DC-36

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-37

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Replace permanent temporary structures with removable temporary structures (example 8070/T-7) whenever it is a stand-alone and not for a widening.

**COMMENTARY:**
A performance specification for temporary bridges would allow the contractor to be innovative in constructing temporary bridges. The contractor will have the option to use temporary bridges supplied by companies such as Acrow. This option also allows more flexibility in his means & methods which should result in a lower cost for the temporary bridge. Since this project will occur over a long period of time, these types of bridges could be reused in other locations within the project.

# VALUE ENGINEERING DESIGN COMMENT # DC-38

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Examine the differences between Design-Bid-Build, Design-Build, and other procurement methods.

**COMMENTARY:**
The VE team recommends examining the differences between Design-Bid-Build verses Design-Build verse other procurement methods. It will be important to determine which is the most advantageous to the client/owner and which is the most advantageous for the designers and contractors/builders. Some of the factors to consider include when is the completed project needed or wanted, who assumes the risk, what is the level of detail available for what is desired, what funding is available, and incentive clauses for early completion. For many commercial projects where timely completion of the project will enable the owner to use the completed facilities earlier and thereby see profits earlier, design–build has many advantages. Timely completion of this project will allow the users, the general public and commerce, to use the roads without any delays. This certainly has a value but the amount of that value is more difficult to measure. For a project of this size, particularly if the entire project was considered ($4 billion), transferring management and risk reasonability's may have some advantages. Limited funding availability would certainly decrease the design-build advantages. This subject was briefly mentioned at the entrance briefing for this study. It is only mentioned here again as a design comment to recommend to the owner/client the possibility that some part of the project, or the entire project, could be considered for other than design-bid-build. An in depth study of the advantage and disadvantages would need to be developed and applied to a choice matrix to determine if any design –build probabilities existed.

An abstract of parts of the Brooks Act is included below for reference.

**Brooks Act**

Nature of the Requirement:
Consultant contracts for engineering and design related services financed with Federal-aid highway funds, must result from negotiations which utilize qualifications-based selection procedures. Qualifications-based selection procedures do not allow for price to be used as a factor in the selection process.

Elements of Flexibility:
States may enact their own statutes which govern consultant selection procedures. These procedures can be based on qualifications, price, or any combination of the two. If enacted, the State procedures take precedence over the qualifications-based requirement stated above. Local governments must use the same procedures used by the State.

Contracting agencies may use small purchase procedures when the contract cost does not exceed $100,000.

# VALUE ENGINEERING DESIGN COMMENT # DC-38

## DISCUSSION CONTINUED

Noncompetitive negotiation may be used where specific conditions exist which allow negotiations to take place with a single firm.

Some States have streamlined the negotiations process by pre-qualifying consultants who have experience that is relevant to transportation enhancements.

Other Considerations:
These guidelines apply only to consultant contracts for engineering and design related services financed with Federal-aid highway funds. For procurement of construction services, see the section titled "competitive bidding." For all other procurements, States and localities are bound by State requirements which comply with rules issued by the Office of Management and Budget known as the grant management common rule.

References:
41 USC 253 and 259, Brooks Act

23 CFR Part 172, Administration of Engineering and Design Related Service Contracts.

49 CFR Part 18.36, OMB Common Rule, Procurement.

June 26, 1996 FHWA memorandum; Consultant Contracts Services, Small Purchases Threshold.

# VALUE ENGINEERING DESIGN COMMENT # DC-39

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize performance specifications with warranties in lieu of method or prescriptive specifications.

**COMMENTARY:**
The KYTC should consider using performance specifications with warranties on this project. These types of specifications can be used within a design-bid-build contract, while still offering some of the advantages of a design-build contract. KYTC can select the items where these specifications apply.

**ADVANTAGES:**

- Improve design to construction communication because design requirements are directly connected to construction realities, as in design-build
- Improve the focus of testing where characteristics that directly impact performance is highlighted
- Improve understanding and focus on quality characteristics that relate more directly to product performance
- Improve quality focus during construction because contractor and engineer both have interest in immediate quality control and long term durability
- Clarifies the distinction in roles and responsibilities between the contractor and engineer
- Defines the levels of risk that the contractor and engineer carry
- Shifts risk regards final design to the contractor thereby largely eliminating the risk in the secondary contract KYTC and engineering consultant
- Encourages innovation by contractually connecting the design, material supply and fabrication, installation, and final construction of the project elements
- Contractors can differentiate themselves during bidding if they are capable of efficiently and innovatively providing quality whereas standard specifications have a tendency to group all bidders under one quality umbrella (i.e. “meet a minimum standard”)

**DISADVANTAGES:**

- Final decisions on design and furnishing of project elements are delayed until construction instead of being chosen before construction
- Community involvement in choosing final design of project elements is problematic because of likely time constraints during construction
- Minimum allowable values or elements may not be as clearly defined with performance specifications
- If decisions by the engineer regarding design or supply of material is interpreted as arbitrary or non-contractual by the contractor, disputes or claims are the result

# VALUE ENGINEERING DESIGN COMMENT # DC-40

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize friction piles where possible.

**COMMENTARY:**

No geotechnical recommendations were available at the time of the VE study; however the VE team has been verbally informed that the soils are probably silty sands. The VE team also understands that the soils are normally consolidated and the depth to rock is ±100 feet. If this information is correct, significant settlements may occur but consolidation time will be short. So long as the embankments adjacent to bridges are constructed early (most already exist), no significant downdrag on piles will occur and, depending on the density of the soils, concrete (cast-in-place or precast) friction piles may be able to achieve the desired capacity above the rock with a resultant savings compared to end bearing H-piles. On the contrary, drilled shafts may have a relatively high unit cost in sandy soils below the water table since full casings may be required and probably should be avoided when possible. These comments should be evaluated once specific recommendations are available from the project's geotechnical engineer.

# VALUE ENGINEERING DESIGN COMMENT # DC-41

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize two lanes for Ramp 51A in lieu of one lane, utilize design standards acceptable to KYTC and AASHTO, and utilize reduced shoulder width across longer bridges (AASHTO 200 ft).

**COMMENTARY:**

Design Standards

In review of the typical section throughout this section it is found that shoulder widths, in some cases, are greater than recommended by the AASHTO policy and geometric design for roads and street (Green Book).

Consideration should be given to reducing the shoulder width on long structures (greater than 200 feet in length). AASHTO policy provides for a 4 feet minimum width.

On the one lane ramp bridges the width of the shoulder is greater than the normal installation provided in Kentucky (see VE Recommendation VE-11).

While it was not possible in the time available in this study to trace the continuity of the shoulder widths, it is recommended that this be done.

Design Caution

The combination of horizontal and vertical alignment on the ramps should be checked to assure the combination provides a satisfactory product.

On the ramp bridges which are considered flyovers, it is recommended that the combination alignment be investigated, especially in light of the problems experienced in Indianapolis on the new interchange upgrade where the combination had several trucks leave the road on the crest of the vertical and in the center of the horizontal curve. An example where this should be investigated is on Ramp 9 (I-65 south bound). This ramp has a 5.40% grade upgrade cresting into a 4.62% downgrade on a 760 radius horizontal curve with a superelevation of 5.4%. The horizontal alignment is good for approximately 40 mph design speed. The vertical curve has a K value of 80 which is adequate for a much higher design speed.

Examples of some differences that exist are:

Ramp 51A (I-64 west bound to I-65 north bound) has an 8 feet right shoulder while it connects to Ramp 26 (I-64 west bound to River Road) and Ramp 32 (I-71 south bound to I-65 north bound) which have 12 feet right shoulder. It would seem that the I-64 west bound to I-65 north bound would have the higher criteria or both could be narrower.

Design Problem

Ramp 51A set a one lane ramp with a 15 foot traveled way, a 8 foot right shoulder, and a 6 foot left shoulder with a projected traffic of 17,000 vehicle per day. This design is in adequate for this traffic volume.

# VALUE ENGINEERING DESIGN COMMENT # DC-42

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize precast, post tension bridge decks.

**COMMENTARY:**

The use of precast panels can contribute both to the speed of construction and to the long term durability of the deck. Post tensioning keeps the deck in compression and can reduce salt infiltration and subsequent corrosion. Precasting is most efficient when uniform sizes can be cast. Therefore geometric, simplification as discussed in Design Comment DC-34 would facilitate the economical use of precast panels. The panels are typically used in conjunction with beam type bridges but can be used with other types. The use of precast panels can speed construction on critical bridges

# VALUE ENGINEERING DESIGN COMMENT # DC-43

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize stay-in-place forms for bridge decks.

**COMMENTARY:**
Currently, in KYTC's 2008 edition of the Standard Specifications, forms for bridge decks can consist of form panels, plywood forms, plastic forms, plastic lined forms, metal forms, plank forms, and stay-in-place metal forms. We recommend using stay-in-place metal forms for all bridge decking to speed construction and reduce costs. Stay-in-place forms have proven to be very effective on Kentucky projects and have not caused any noticeable maintenance problems. The only drawback is that the bottoms of the bridge decks cannot be inspected with conventional methods. This is more than offset with the speed of construction and cost savings over other forming methods.

# VALUE ENGINEERING DESIGN COMMENT # DC-44

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize fly-ash for fill material from Louisville Gas & Electric (E-on).

**COMMENTARY:**
Louisville Gas and Electric (E-on) and Kentucky Utilities are currently looking for areas to waste fly-ash material that is a by-product of the coal burning process. We would encourage that these utilities be contacted to determine if there is an adequate supply of this excess material that is relatively close to the project site. The fly-ash could be shipped by rail or barge relatively inexpensively and used as part of the fill material. This could be accomplished at a break-even or reduction in fill cost.

# VALUE ENGINEERING DESIGN COMMENT # DC-45

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize specialty contracts for project-wide construction elements.

**COMMENTARY:**
The KYTC should consider using specialty contracts for construction elements where either the application of the element would be better served being project-wide or where the volume of the element will provide efficiencies that offset coordination concerns. Some examples of possible specialty contracts are as follows:

- Traffic control – the supply and most of the installation of traffic control signing and markings could be consolidated into one contract. This contract might include the allowance of individual contractors to install this material. This is recommended if multiple contracts will be ongoing concurrently.
- Unique foundation elements – the installation of specialty foundations such as auger cast piling or drilled shafts might be consolidated for uniformity in installation, production efficiencies, and volume pricing.
- Retaining walls – the fabrication and furnishing of MSE walls might be consolidated for uniformity in fabrication of wall panels and barrier slabs (i.e. architectural treatments, precast panel "look", barrier slab size and "look"), uniformity in design practices, and volume pricing. The furnishing of CIP walls might be consolidated for uniformity and distribution of costs for form "look" and fabrication expense.
- Bridge substructure – fabrication and installation of bridge substructures primarily to provide uniformity in aesthetics and to provide volume pricing. This especially applies at piers within the interchange where piers in multiple contracts may end up side by side.
- Structural steel – the fabrication and furnishing of structural steel might be consolidated for volume pricing primarily and for fabrication uniformity.

**ADVANTAGES:**

- Traffic control on each of the three interstates and on surface streets will be coordinated
- Aesthetic uniformity
- Volume pricing

**DISADVANTAGES:**

- KYTC coordination of these specialty contracts
- Duration on these specialty contracts if construction phasing will extend over many years
- General contractor does not have direct control and responsibility for the element that is under separate specialty contract, therefore leading to a "blame game"
- Lower volume pricing may be offset by contractor and KYTC coordination costs

# VALUE ENGINEERING DESIGN COMMENT # DC-46

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Standardize design elements such as the pier columns in order to maximize the reuse of concrete formwork or to allow standard precast elements.

**COMMENTARY:**
Since this is a large project that will be designed by multiple firms (teams), the appropriate aesthetic guidelines that are to be incorporated into the overall project should be standardized either by the KYTC and/or a lead project consultant. These guidelines should be developed as Project Design Standards to be used by all consultant teams on the project.

For example, the detailing of the pier columns for this project should be standardized in order to maximize the reuse of concrete formwork or to allow standard precast elements. The diameter of the columns should be limited to a single size (e.g. 3'-0") except when required for structural capacity. Also, the capitols of each column, which are provided for aesthetic purposes, should be uniform in size. Any aesthetic accents that are incorporated into the columns such as circular reveals should be coordinated in the overall project design to be uniformly located on the columns. This will minimize the number of concrete forms to be fabricated, thus reducing the construction cost.

Also, any KYTC standard details for abutments should be used for this project as appropriate for each bridge site.

# VALUE ENGINEERING DESIGN COMMENT # DC-47

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Allow precast wing-wall panels as an alternate in lieu of cast-in-place wing-walls.

**COMMENTARY:**
An alternate should be given in the bridge plans as appropriate for the specific bridge site to allow the contractor to provide concrete precast wing-wall panels in lieu of cast-in-place wing-walls. This will allow the contractor choose the least expensive method of providing wing-walls. Precast wing-walls will also save the contractor time since this will eliminate erecting formwork and placing reinforcing.

# VALUE ENGINEERING DESIGN COMMENT # DC-48

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Investigate sight distance due to the relatively sharp curve on I-65 adjacent to the hospital.

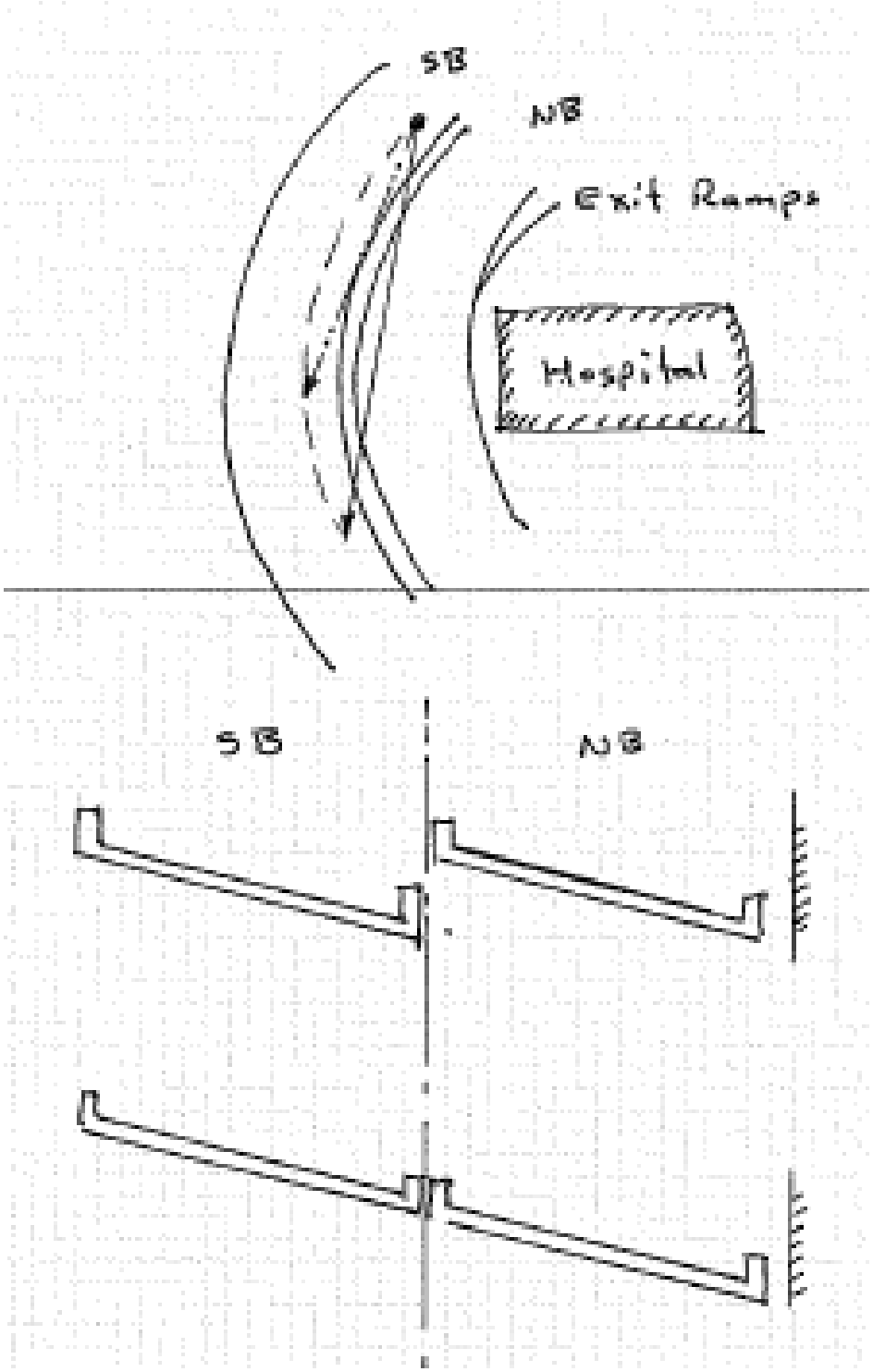
**COMMENTARY:**
The alignment of I-65 at the southern end of the project has a relatively sharp radius for a design speed of 60 mph. Obstructions on the inside of the curve such as barriers/railings can reduce stopping sight distance (SSD). It is recognized that available right of way is limited due to the proximity of the hospital.

On the northbound side, ramps are being added in the lane nearest the curve center and the average speed may be less, thus partially mitigating the problem.

On the southbound side, the high-speed lane is nearest the curve center and the median shoulder is inadequate to provide the necessary SSD. In this situation, it may be possible to raise the southbound lanes relative to the northbound lanes, such that the southbound traffic can see over the median barrier.

## VALUE ENGINEERING DESIGN COMMENT # DC-48

### SKETCH OF ORIGINAL DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-49

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Construct Ramp 26 and Ramp 21 under Ramp 10 in lieu of over Ramp 10.

**COMMENTARY:**

Ramp 26 and Ramp 21 are currently shown crossing over Ramp 10. Ramp 26 and Ramp 21 are also shown merging within this crossing with a total of 4 lanes. Ramp 10 is only a single lane ramp. If it is feasible, Ramp 10 should cross over Ramp 26 and Ramp 21, which will save on construction costs in two ways. One, the piers for Ramp 10 will not be as wide as they would be for Ramp 26 and Ramp 21. Second, the erection costs would be less since there would be fewer girders to erect for the higher ramp. In general, cross the smaller bridge over the larger bridge whenever possible.

# VALUE ENGINEERING DESIGN COMMENT # DC-50

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Combine bike rail with barrier wall.

**COMMENTARY:**
On sheet TS78, the typical section for the bridge section shows a safety rail for bikes at 54 inches minimum, next to a 32 inch barrier wall for the vehicular traffic. We recommend either utilizing a 54 inch barrier wall that serves both purposes, or we recommend placing a 22 inch safety rail for the bikes on top of the 32 inch barrier wall. The second choice is less desirable as the safety rail and will probably not prove to be crash worthy as a taller barrier wall. Either way, there should be a slight cost savings for deletion of the high safety bike rail.

# VALUE ENGINEERING DESIGN COMMENT # DC-51

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize alternative contracting methods to minimize impacts to motorists and/or expedite the construction schedule.

**COMMENTARY:**
The KYTC should consider alternative contracting methods, many of which have already been used. Common alternative contracts include the following:

Incentive Contracts
Contractor can receive an incentive equal to contract administration fees saved or a calculated user delay costs for early completion.

**ADVANTAGES:**

- Reduced construction time
- Potential for lower contract administration costs, a direct KYTC cost

**DISADVANTAGES:**

- May require additional funding
- Outside influences more easily lead to disputes and claims (i.e. utility delays, contract coordination delays, design error delays)

A + B Contracting Methods
Two components are included in the bid where A = dollar amount for contract items and B = days required to complete the project.

**ADVANTAGES:**

- Schedule must minimize construction time and delays
- Coordination with all stakeholders is encouraged to meet time constraints
- Applies to entire project if the entire project impacts traffic (applies to existing confined corridors if total closure used (i.e. I-65 S of I-64 and I-64 west of I-65 and S of I-71)
- Low bidder may be a more organized contractor because scheduling capability, significant and deep resources, price, and efficiency are combined to obtain low bid

**DISADVANTAGES:**

- Definition of what is included in A+B if traffic impacts are only concern rather than entire project (i.e. I-64 move to the south)
- Time and review of a reliable schedule with clear critical path
- More resources and effort required for contract administration
- Time constraints for issue response on the part of Engineer
- Intense negotiations and discussion for additional work or time delays

# VALUE ENGINEERING DESIGN COMMENT # DC-51

## DISCUSSION CONTINUED

Lane Rental Bid Item

This method encourages contractors to minimize road user impacts during construction. The fee for lane rental is assessed for the time that the contractor occupies or obstructs a part of an individual lane.

**ADVANTAGES:**

- Accelerates only that work required within existing and future footprint of individual freeway lanes, therefore focusing the incentive money
- Encourages scheduling of work to limit duration and impact on traffic
- Encourages innovation during construction
- Ideal for new freeway interchanges where only a portion of the work directly impacts existing or proposed “through” freeway lanes
- Ideal for projects that have major traffic impacts

**DISADVANTAGES:**

- Requires additional effort to monitor and track lane closures
- Forces night and weekend work if rental is waived during defined times
- Does not address freeway to freeway movements unless specifically defined
- Unintended consequences such as undesirable part-width work
- Safety is sometimes compromised to avoid lane rentals (i.e. working too close to traffic)

# VALUE ENGINEERING DESIGN COMMENT # DC-52

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize ramp metering techniques.

**COMMENTARY:**
AASHTO, the "Voice of Transportation", recognizes ramp metering as one of the three most effective methods of increasing safety. This safety is for both the workers and road users and ensuring a more efficient traffic flow. Since the "City of Louisville" already has TRIMARC in place, it would simply be a matter of placing ramp meters on entrance ramps to control traffic flow onto the interstates both during and after construction to ease traffic congestion and improve safety. Wireless communications can be utilized to lower costs where metered ramps are not adjacent to existing communication facilities.

# VALUE ENGINEERING DESIGN COMMENT # DC-53

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Use standard specifications for sign supports.

**COMMENTARY:**
Utilize standard KYTC major guide sign support in all locations.

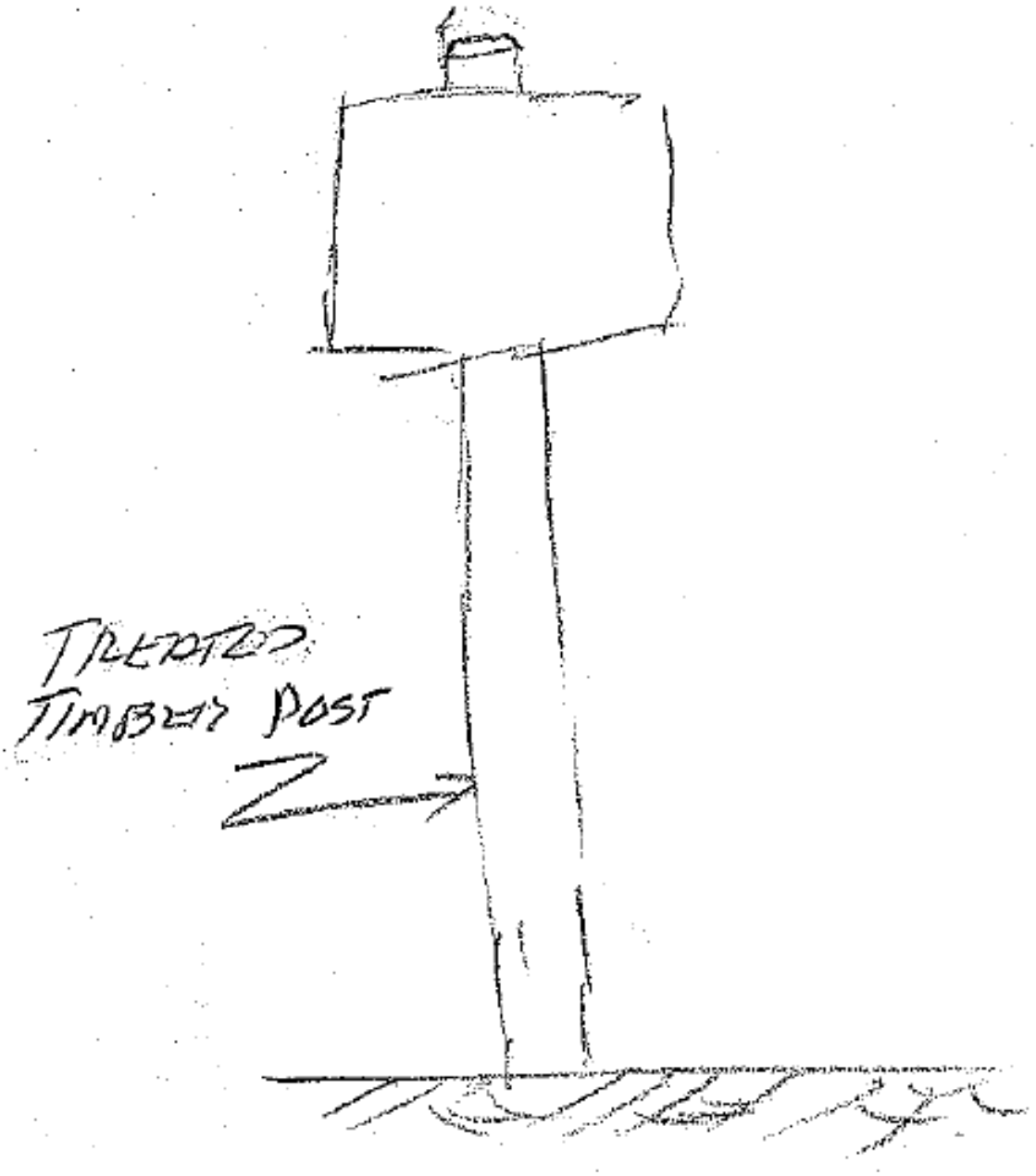
**ADVANTAGES:**

- Time tested design – low failure rate
- Contractors know how to install them
- Fabricators know how to build them
- Parts available for repair of knockdowns
- Easily modified for future sign revisions
- Galvanizing can be converted with powder coat finish for softer color

Some decorative, but relative standard ground mount supports are available for use on surface streets. These include square post, painted in various colors with matching caps or timber posts. Both are complaint with NCHRP 350 safety standards.

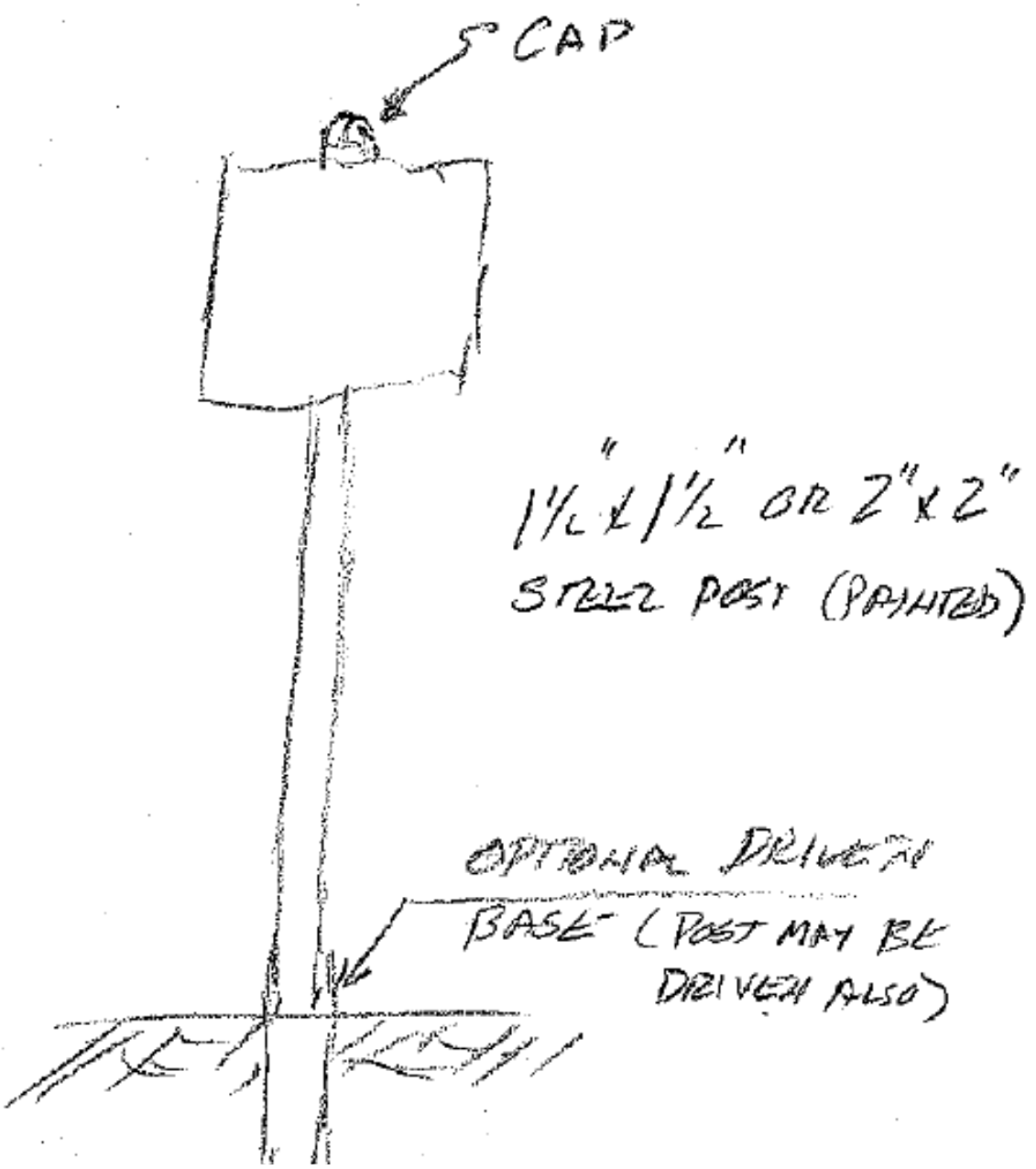
## VALUE ENGINEERING DESIGN COMMENT # DC-53

### SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING DESIGN COMMENT # DC-53

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-54

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Use standard specifications for lighting fixtures.

**COMMENTARY:**
Utilize standard optics in all lighting fixtures along with readily available mounting hardware.

1. Standard optics permit
   - Low energy, light efficient fixtures
   - Good control of light
   - Standard maintenance parts inventories

2. Catalog hardware and supports
   - Proven design
   - Replacements are available, often sole source
   - Supports have multiple patterns to choose from

3. Freeway lighting tends to be high mast

Do not combine with signs. Luminaries degrade sign visibility. Do not mount supports on the structures. Over time, bridge motion will fatigue and fracture these fixtures at their base.
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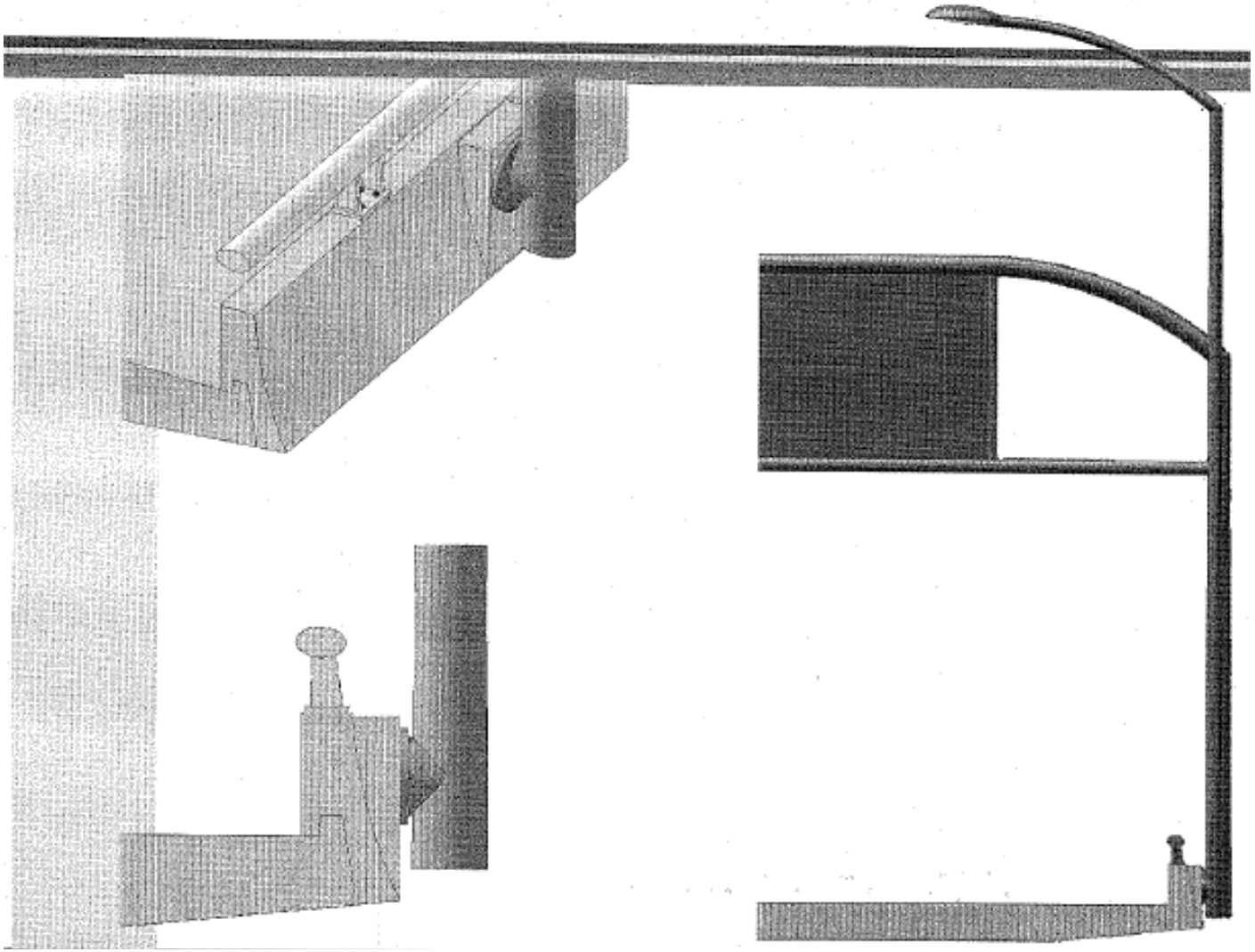
# VALUE ENGINEERING DESIGN COMMENT # DC-54

## SKETCH OF ORIGINAL DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-55

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Use wick drains in fill areas to reduce settlement time.

**COMMENTARY:**

At the time of this VE session, no geotechnical information was available to the VE team; however, based on local knowledge, we understand that moist soils can be expected to be silty sands, except in the fill. If that is the case, the soils may be relatively free draining and the wick drains would not add value. However, if the soils are layered with less permeable material, consolidation will be inhibited and the use of wick drains will be beneficial. In some soils, the consolidation time can be reduced from years to months. Due to the large volume of fill to be placed on this project (east of Campbell Street fills rise to 35 feet) and the dependency of the bridge construction on settlement of the approval embankments, even a short decrease in adequate settlement time (say a month), may result in a significant savings by shortening the construction time.

# VALUE ENGINEERING DESIGN COMMENT # DC-56

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize open drain and multi-access closed drain system on structure in lieu of traditional "closed" systems.

**COMMENTARY:**
Allow drainage collected on structures to pass through barrier wall or through deck without being collected into a system where ever possible.

In areas, such as in high pedestrian traffic areas, insure access to all areas where sharp turns or points of collection into larger system occurs by those responsible for maintenance of system. If tub girder system is utilized, insure any collection is constructed outside of structure.

# VALUE ENGINEERING DESIGN COMMENT # DC-57

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Configure drainage to eliminate longitudinal drainage particularly behind MSE walls.

**COMMENTARY:**
Longitudinal drainage from drainage outlets behind MSE walls should be eliminated. Should any leakage problems occur in the longitudinal drain lines, it is possible that large sections of select granular fill could be washed out causing undermining. This could lead to possible settlement of the roadway. Also, repairs to restore the wall would be expensive because it would be necessary to cut the reinforcing straps and temporarily support the wall and loads above the undermined area. Placing vertical drain lines at each roadway outlet and directing the pipe down and out away from the wall to connect to street level storm drainage outside the wall would be preferable.

# VALUE ENGINEERING DESIGN COMMENT # DC-58

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize one construction package in lieu of 14 or 22 construction packages.

**COMMENTARY:**
The use of one construction package would create several opportunities for time and cost savings. The construction contractor could designate a project manager that would adjudicate any quarrels between the sub-contractors. Common equipment storage sites, dealing at one time with outside entities, and using the same suppliers are all advantages that could be realized.

**ADVANTAGES:**

- One overall project manager
- Economies of scale
- Same storage sites
- Dealing once with other stakeholders
- Utilizing the same suppliers
- Possibility of a design/build
- Single party responsibility
- Uniformity in aesthetics, materials, and construction methods
- Coordination becomes responsibility of contractor, not KYTC, nor a designee
- Innovation in MOT or at least simplify MOT
- All temporary costs are the contractor's
- Innovation in contracting methods
- Significant true savings
- Volume cost savings

**DISADVANTAGES:**

- Ability of one contractor to do the work (putting all the eggs in one basket)
- Funding issues
- Project size limits
- Contractor pool will be small
- Local contractors unable to pursue or participate in job possibly

# VALUE ENGINEERING DESIGN COMMENT # DC-59

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Incorporate TRIMARC into the entire MOT process to monitor traffic, divert traffic from work area, and to control access to work area.

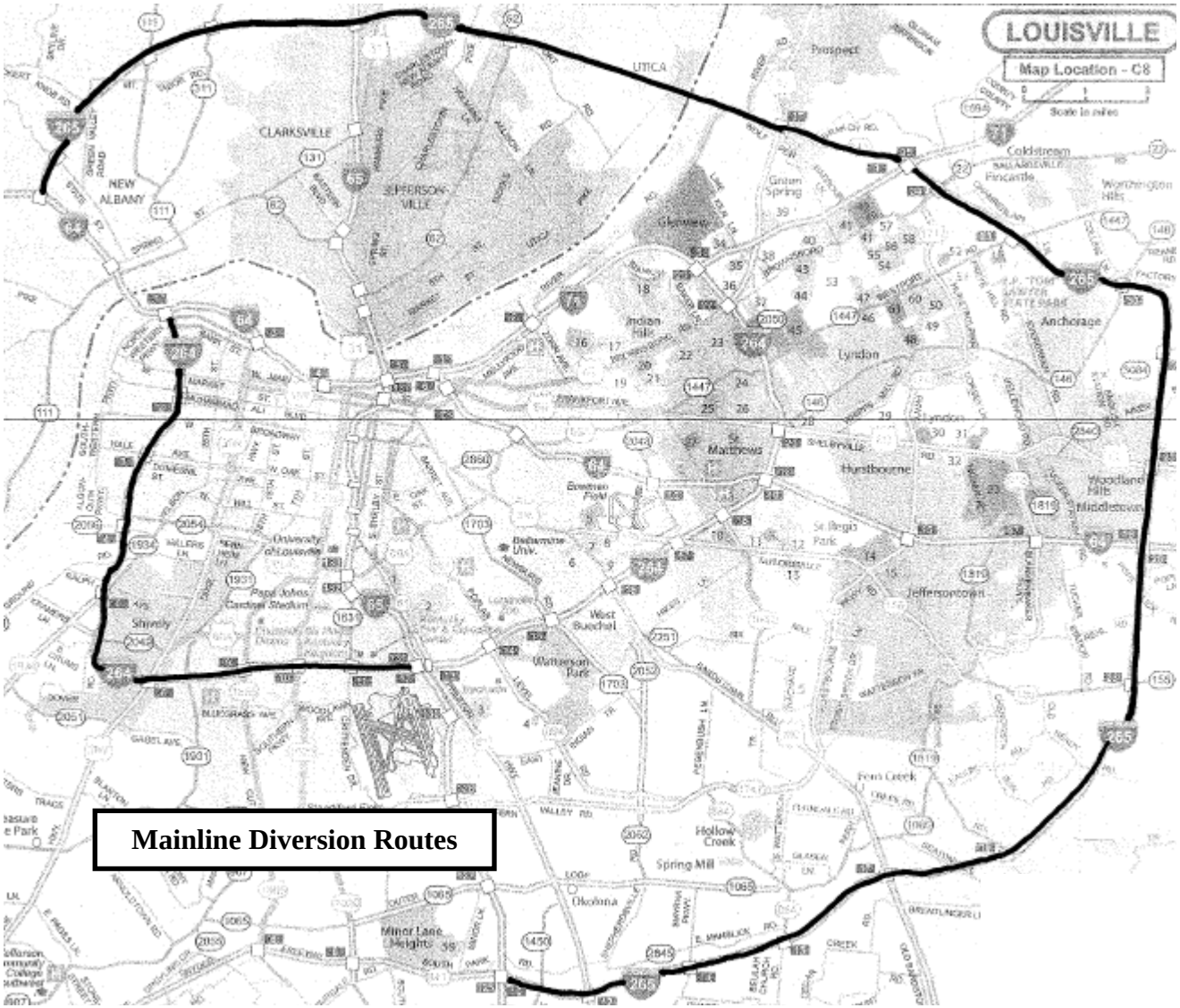
**COMMENTARY:**
The TRIMARC freeway management system has the capability of monitoring traffic on the area freeway system. The system, in combination with temporary fixed signs, can be utilized to keep outside traffic from entering the work zone during congested conditions or during incidents.

Off project traffic management consists of:

1. Sign diversion routes on all inbound interstate approaches to the metro area (see figure 103-1)
2. Meter inbound entrance ramps during peak hours, special events and incidents (see figure 103-1)
3. Add three VMS signs at icy diversion points to supplement the existing signs on the system (see figure 103-2)

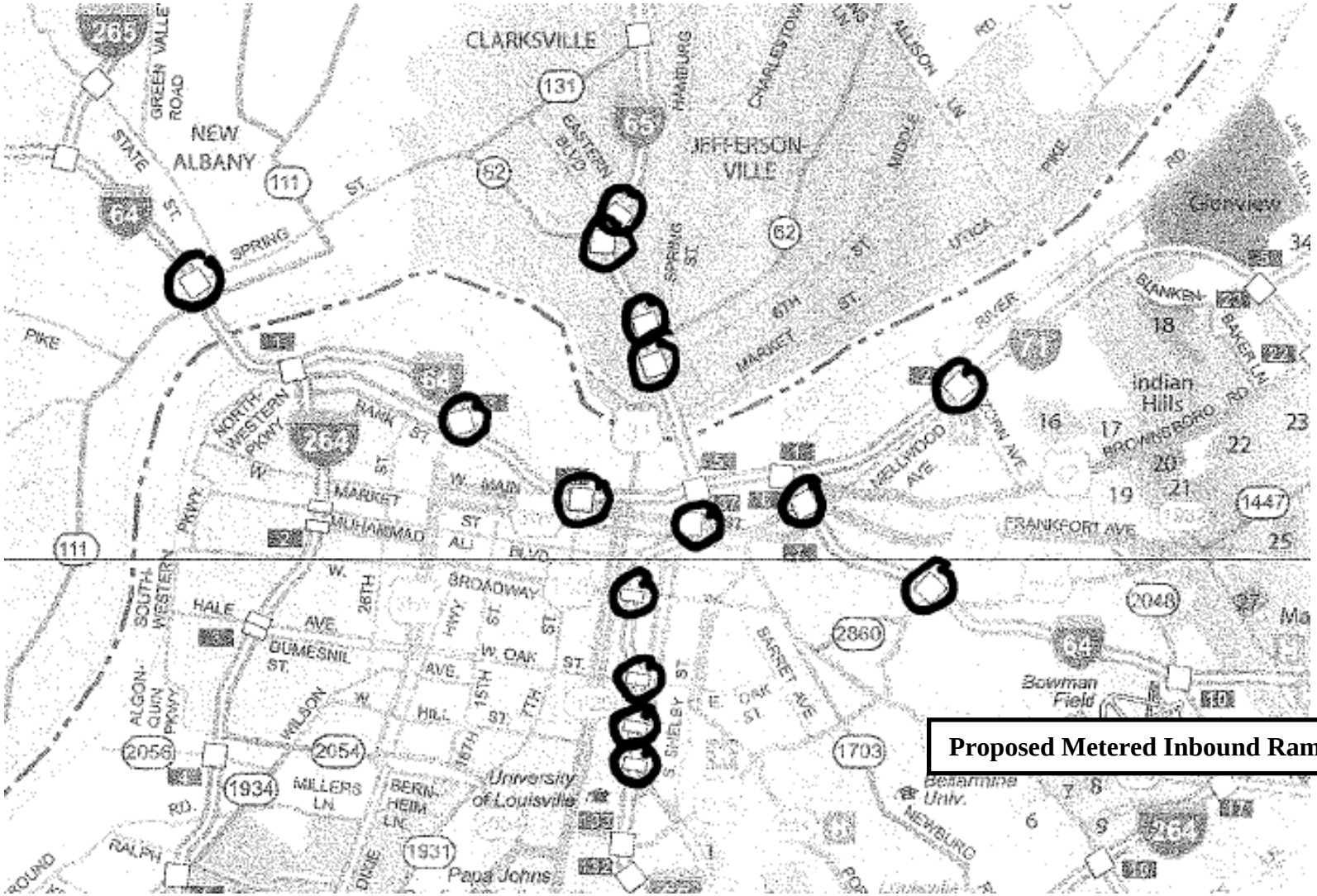
# VALUE ENGINEERING DESIGN COMMENT # DC-59

## SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-59

## SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-60

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize low maintenance vegetation in areas of aesthetic viewpoints in lieu of vegetation that requires irrigation and/or frequent attention by agronomist.

**COMMENTARY:**
Vegetation that will requires heavy, labor intensive maintenance, requires frequent fertilization, or an infrastructure, such as irrigation, will have a high likely hood of failure. However hardy, drought resistant plants will have a higher probability of survival and provide a continual appreciation by the public.

# VALUE ENGINEERING DESIGN COMMENT # DC-61

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize a steel guardrail barrier system in lieu of barrier type A and handrail where aesthetics are not as critical.

**COMMENTARY:**
Maintenance and repairs to concrete barriers are not only more costly, but also require a longer exposure of repair crews to the traveling public during needed maintenance and repair as well as exposing the traveling public to defective barriers. Items that cause concrete barriers to be more costly include masonry coating replacement, vacuum sweeping, forming/placement/curing of concrete as results of accidents and stocking piling/replacement of any handrail potentially attached to barrier wall.

# VALUE ENGINEERING DESIGN COMMENT # DC-62

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize “re-boundable” crash cushions in lieu of cartridge reliant crash type barrier units.

**COMMENTARY:**
Due to the traffic volumes, geometrics, and nearness of crash cushions to the traveled way, it is inevitable that their repair or replacement will be necessary. Cushions that are able to sustain multiple hits with little or no repair are preferred elements, especially in gores that have “on” lane ramps departures. The specific type of cushion recommended is Type VII Class C

Reduction of exposure for repair crews combined with safety to the traveling public results from this type of cushions ability to provide continued protection after an initial incident. Additional capital cost during initial construction will be offset in user cost resulting from repair time delays.

# VALUE ENGINEERING DESIGN COMMENT # DC-62

## SUPPORTING DOCUMENTATION

**DESIGN MEMORANDUM NO. 03-07**

TO: Chief District Engineers
Design Engineers
Active Consultants

FROM: David E. Kratt, P.E.
Director
Division of Highway Design

DATE: December 13, 2007

SUBJECT: Crash Cushion Type VI Class B and Class C, and
Crash Cushion Type VII Class B and Class C
Standard Drawings RBE-040 and RBE-060

As announced in Design Memorandum No. 02-07, *Standard Drawings Revision No. 1 to Reprint No. 9* is being published and will be effective on January 1, 2008 and thereafter. In the Revision, new classes have been created for the Crash Cushion Type VI and VII. The two new classes for these crash cushions are Class B and Class C.

Class B crash cushions are fully redirectional and energy absorbing. Class B crash cushions are to be used in areas where crash history is not known to be severe. The Crash Cushion Type VI Class B may also be utilized for temporary use and construction zones (Class BT).

Class C crash cushions are also fully redirectional and energy absorbing. However, this class of crash cushion requires minimal replacement of parts, if any, after a hit and will be quickly repaired and placed back into service. This unit is considered a severe use crash cushion. If hits to the cushion are frequent, the Class C crash cushion will have a lower life-cycle cost than the Class B crash cushion. The Crash Cushion Type VI Class C may also be utilized for temporary use and construction zones (Class CT).

When selecting between the Crash Cushion Class B or Class C, the following factors should be considered:

- Is the hazard to be shielded located in a high risk or low risk impact area?
- Would the life-cycle cost of the crash cushion justify a higher initial installation cost?
- How difficult would the restoration of the system be after impact? The importance of this factor will be related to the traffic and hazard levels at the site. More traffic or a higher hazard level will make speedy repair or replacement a higher priority. A suggested ADT range is given on the Standard Drawing for guidance. This guidance should not supersede the application of sound engineering principles by experienced design professionals.

# VALUE ENGINEERING DESIGN COMMENT # DC-62

## SUPPORTING DOCUMENTATION

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Since the new classes of crash cushions replace the models used previously, designers should examine their projects and update any reference to the Type VI and VII crash cushions to reflect the new policy. The new bid items codes are as follows:

| | |
|---|---|
| 08900 | CRASH CUSHION TYPE VI CLASS B TL2 |
| 08901 | CRASH CUSHION TYPE VI CLASS BT TL2 |
| 08902 | CRASH CUSHION TYPE VI CLASS B TL3 |
| 08903 | CRASH CUSHION TYPE VI CLASS BT TL3 |
| 08904 | CRASH CUSHION TYPE VI CLASS C |
| 08905 | CRASH CUSHION TYPE VI CLASS CT |
| 08906 | CRASH CUSHION TYPE VII CLASS B TL2 |
| 08907 | CRASH CUSHION TYPE VII CLASS B TL3 |
| 08908 | CRASH CUSHION TYPE VII CLASS C |

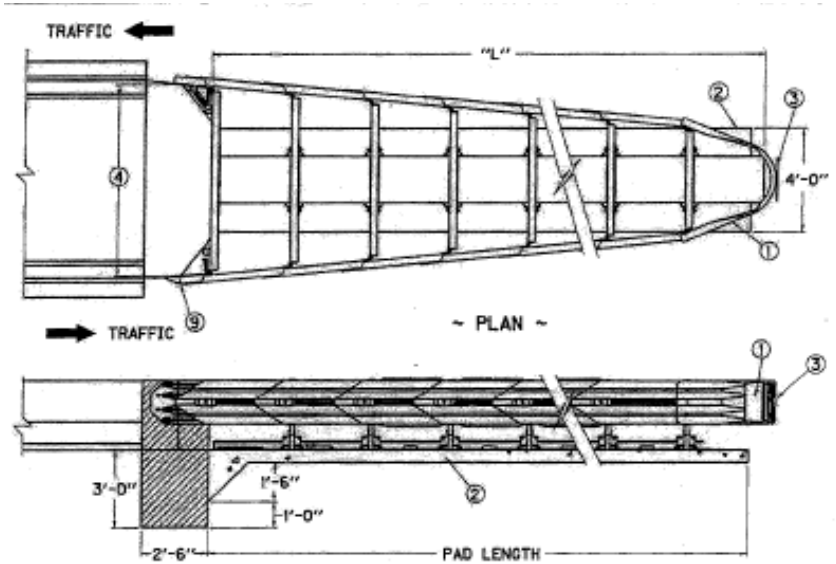
Included with this memorandum are the revised drawings for the Crash Cushion Type VI and VII. Please direct any questions regarding this memo to our office.

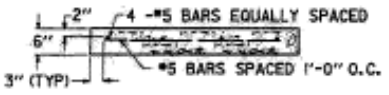
DEK:JDJ:CW

Attachments

# VALUE ENGINEERING DESIGN COMMENT # DC-62

## SUPPORTING DOCUMENTATION




~ CONCRETE PAD SECTION ~

~ LEGEND ~

① NOSE ASSEMBLY
② 6" CONCRETE PAD
③ OBJECT MARKER TYPE I, (SEE CUR. MUTCD MANUAL FOR DETAILS) CENTER HORIZ. AND VERT.
④ MEDIUM WIDTH = 70 ½", APPROX. 2.8 CU. YD. CONC. AND 265 LBS. OF STEEL FOR MED. BACKUP. WIDE WIDTH = 91 ½". APPROX. 3.8 CU. YD. CONC. AND 299 LBS. OF STEEL FOR WIDE BACKUP.

| CLASS | SPEED (MPH) | ATTENUATOR MODEL | ATTENUATOR PRODUCT NAME | ATTENUATOR LENGTH | APPROX. CU. YD. CONC. FOR PAD | SUGGESTED ADT* RANGE (P.C.P.L.)** |
|---|---|---|---|---|---|---|
| B | 45 & LESS | TL2 | SHORTRACC | 14'-0" | 1.12 | UP TO 12,000 |
| | | | 3-BAY QUADGUARD | 12'-0" | 0.87 | |
| | OVER 45 | TL3 | TRACC | 21'-0" | 1.63 | |
| | | | 6-BAY QUADGUARD | 21'-0" | 1.53 | |
| C | OVER 45 | TL3 | SCI100GM | 23'-0" | 1.7 | 6,000 AND OVER |
| | | | QUADGUARD ELITE | 33'-4" | 2.46 | |

* AVERAGE DAILY TRAFFIC
** PASSENGER CARS PER LANE

~ NOTES ~

1. THE CONTRACT UNIT PRICE SHALL BE CRASH CUSHION TYPE VII, CLASS ♟, ○, △.
   ♟ CLASS _B_ OR _C_, AS REQUIRED
   ○ TEST LEVEL 2 (TL2) OR TEST LEVEL 3 (TL3), AS REQUIRED.
   △ EITHER _M_ MEDIUM, OR _W_ WIDE, OR _S_ SPECIAL WIDE UNITS
2. THE CONC. PAD SHALL BE REQUIRED ONLY WHEN THE UNIT IS CONSTRUCTED ON NON-RIGID PAVEMENT AND SHALL BE MEASURED AND PAID FOR PER CUBIC YARD OF CLASS "AA" CONC., WHICH SHALL INCLUDE ALL NECESSARY EXCAVATION AND REINFORCING STEEL. THE PAD SHALL BE CURED AND FINISHED AS EITHER SIDEWALK OR PAVEMENT. REAR FOOTING AND REAR BACK-UP WALL, EXCEPT ON STRUCTURES, SHALL BE REQUIRED AT ALL INSTALLATIONS, WHICH SHALL BE MEASURED AND PAID FOR AS CLASS "AA" CONCRETE AND SHALL INCLUDE ALL NECESSARY EXCAVATION AND REINFORCING STEEL.
3. THE CROSS SLOPE ON THE PAD OR PAVEMENT SHALL NOT EXCEED 5 PERCENT.
4. WHEN INSTALLED ON A STRUCTURE, DETAILS FOR ANCHORAGE SHALL BE DEVELOPED AND SHOWN ELSEWHERE ON THE PLANS.
5. SPECIAL WIDTH UNITS ARE AVAILABLE FROM THE MANUFACTURERS. WHEN SPECIAL WIDE UNITS ARE REQUIRED DETAILS OF THE UNIT SHALL BE DEVELOPED AND SHOWN ELSEWHERE ON THE PLANS.
6. SEE SHOP DRAWINGS FROM MANUFACTURER FOR BACK UP DETAILS.
7. CONCRETE PAD AND BELOW GRADE ANCHOR SHALL BE PLACED MONOLITHICALLY.
8. CRASH CUSHION TYPE VII IS A PATENTED (ONE SOURCE) PRODUCT MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC. OF CHICAGO, IL., TRINITY INDUSTRIES, INC. OF DALLAS, TX. OR SCI PRODUCTS, INC. OF ST. CHARLES, IL.
9. END SHOE MAY BE ELIMINATED WITH ONE WAY TRAFFIC.
10. THE CRASH CUSHION TYPE VII MAY ALSO BE UTILIZED FOR TEMPORARY USE AND CONSTRUCTION ZONES (CLASS BT OR CLASS CT).
11. A CRASH CUSHION TYPE VII CLASS B IS TO BE USED IN AREAS WHERE CRASH HISTORY IS NOT KNOWN TO BE SEVERE.
12. A CRASH CUSHION TYPE VII CLASS C IS CONSIDERED A SEVERE USE CRASH CUSHION.
13. WHEN SELECTING BETWEEN THE CRASH CUSHION CLASS B OR C, CONSIDER THE FOLLOWING FACTORS:
    - WHETHER THE HAZARD TO BE SHIELDED IS LOCATED IN A HIGH OR LOW RISK IMPACT AREA;
    - INITIAL, MAINTENANCE, AND RESTORATION COST; AND
    - EASE OR DIFFICULTY OF RESTORATION OF THE SYSTEM AFTER IMPACT.

    THE IMPORTANCE OF THIS FACTOR WILL BE RELATED TO THE TRAFFIC AND HAZARD LEVELS AT A SITE. MORE TRAFFIC AND HIGHER HAZARDS WILL MAKE SPEEDY REPAIR OR REPLACEMENT A HIGHER PRIORITY. A SUGGESTED ADT RANGE IS GIVEN IN THE TABLE BELOW FOR GUIDANCE. THIS GUIDANCE SHOULD NOT SUPERSEDE THE APPLICATION OF SOUND ENGINEERING PRINCIPLES BY EXPERIENCED DESIGN PROFESSIONALS.

KENTUCKY DEPARTMENT OF HIGHWAYS

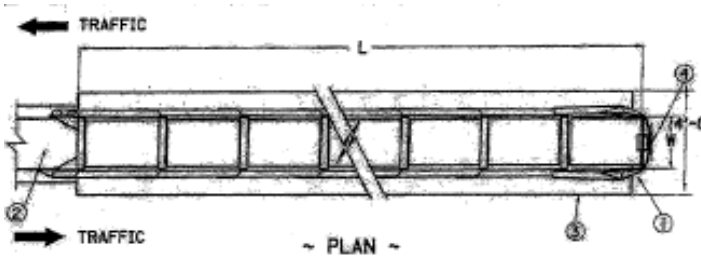
CRASH CUSHION TYPE VII CLASS B AND C (ONE & TWO DIRECTION)

STANDARD DRAWING NO. RBE-040-09

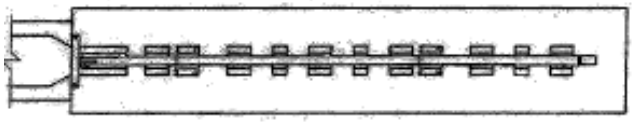
SUBMITTED _____ 11-21-07
APPROVED _____ 11-27-07

# VALUE ENGINEERING DESIGN COMMENT # DC-62

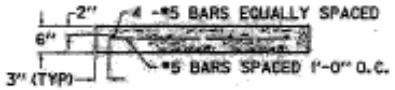
## SUPPORTING DOCUMENTATION







~ SECTION A-A ~




~ CONCRETE PAD SECTION ~

~ NOTES ~

1. CRASH CUSHION TYPE VI, CLASS ♠, ☆, △
   ♠ CLASS _B_ OR _C_, AS REQUIRED
   ☆ EITHER TEST LEVEL 2 (TL2) OR TEST LEVEL 3 (TL3), AS REQUIRED.
   △ SEE "CONNECTION DETAILS OF CRASH CUSHION TYPE VI TO DOUBLE FACE GUARDRAIL".
2. THE CONCRETE PAD, PAD EXCAVATION AND STEEL REINFORCEMENT, INSTALLED IN PLACE SHALL BE INCLUDED IN THE UNIT PRICE BID FOR CRASH CUSHION TYPE VI. USE CLASS AA CONCRETE TO CONSTRUCT CONCRETE PAD (SEE CONCRETE PAD SECTION FOR STEEL REQUIREMENTS). THE PAD SHALL BE CURED AND FINISHED AS EITHER SIDEWALK OR PAVEMENT. THE CROSS SLOPE OF THE PAD OR PAVEMENT SHALL NOT TO EXCEED 5%. THE PAD WILL NOT BE REQUIRED WHEN THE UNIT IS CONSTRUCTED ON RIGID PAVEMENT.
3. CRASH CUSHION TYPE VI MAY BE USED AT THE END OF: CONCRETE MEDIAN BARRIER, BRIDGE PIERS AND STEEL "W" BEAM GUARDRAIL (DOUBLE FACE).
4. WHEN CRASH CUSHION TYPE VI CONNECTS TO: CONCRETE MEDIAN BARRIER OR BRIDGE PIER THE CONTRACT UNIT PRICE SHALL INCLUDE: CRASH CUSHION TYPE VI, ALL HARDWARE, ADDITIONAL RAIL ELEMENTS, POST, CONCRETE PAD AND ALL OTHER INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION.
5. THIS DRAWING DEPICTS CONNECTION OF CRASH CUSHION TYPE VI TO CONCRETE MEDIAN BARRIER END. FOR THIS APPLICATION SEE CURRENT STD. DWG. RBE-065 " CONCRETE MEDIAN BARRIER END ".
6. WHEN CRASH CUSHION TYPE VI CONNECTS TO DOUBLE FACE GUARDRAIL SEE CURRENT STD. DWG. RBC-110 "CONNECTION DETAILS OF CRASH CUSHION TYPE VI TO DOUBLE FACE GUARDRAIL".
7. PERMISSABLE ALTERNATES FOR CRASH CUSHION TYPE VI ARE PATENTED ITEMS: QUADGUARD MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC. OF CHICAGO, IL., TRINITY INDUSTRIES, INC. OF DALLAS, TX. OR SCI PRODUCTS, INC. OF ST. CHARLES, IL.
8. THE MANUFACTURER SHALL FURNISH TWO (2) SETS OF SHOP PLANS TO THE CONTRACTOR WITH EACH INSTALLATION.
9. THE CRASH CUSHION TYPE VI MAY ALSO BE UTILIZED FOR TEMPORARY USE AND CONSTRUCTION ZONES (CLASS BT OR CLASS CT).
10. A CRASH CUSHION TYPE VI CLASS B IS TO BE USED IN AREAS WHERE CRASH HISTORY IS NOT KNOWN TO BE SEVERE.
11. A CRASH CUSHION TYPE VI CLASS C IS CONSIDERED A SEVERE USE CRASH CUSHION.
12. WHEN SELECTING BETWEEN THE CRASH CUSHION CLASS B OR CLASS C, CONSIDER THE FOLLOWING FACTORS:
    •WHETHER THE HAZARD TO BE SHIELDED IS LOCATED IN A HIGH-OR LOW-RISK IMPACT AREA;
    •INITIAL, MAINTENANCE, AND RESTORATION COST; AND
    •EASE OR DIFFICULTY OF RESTORATION OF THE SYSTEM AFTER IMPACT. THE IMPORTANCE OF THIS FACTOR WILL BE RELATED TO THE TRAFFIC AND HAZARD LEVELS AT A SITE. MORE TRAFFIC AND HIGHER HAZARDS WILL MAKE SPEEDY REPAIR OR REPLACEMENT A HIGHER PRIORITY. A SUGGESTED ADT RANGE IS GIVEN IN THE TABLE BELOW FOR GUIDANCE. THIS GUIDANCE SHOULD NOT SUPERCEDE THE APPLICATION OF SOUND ENGINEERING PRINCIPLES BY EXPERIENCED DESIGN PROFESSIONALS.

| CLASS | SPEED (MPH) | ATTENUATOR MODEL | ATTENUATOR PRODUCT NAME | ATTENUATOR LENGTH | APPROX. CU. YD. CONC. FOR PAD | SUGGESTED ADT* RANGE (P.C.P.L.) ** |
|---|---|---|---|---|---|---|
| B | 45 & LESS | TL2 | SHORTRACC | 14'-0" | 1.12 | UP TO 12,000 |
| | | | 3-BAY QUADGUARD | 12'-0" | 0.87 | |
| | OVER 45 | TL3 | TRACC | 21'-0" | 1.63 | |
| | | | 6-BAY QUADGUARD | 21'-0" | 1.53 | |
| C | OVER 45 | TL3 | SCI100GM | 23'-0" | 1.7 | 8,000 AND OVER |
| | | | QUADGUARD ELITE | 33'-4" | 2.46 | |

W= 2'-0" (INSIDE BAY WIDTH)

* AVERAGE DAILY TRAFFIC
** PASSENGER CARS PER LANE

~ LEGEND ~

① NOSE ASSEMBLY
② BACKUP
③ 6" CONCRETE PAD
④ OBJECT MARKER TYPE I, (SEE CUR. MUTCD MANUAL FOR DETAILS) CENTER HORIZ. AND VERT.

USE WITH CUR. STD. DWGS. RBE-065 OR RBC-110 AS APPLICABLE

KENTUCKY DEPARTMENT OF HIGHWAYS

CRASH CUSHION TYPE VI ♠ ☆ △ (ONE & TWO DIRECTION)

STANDARD DRAWING NO. RBE-060-13

11-21-07 DATE

5-2-07 DATE

# VALUE ENGINEERING DESIGN COMMENT # DC-63

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize multi-use agreement for the right-of-way area under structures.

**COMMENTARY:**

In order to maximize the facilities for the public use area on the "Ohio River side" of the project (where the old interchange will be removed), develop joint use agreements with the responsible parties. The joint use agreements will address use of all areas under the structures which will not be used by the various ramps and roadways. This would involve those areas where the highway is on the viaduct and the land underneath is accessible from River Road or one of the streets connecting Butchertown to River Road. Potential uses include off-street parking for those using the Park Kiosks for services to the park users, park buildings, relocation, or expansion of the "Extreme Park" and other park facilities. All users must be subject to removal or should be constructed in such a manner as to allow full availability for inspection and repair of the overhead bridges and other highway features. This joint use allows for policing of the area adjacent to the park, provides maximum use of the public land, allows the park authority to develop beautification of the understructure area, and overall improve the visual and utile aspects of the highway right-of-way. An agreement should be developed which itemizes the responsibilities of the parties including accessibility, notice of change, approval of use, liability, time of notice for cancellation, and provisions by the KYTC, etc.

# VALUE ENGINEERING DESIGN COMMENT # DC-64

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize 42” high bridge parapet/barrier walls in lieu of 32" walls to allow for a future overlay and paving.

**COMMENTARY:**
A 42” tall wall in lieu of a 32” tall wall will reduce construction time and costs, when deck and associated units require maintenance. Future overlays will immediately make the 32” tall walls substandard and less safe for the motoring public. The additional height will also have a secondary effect of reducing headlight glare from all automobile traffic, as well as truck traffic in many areas.

| **Bridge #** | **Length (FT)** |
|---|---|
| 0005 | 125 |
| 0815 | 350 |
| 0820 | 350 |
| 0050 | 1200 |
| 0165 | 1000 |
| 0920 | 110 |
| 0930 | 225 |
| 0940 | 150 |

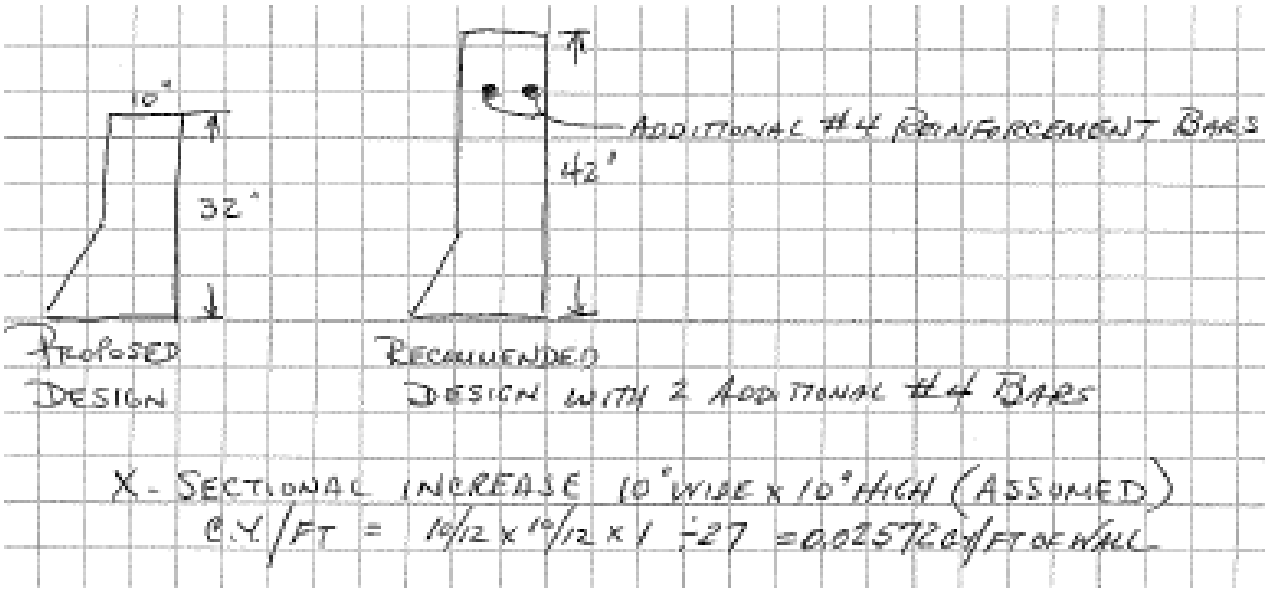
| **Page** | |
|---|---|
| 1 | 20,291 |
| 2 | 17,246 |
| 3 | 10,347 |

51,394 x 2 = 102,788 LF

Additional concrete required: 102,788 x 0.02572 = 2643 CY
Additional # 4 rebar: 102,788 x 2/ft = 205,756 LF

# VALUE ENGINEERING DESIGN COMMENT # DC-64

## SKETCH OF RECOMMENDED DESIGN




| ITEM | UNIT | # UNIT | ORIGINAL # UNIT | $ COST | # UNIT |
|---|---|---|---|---|---|
| CLASS "AA" CONC | C.Y. | 240.00 | [illegible]0 | 0 | 2643O |
| #4 - REBAR EPOXY-COATED | L.F | 0.90 | [illegible]0 | 0 | 205,576 |

# UNIT BASED ON 2006 UNIT BID PRICE SHEET
CLASS "AA" CONC COST WAS CALCULATED @ 50% BECAUSE ADDITIONAL HEIGHT SHOULDN'T REQUIRE ADDITIONAL LABOR ETC. FOR FORMING, STRIPPING FINISHING.

# VALUE ENGINEERING DESIGN COMMENT # DC-65

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize the sidewalk directly behind the curb in lieu of providing a 3 feet grass strip between curb and sidewalk as proposed on typical sections.

**COMMENTARY:**
The proposed design has a grass strip between the back of curb and the sidewalk. These locations exist generally along Witherspoon, Frankfort Avenue, Campbell, Clay, and West River Road. Propose moving the sidewalk directly behind the curb which eliminates the small narrow strip of grass. This eliminates the need to maintain vegetation by hand in a narrow strip. Eliminating the grass strip will reduce the operation and maintenance costs in this area. This will eliminate objects being thrown from the mowers, which damage equipment and pose a threat to the maintenance staff and pedestrians.

# VALUE ENGINEERING DESIGN COMMENT # DC-66

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize aesthetic fence for all of the right of way in lieu of a chain link or standard woven wire field fence where retaining walls are not used for right of way barrier.

**COMMENTARY:**
Aesthetic fence will not only delineate right-of-way areas but enhance the appearance and feel in the historic areas or neighborhoods. The fence should be low in maintenance and high enough to prevent “walk” over. Steel or aluminum fence, coated, anchored in concrete, and “spike” on top with a height of 6’ and 8’ in dimension.

# VALUE ENGINEERING DESIGN COMMENT # DC-67

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Reduce radius and profile grade for ramps in the I-65 and I-64 Interchange area including Ramp 9 and Ramp 43, relative to the relocation of Witherspoon Street.

**COMMENTARY:**
With the relocation of Witherspoon Street the ramps in the south side of the I-65 and I-64 interchange should be redesigned both horizontally and vertically to minimize profile grades, bridge lengths and horizontal footprint.

# VALUE ENGINEERING DESIGN COMMENT # DC-68

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Check peak hour traffic volumes on roadways that are less than 10% ADT.

**COMMENTARY:**
Many, if not most, of the peak hour volumes are less than 10% of the ADT. This appears to be inconsistent with the relatively short peak periods and highly directional flows observed on the area freeways.

Design traffic is for 2025. This is approaching 10years from opening day. It should be updated to the current MPO model.

# VALUE ENGINEERING DESIGN COMMENT # DC-69

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Divert traffic from work area by utilizing alternate routes, time shifts, and other methods.

**COMMENTARY:**
In order to minimize disruption and traffic congestion for the traveling public, it is recommended to explore several techniques to reduce and/or divert traffic from the existing interchange complex during construction. This could be accomplished by constructing the East End Bridge first to divert through traffic around the city.

Additional measures would include working with Greater Louisville Inc. (Metro Louisville's Chamber of Commerce) and the Mayor's Office to urge businesses to stagger their work hours to reduce peak hour congestion. The KYTC should work with TRIMARC and the local media outlets to constantly provide information and alternate route suggestion to the driving the public. Partnership should be developed with TARC to increase bus ridership and KIPPA to specify or constructing Park-N-ride lots through the region. Long term benefits could be related by introducing people to mass transit who continue to use it after construction is complete.

# VALUE ENGINEERING DESIGN COMMENT # DC-70

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Construct all shoulders to full depth in lieu of partial depth.

**COMMENTARY:**
Understanding that a pavement design has not been approved and yet, we thought it would be worth noting that the shoulders should be constructed with full depth pavement to ease construction and allow for future use doing maintenance operation and incident management. Constructing the shoulders to be used during full depth will allow the shoulders to be used during the maintenance of traffic phases without the fear of disintegration. The additional initial construction cost will bring more value to the project by reducing maintenance cost and providing more flexibility of operations.

# VALUE ENGINEERING DESIGN COMMENT # DC-71

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Add a ramp to connect southbound I-71 to eastbound I-64 as well as a ramp to connect westbound I-64 to northbound I-71.

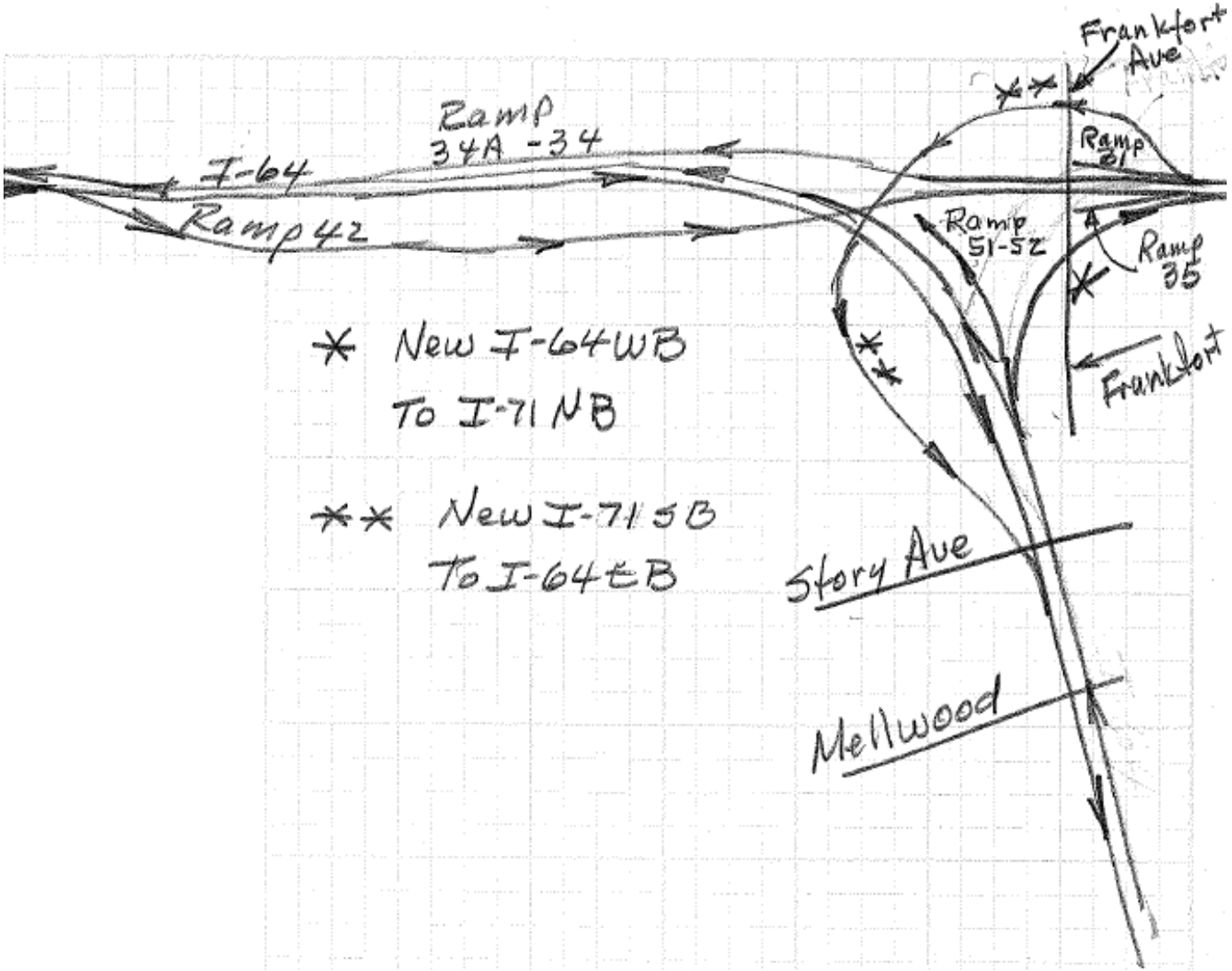
**COMMENTARY:**
The design of the Kennedy Interchange to connect I-64, I-65, and I-71 is intended to upgrade and update the movements and interchange of traffic between the Interstate routes and the local street system.

The current (existing) interchange does not have a connection between I-71 and I-64 East. While it does provide the movements from I-71 to I-64 west and to I-65 north and south. While this movement has been missing serve the interstate highway system, there would be considerable service provided to the area between I-64 and the connection of I-71 and I-264 approximately 5 miles to the north. Providing for this movement would complete the interchange of all movements between the three major interstate routes via direct full control of access connections. There is a street level connection provided which serves this movement. Using the existing street system from Story Avenue/Mellwood Avenue to Frankfort Avenue and then onto I-71 via the new diamond ramps at Frankfort Avenue. In order to provide this movement via freeway type connection it would be necessary to construct a ramp with an overpass over I-64 westbound to tie to I-64 eastbound. This ramp would diverge from I-71 along with Ramp 31 and would need to cross over or under several ramps in the area west of Frankfort Avenue, while a ramp from I-64 Ramp 51/52 to the entry ramp to I-71 from Frankfort Avenue (Ramp 35) would provide the I-64 westbound to I-71 northbound.

No estimate of cost is made but a general estimate would be in the order of 10-15 million.

## VALUE ENGINEERING DESIGN COMMENT # DC-71

### SKETCH OF ORIGINAL DESIGN



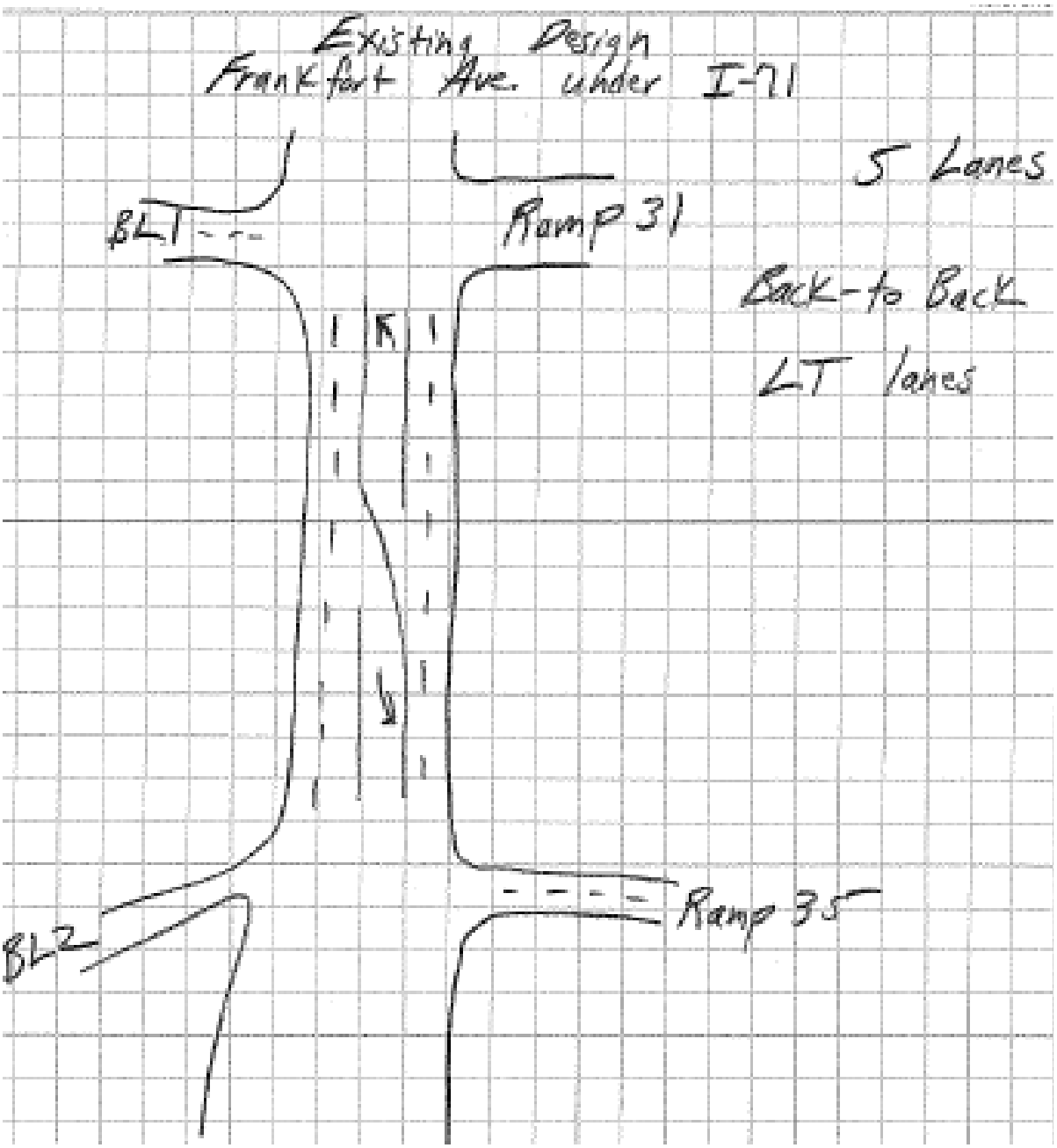
# VALUE ENGINEERING DESIGN COMMENT # DC-72

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Improve the operation of the I-71 westbound and Frankfort Avenue interchange.

**COMMENTARY:**
Investigate lengthening Bridge 330 and 140 to provide two side-by-side left-turn lanes on Frankfort Avenue instead of two back-to-back left-turn lanes. The two interstate ramp intersections are just 300 feet apart. This allows for minimal left-turn storage. Side-by-side left-turn lanes would double the left-turn storage.

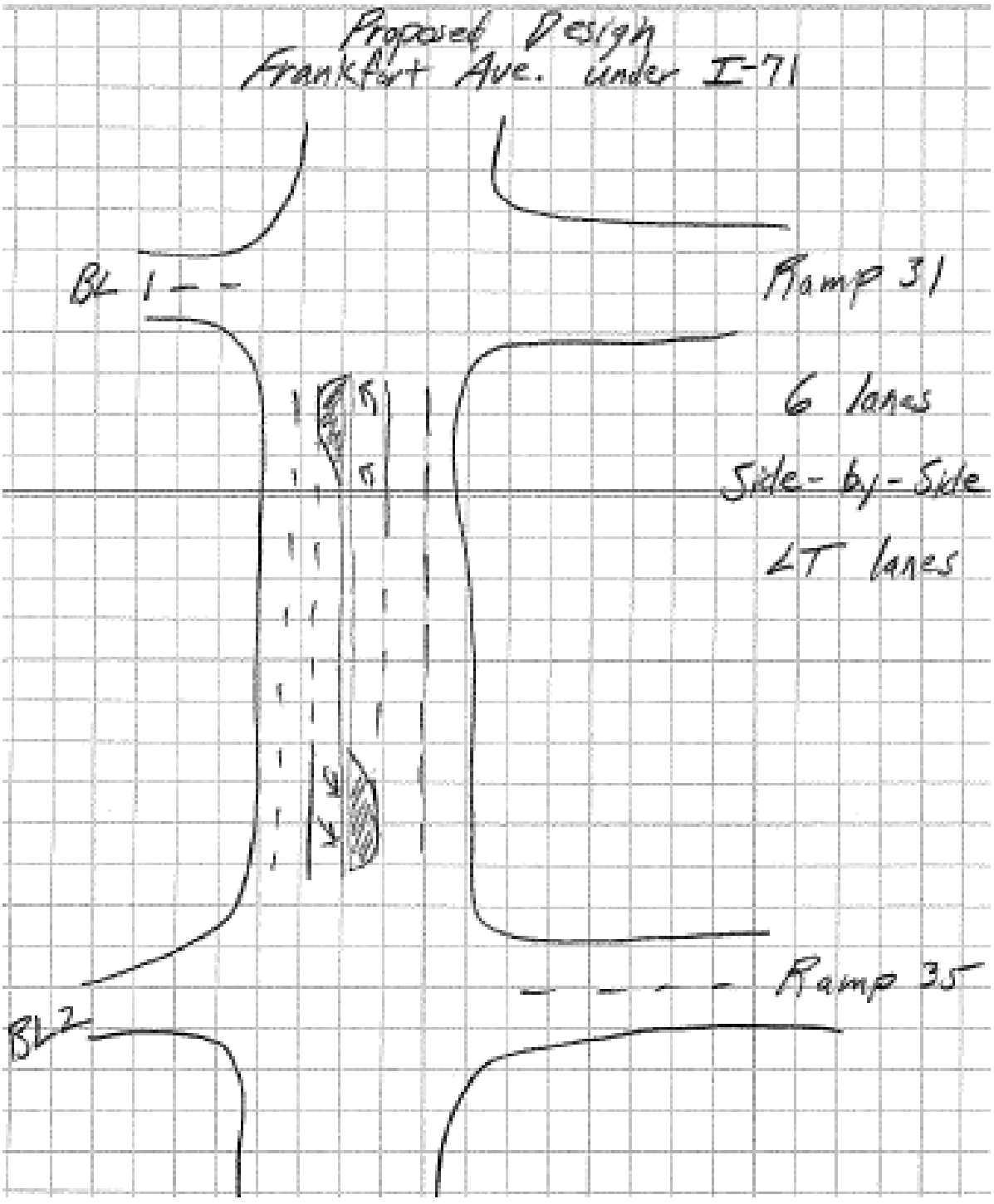
## VALUE ENGINEERING DESIGN COMMENT # DC-72

### SKETCH OF ORIGINAL DESIGN



## VALUE ENGINEERING DESIGN COMMENT # DC-72

### SKETCH OF RECOMMENDED DESIGN



# VALUE ENGINEERING DESIGN COMMENT # DC-73

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Review retaining wall IW64-7 to verify location and dimensions on the plans and cross-sections.

**COMMENTARY:**
According to the available information, the description of the retaining wall IW64-7 states that the wall is approximately 2200 feet long. This wall is indicated on the retaining wall plan view and plan and profile drawings. However, on the cross-sections (sheets XS0698 to XS0719) the wall is not clearly shown. It appears that fill is being placed between the barriers for I-64 WB lanes and Ramp 34.

# VALUE ENGINEERING DESIGN COMMENT # DC-74

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize graffiti deterring measures in lieu of not providing any measures.

**COMMENTARY:**
Deter graffiti by planting hardy, thorny, draught-resistant vegetation at the base of retaining walls in accessible areas. Also, place 6 feet to 8 feet high graffiti coatings along the base of the retaining walls in accessible areas. Both measures will reduce maintenance time, labor, and material expenditures in high visibility and traveled areas.

# APPENDICES

The appendices in this report contain backup information supporting the body of the report, and the mechanics of the workshop. The following appendices are included.

## CONTENTS

# APPENDIX A
# Participants

**APPENDIX A - Participants**

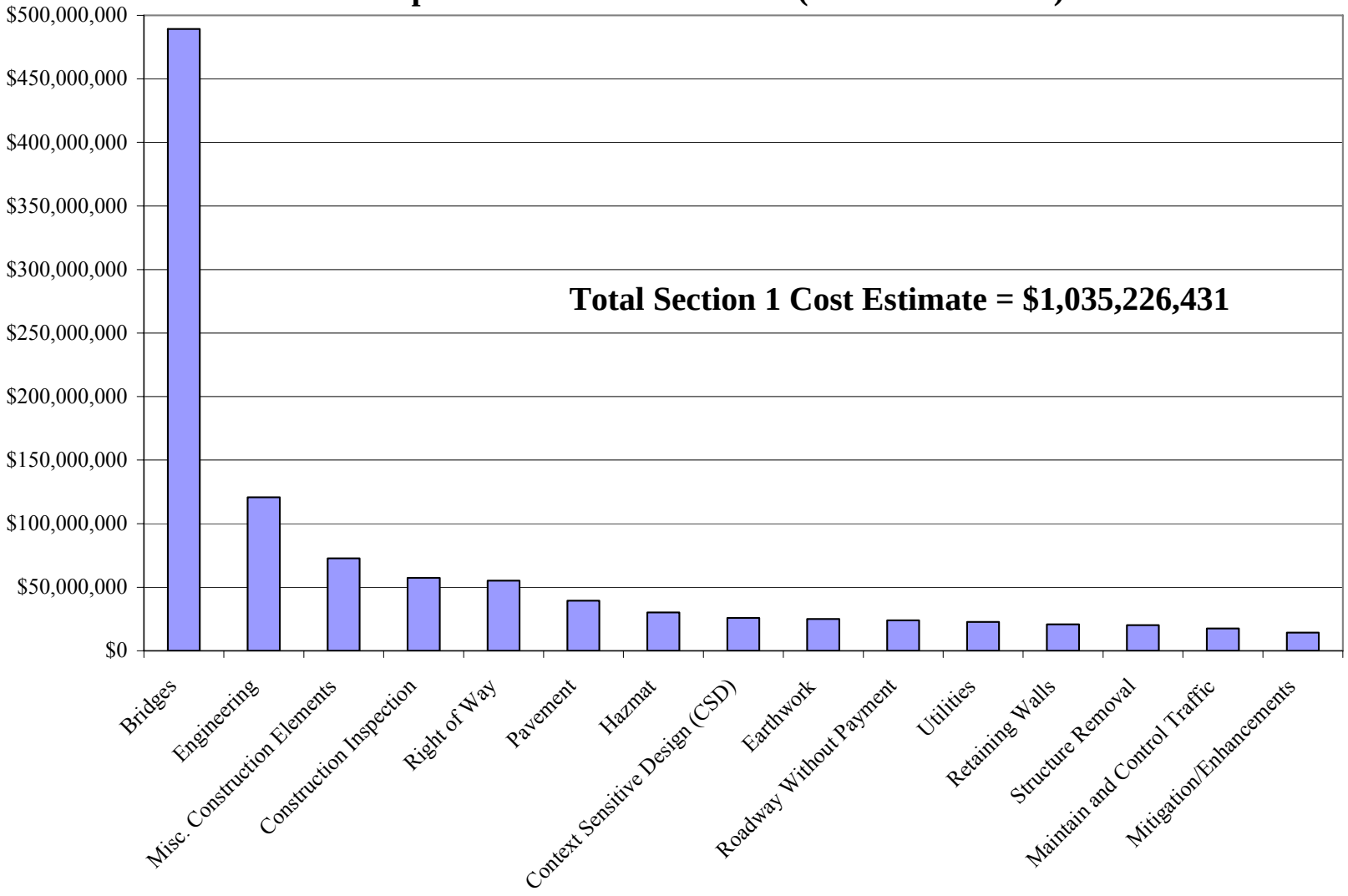
| Workshop Attendance | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Attendees | | | | Participation | | | | | | | |
| | | | | Meetings | | Study Sessions | | | | | |
| Name | Organization and Address | Tel # and Email | Role in wk shop | Intro | Out Brief | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
| Robert Ballard | URS 277 West Nationwide Boulevard Columbus, OH 43215 | 614-464-4500 Robert_W_Ballard@urscorp.com | VE Bridge Expert | X | X | X | X | X | X | X |
| Amanda Beiting | URS 36 East Seventh St. Ste. 2300 Cincinnati, OH 45202 | 513-419-3474 Amanda_Beiting@urscorp.com | VE Technical Recorder | X | X | X | X | X | X | X |
| Holly Bezold | URS 36 East Seventh St. Ste. 2300 Cincinnati, OH 45202 | 513-307-.6270 Holly_Bezold@urscorp.com | VE Technical Recorder | X | X | X | X | X | X | X |
| Pete Bick | URS 420 Madison Avenue, Ste 1235 Toledo, OH 43604 | 419-246-0839 Pete_Bick@urscorp.com | VE Design/ Geometrics | X | X | X | X | X | X | X |
| Paul Boone | INDOT | 812-282-7493 pboone@indot.in.gov | IN Owner | X | X | | | | | |
| Matt Bullock | KYTC 200 Metro St. Frankfort, KY 40622 | 502-367-6411 Matt.Bullock@ky.gov | KYTC Owner | X | | | | | | |
| Daniel Byers | KTA/WMB Inc | 859-299-5226 dan@wmbinc.com | Engineering Design Manager | X | X | | | | | |
| Stephen Curless | URS 36 East Seventh St. Ste. 2300 Cincinnati, OH 45202 | 513-419-3504 Steve_curless@urscorp.com | VE Lane Continuity | X | X | X | X | X | X | X |
| Joe Feinauer | URS 36 East Seventh St. Ste. 2300 Cincinnati, OH 45202 | 859-781-5495 jwfeinauer@InsightBB.com | VE Maintenance | X | X | X | X | X | X | X |
| Greg Groves | URS 325 W Main St. Ste. 1200 Louisville, KY 40202 | 502-217-1509 Greg_Groves@urscorp.com | VE Design Expert | X | | X | X | X | X | X |
| Mike Guter | URS 3950 Sparks Dr. SE Grand Rapids, MI 49546 | 616-574-8477 Mike_Guter@urscorp.com | VE Surface Transportation Expert | X | X | X | X | X | X | X |
| Rob Harris | CTS 305 N Hurstbourne Parkway Ste 100 Louisville, KY 40222 | 502-394-3841 rharris@CTSGEC.com | Department Project Manager | X | X | | | | | |
| John Hollenbaugh | URS 564 White Pond Drive Akron, OH 44320 | 330-836-9111 John_Hollenbaugh@uscorp.com | VE Structures | X | X | X | X | X | X | X |
| Steve Hoefler | CTS-GEC | 502-394-3854 shoefler@ctsgec.com | CTS Design Manager Section 1 | X | X | | | | | |
| Glen Kelly | QK4 815 West Market Street Ste. 300 Louisville, KY 40202 | 502-585-2222 gkelly@QK4.com | KTA Project Manager | X | X | | | | | |
| Phil Lambert | KTA | 859-299-5226 phil@wmbinc.com | VE MOT Designer | X | X | | | | | |
| Bill Madden | URS 36 East Seventh St. Ste. 2300 Cincinnati, OH 45202 | 513-419-3513 William_F_Madden@urscorp.com | VE Traffic | X | X | X | X | X | X | X |
| Dick McGuinness | URS 277 West Nationwide Boulevard Columbus, OH 43215 | 614-464-4500 Dick_McGuinness@urscorp.com | VE Traffic Expert | X | X | X | X | X | X | X |

| Workshop Attendance | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Attendees** | | | | **Participation** | | | | | | | |
| | | | | **Meetings** | | **Study Sessions** | | | | | |
| Name | Organization and Address | Tel # and Email | Role in wk shop | Intro | Out Brief | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
| Kim Mulder | KYTC 200 Metro St.<br>Frankfort, KY 40622 | 502-564-0319<br>Kimberley.Mulder@ky.gov | KYTC Owner | X | | | | | | |
| Norman Roush | URS # 4 Mission Way Ste. 201<br>Scott Depot, WV 25560 | 304-757-6642<br>Norman_Roush@urscorp.com | VE Geometrics Expert | X | X | X | X | X | X | X |
| Kevin Rust | URS 36 East Seventh St. Ste. 2300<br>Cincinnati, OH 45202 | 513-419-3503<br>Kevin_Rust@urscorp.com | VE Construction Expert | X | X | X | X | X | X | X |
| John Sacksteder | CTS 305 N Hurstbourne Parkway Ste 100<br>Louisville, KY 40222 | 502-394-3847<br>jsacksteder@CTSGEC.com | CTS Project Manager | X | X | | | | | |
| Kyle Schafersman | URS 8300 College Blvd. Ste. 200<br>Overland Park, Kansas 66210 | 913-344-1019<br>Kyle_Schafersman@urscorp.com | VE Team Leader | X | X | X | X | X | X | X |
| Christopher T. Smith | URS 325 W Main St. Ste. 1200<br>Louisville, KY 40202 | 502-382-6013<br>aels@bellsouth.net | VE Maintenance Expert | X | X | X | X | X | X | X |
| Jadie Tomlinson | KYTC 200 Metro St.<br>Frankfort, KY 40622 | 502-564-0319<br>Jadie.Tomlinson@ky.gov | KYTC Owner | X | X | | | | | |
| Ken True | URS 8300 College Blvd. Ste. 200<br>Overland Park, Kansas 66210 | 402-516-2635<br>kentrue@maladon.com | VE Team Leader | X | X | X | X | X | X | X |

# APPENDIX B
# Cost Information

## APPENDIX B - Cost Information

**Louisville-Southern Indiana Ohio River Bridges Project**
**Section 1-Kennedy Interchange**
**Joint Inspection Cost Estimate 2006 (Without Inflation)**



# APPENDIX C
# Function Analysis

## APPENDIX C - Function Analysis

# Function Model

| Item | Function |
|---|---|
| **GEOMETRICS** | |
| Pavement Section | Transmit load<br>Durability<br>Ride-ability |
| Provide thru lanes | Ease traffic flow |
| Provide exit | Change direction/Exit freeway |
| Provide exit ramp lane | Change roadway |
| Provide weave lane | Cross movement |
| Provide drop and add lanes | Capacity/Continuity |
| Provide directional ramps | Minimize/Eliminate Weave |
| Provide entrance | Combine traffic/Access freeway |
| Witherspoon | maintain extreme park foot print |
| -crossing under 15 bridges | avoid Butcher Town |
| Clay/Campbell | Improve connection to Ohio River |
| -two separate accesses to one gateway | Overload River Road |
| -redundant connections | Increase access |
| Width of Clay | Improve connection to Ohio River |
| -5-12’ lanes, 2-6’ bike/shoulders, 2-5’ sidewalks | Accommodate pedestrians |
| Width of Frankfort | Improve connection to Ohio River |
| -4-12’ lanes, 20’-40’median, 2-6’ bike/shoulders, 2-5’ sidewalks | Create gateway |
| Number of lanes from I-64 WB to I-65 NB (Ramp 51A) | Bottleneck traffic |
| -Appears to be only one lane | |
| -33,000 ADT for no build option | |
| Ramp 34 from 34A to 26B to River Rd. | Create duplicate access to River Rd. |
| Ramp 26B to 51A to River Rd. | Create duplicate access to River Rd. |
| I-71 SB to I-64 EB (I-64 WB to I-71 NB) | Maintain existing connections |
| - No connection ramp | |
| Ramp widths | Future conversion to two lanes |
| -Ramp 6 (12’- 15’- 8’) | |
| -Examples Ramp 51A (29’) | |
| -Examples Ramp 52 (31’-33’) | |
| -Examples Ramp 24 (31’) | |
| Weave length of Ramp 2&3 to Ramp 4&5 | Create difficult merge |
| Lane Drop on I-64 EB East of Ramp 23 to West of BL CD 2 | Volume drop |
| -Weave length | Maintain lane balance |
| Cross Section of Ramp 52 & 32 | Maintain lane balance |
| Buchanan St. connection through Park | Improve connection to Ohio River and Butcher Town areas |

| Item | Function |
|---|---|
| - Excessive connection to River Road | Meet HPP |
| Adam Street connection through Park | Improve connection to Ohio River and Butcher Town areas |
| Width of multi-use paths (17' at River Rd.) | Eliminate pedestrian vehicles on bike path |
| -no bollards at ends of path | Eliminate pedestrian vehicles on bike path |
| Width of Ramp 26 | Appears excessive |
| - 2-12' shoulders | Appears excessive |
| 2 lane at terminal on Ramp 35 | Accommodate more vehicles |
| -Necessity of 2 lanes | Maintain traffic |
| No connection from Ramp BL 3 to Frankfort Ave. | Utilization of Ramp 26 |
| Multi-use path across new I-65 corridor bridge | Connect bike paths to Indiana |
| Temporary T-12 bridge | Staging of maintain traffic |
| -review necessity versus using existing bridge | Change elevation 1 foot |
| | |
| **TRAFFIC** | |
| Signage | Communicate information |
| Pavement Markings | Communicate information |
| Intersection Safety | Move through the intersection safely |
| MOT | Maintain optimal traffic flow and access<br>Safety (Worker/Traffic)<br>Constructability |
| Lighting | Illuminate Roadway |
| Ramp 51A | Bottleneck traffic |
| -Needs 2 lanes to maintain lane continuity | |
| Conceptual signage appears to need development | Notify travelers |
| Tie in to the TRIMARC System | Inform traffic |
| Several connections have less than 10% of ADT (Examples) | Insufficient traffic maintenance |
| - Ramp 51A (single lane width 1240 DHV) | Insufficient capacity |
| - Ramp 23 ( 8000 ADT, 520 peak) | Insufficient capacity |
| -Ramp 32 ( 27,500ADT, 19000 Peak) | Insufficient capacity |
| Unload traffic from the work zone | Improve construction |
| Stabilize traffic in to long term phases | Improve driver expectancy |
| Construct surface streets in first phase | Improve infrastructure before interstate construction |
| Reduce to 2-3 major phases to keep stable | Improve constructability |
| 9 construction phases | Accommodate segmental construction |
| | |
| **CONSTRUCTABILITY** | |
| Construction Inspection | Verify compliance with contracts |

| Item | Function |
|---|---|
| Construction Phasing | Maintain traffic<br>Match funding<br>Provide sequencing |
| Construction Methods | Specify performance criteria |
| Construction Duration | Optimize work to minimize construction time |
| Temporary Construction | Maintain traffic<br>Allow construction access |
| Utility Construction | Provide utility |
| -Storm & Power | Maintain existing |
| Utility Relocation | Maintain usage<br>Eliminate conflict |
| -Railroads, Water, Gas, Sewer, Force Main & Power | |
| Right of Way | Provide project area |
| Construction Packaging | Address cabinet risk<br>Maximizes competition<br>Optimizes use of funding |
| Variable bridge widths | Accommodate for road geometrics |
| -several bridges | |
| -minimal variation | |
| -consideration for constant width | |
| Fabrication of steel tub girders | Improve aesthetics |
| -difficult to construct | Increase cost |
| -difficult to install | Increase cost |
| -custom fabricate sole plates | Increase cost |
| **STRUCTURES** | |
| Bridges | Separate grade crossing<br>Reduce earthwork<br>Allow visible river access<br>Provides desirable elevation<br>Untangle the web |
| Retaining Walls | Reduce footprint |
| Barrier Walls | Contain vehicles |
| Earthwork | Obtain desirable elevation |
| Context Sensitive Design | Provide aesthetics<br>Address stakeholder concern |
| Retaining walls at Ramp 31 & 35 | Hold back earth |
| Complexity of super structure and piers | Adhering to aesthetic guidelines |
| -trapezoidal regardless of size or location | Improve aesthetics |
| New bridges on I-64 EB and I-65 SB south of Interchange are also trapezoidal | Adhering to aesthetic guidelines |
| -existing I-64 and I-65 are not trapezoidal | Utilize existing |
| Retaining walls with vegetation | Increase maintenance |
| -maintenance free vegetation | Visually hide interstate |

| Item | Function |
|---|---|
| Column elliptical | Adhering to aesthetic guidelines |
| -drain down outside side slots | Improve aesthetics |
| -uniform size and shape | Improve constructability |
| | |
| **MAINTENANCE** | |
| Maintainability | Minimize future maintenance |
| Drainage issues | Complicates drainage |
| -drainage on bridge structure not developed | Visually not appealing |
| Retaining Walls | Facilitate graffiti |
| -anti-graffiti finish or thorny greenery | Detour vandalism |
| -maintenance free vegetation | Reduce maintenance |
| Barrier wall with handrail on bridges | Improve aesthetic |
| -aluminum | Improve aesthetic |
| -additional maintenance | Increases maintenance |
| -require stock pile | Accommodate future handrail replacement |
| Tub girder | Improve aesthetics |
| -difficult to inspect inside | Complicates inspection |
| -repeatedly painted every 20-25 yrs. | Increases maintenance |
| -drainage around or through tub | Visually not appealing |
| -fracture critical | Structural concern |
| If weathered steel is used it will stain and discolor piers | Aesthetically not appealing |
| -continued deterioration | Aesthetically not appealing |
| Access to storm drainage | Improve maintenance |
| Crash cushions in gore areas should be “rebounding/reusable” | Reduce exposure to labor and future maintenance cost |
| Some full depth shoulders | Accommodate maintenance |

# APPENDIX D
# Creative Idea List and Evaluation

## APPENDIX D - Creative Idea List and Evaluation

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 1 | Provide roadway system redundancy (Incident Management) | DC | B. Madden |
| 2 | Move the new Ohio River Bridge upstream approx. 3500’ | Eliminate | |
| 3 | Simplify structure design in non-critical CSD areas (example: most economical section for span length and curvature) | DC | R. Ballard<br>J. Hollenbaugh |
| 4 | Eliminate the bike path on the new Ohio River Bridge crossing | Develop See with 5, 101 | J. Feinauer |
| 5 | Simplify bike path on the new Ohio River Bridge by decreasing its width | Comb with 4 | |
| 6 | Eliminate the bridge over the Great Lawn and use embankment instead | Develop | K. Rust |
| 7 | Modify the roadway geometrics to improve bridge geometries | DC | R. Ballard<br>J. Hollenbaugh |
| 8 | Utilize railroad right-of-way for project construction easement | DC | B. Madden |
| 9 | Utilize a buried utility corridor approximately along Witherspoon Street | Eliminate | |
| 10 | Replace barrier wall with cable barrier | Eliminate | |
| 11 | Provide a conventional reinforced earth wall outside of CSD areas | Develop | J. Feinauer |
| 12 | Replace Clay Street and Witherspoon Street intersection with a roundabout | DC See 110 | D. McGuinness |
| 13 | Eliminate Campbell Street | Eliminate | |
| 14 | Replace permanent temporary structures with removable temporary structures (example 8070/T-7) (whenever it is a stand-alone and not for a widening) | DC | R. Ballard<br>J. Hollenbaugh |
| 15 | Reduce accessibility to Adams Street during construction | Eliminate | |
| 16 | Maintain access to Third Street | Develop | B. Madden |
| 17 | Utilize Design-Build Concept where possible | DC with 146 | K. True |
| 18 | Utilize performance specification where possible | DC with 81 | M. Guter |
| 19 | Relocate the railroad | Eliminate | |
| 20 | Utilize friction piles where possible | DC | R. Ballard<br>J. Hollenbaugh |
| 21 | Utilize minimum design standards in lieu of preferred | Develop see 22 | N. Roush |
| 22 | Utilize reduced shoulder width across longer bridges (AASHTO 200 ft) | With 21 | |
| 23 | Utilize an existing railroad bridge for bike/pedestrian path | Comb with 4 | |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 24 | Utilize geo-synthetic material to minimize embankment | Eliminate | |
| 25 | Utilize precast post-tensioned decks | DC | R. Ballard<br>J. Hollenbaugh |
| 26 | Utilize stay-in-place forms for bridge decks | DC | K. Rust |
| 27 | Utilize fly-ash fill from Louisville Gas & Electric (E-on) | DC | K. Rust |
| 28 | Utilize the prime contractor to supply embankment material | Eliminate | |
| 29 | Contract by specialty | DC | M. Guter |
| 30 | Standardized design elements | DC with 121, 122 | R. Ballard<br>J. Hollenbaugh |
| 31 | Utilize precast wing-wall panels | DC | R. Ballard<br>J. Hollenbaugh |
| 32 | Minimize the length and number of bridges over the Great Lawn | Eliminate | |
| 33 | Revise, simplify, or eliminate Ramp 22 | Develop with 109, 46 | S. Curless |
| 34 | Revise or simplify Ramp 8 | Develop | B. Madden |
| 35 | Decrease bridge width over the Great Lawn | Eliminate | |
| 36 | Investigate sight distance due to the relatively sharp curve on I-65 adjacent to the hospital | DC | S. Curless |
| 37 | Simplify interchange configuration for Ramps 1, 3, 11, and 72 | Eliminate | |
| 38 | Utilize existing bridge in lieu of providing a new Bridge 65-0 | Eliminate | |
| 39 | Move the I-65 centerline to the west to align with Clark Memorial Bridge from Muhammad Ali Blvd | Eliminate | |
| 40 | Move I-65 southbound to the west to align with Clark Memorial Bridge from Muhammad Ali Blvd | Eliminate | |
| 41 | Simplify the exit at Ramp 11 and make Liberty Street a 2-way road for a short distance | Eliminate | |
| 42 | Close Market Street permanently and use embankment in lieu of a bridge | Eliminate | |
| 43 | Close south Jackson Street permanently | Develop with 44 | K. Rust |
| 44 | Analyze local street grid to reduce the number of bridges by closing certain streets | Comb with 43 | |
| 45 | Consolidate BL CD-1 and BL CD-2 | Develop | S. Curless |
| 46 | Eliminate Ramp 42 and replace it with an on-ramp to serve I-64 eastbound | Comb with 33 | |
| 47 | Construct Ramps 26 and 21 under Ramp 10 | Develop | R. Ballard |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 48 | Move the radius point of Ramp 26 southeast to reduce the length of the Ramp 26 | Eliminate | |
| 49 | Reduce number of lanes on Ramp 4 | Eliminate | |
| 50 | Reduce part-width construction | DC | M. Guter |
| 51 | Relocate Witherspoon Street to the south to reduce the number of bridges | Eliminate | |
| 52 | Reduce temporary construction | Eliminate | |
| 53 | Designate utility corridor within freeway footprint | Develop | M. Guter |
| 54 | Eliminate all context sensitive design | Eliminate | |
| 55 | Combine bike rail with barrier wall | DC | K. Rust |
| 56 | Relocate Clay Street to intersect River Road 600’ to the west | Eliminate | |
| 57 | Relocate the I-64 centerline to the south over the top of Witherspoon Street from the west project limits to I-65 | Develop | B. Madden |
| 58 | Shorten construction durations by requiring an expedited schedule | Eliminate | |
| 59 | Utilize incentive/disincentive clauses | DC with 60, 61 | M. Guter |
| 60 | Utilize “A + B” contracting methods to save time and money | Comb with 59 | |
| 61 | Use lane rental bid-item | Comb with 59 | |
| 62 | Eliminate the construction to the west end of River Road | Develop | K. Rust |
| 63 | Investigate connection to the Clark Memorial Bridge | Eliminate | |
| 64 | Utilize ramp metering techniques | DC | K. Rust |
| 65 | Use freeway closures during construction | Develop | M. Guter |
| 66 | Reduce phasing | Eliminate | |
| 67 | Close I-64 from Payne to Third Street and construct project in one accelerated phase | Develop | M. Guter |
| 68 | Use movable median barrier on existing bridge in lieu of constructing a new bridge | Develop with 69, 99, 152 | B. Madden<br>D. McGuinness |
| 69 | With the exception of adding some earmarks for I-65 improvements eliminate the rest of the project | Comb with 68 | |
| 70 | Use the railroad to move the fill from Section 4 to Section 1 | Eliminate | |
| 71 | Utilize existing bridges for the Great Lawn | Develop | K. Rust |
| 72 | Use standard specifications for sign support | DC with 73, 74 | D. McGuinness |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 73 | Use standard specifications for lighting fixtures | Comb with 72 | D. McGuinness |
| 74 | Consider different configuration for structural anchorage of light pole and signs | Comb with 72 | |
| 75 | Use recessed pavement markings | Eliminate | |
| 76 | Use post-tensioned segmental construction | Eliminate | |
| 78 | Sell the excess right of way to finance the project in lieu of giving away excess right-of-way | Eliminate | |
| 79 | Provide an alternate park site for part of the Great Lawn | Eliminate | |
| 80 | Use contractor quality control in lieu of total cabinet construction inspection | Develop | M. Guter |
| 81 | Use long term warranties on various project elements | Comb with 18 | |
| 82 | Standardize retaining wall design | Eliminate | |
| 83 | Standardize barrier wall design | Eliminate | |
| 84 | Use wick drains in fill areas to reduce settlement time | DC | R. Ballard<br>J. Hollenbaugh |
| 85 | Minimize drainage collection on the bridges | Develop | C. Smith |
| 86 | Configure drainage to minimize longitudinal drainage particularly behind MSE walls | DC | R. Ballard<br>J. Hollenbaugh |
| 87 | Utilize one construction phase in lieu of 14 or 22 construction packages | DC | M. Guter |
| 88 | Relocate Extreme Park to the north side of I-64 on Campbell Road to improve relocation of Witherspoon Street and minimize profile changes to Ramp 4 | Develop with 98 | P. Bick<br>N. Roush |
| 89 | Combine Clay Street and Campbell Street in lieu of utilizing two separate streets beneath Kennedy Interchange | Develop | P. Bick<br>G. Groves |
| 90 | Terminate Buchanan Street north of Witherspoon in lieu of building bridges over this road | Develop | K. Schafersman |
| 91 | Terminate Adams Street north of Witherspoon in lieu of building bridges over this road | Develop | K. Schafersman |
| 92 | Utilize a mural on the retaining wall in lieu of the proposed aesthetic finish | Eliminate | |
| 93 | Connect Baseline 3 to Frankfort Avenue to provide alternate access to River Road so Ramp 26B and the part of Ramp 34 that connects to River Road can be eliminated which will improve traveler safety | Develop | P. Bick<br>N. Roush |
| 94 | Utilize two lanes for Ramp 51A in lieu of one lane | Develop with 95 | S. Curless |
| 95 | Utilize 3 lanes for Ramp 32 for the merge point at Ramp 51A in lieu of utilizing 2 lanes | Comb with 94 | |
| 96 | Utilize two lanes on Frankfort Avenue in lieu of 4 lanes and a median | Develop | J. Feinauer |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 97 | Utilize two lanes on Clay Street in lieu of 5 lanes | Develop | G. Groves |
| 98 | Relocate Witherspoon Street south of Ramp 42 in lieu running under Ramp 42 | Comb with 88 | P. Bick<br>N. Roush |
| 99 | Utilize reconstruction of existing interchange within existing footprint in lieu of realignment interchange to the north | Comb with 68 | |
| 100 | Utilize overall project manager with absolute decision making power to improve coordination of MOT and construction management/inspection | Develop | K. True |
| 101 | Eliminate proposed multi-use path on I-65 bridge and relocate to Big 4 Bridge | Comb with 4 | |
| 102 | Utilize temporary detour north of existing mainline and to the south on the proposed Witherspoon Street alignment to carry all freeway traffic and construct interchange in one phase in lieu of 9 phases | Develop | D. McGuinness |
| 103 | Incorporate TRIMARC into the entire MOT process to monitor traffic, divert traffic from work area, and to control access to work area | DC | D. McGuinness |
| 104 | Move southbound I-65 as far west as possible to minimize the stacking of ramps within the I-64 and I-65 interchange | Eliminate | |
| 105 | Where aesthetics are not as critical (I-64 and I-65 south of interchange), utilize square box girders in lieu of trapezoidal tub girders | Develop with 106, 123, 144 | R. Ballard<br>J. Hollenbaugh |
| 106 | Utilize other superstructure types such as steel I-girder and prestressed girders for bridges away from downtown where aesthetics are not as critical to provide aesthetic viewshed | Comb with 105 | |
| 107 | Maintain constant width for bridges B64-2, B64-15, B71-10 and B65-24A in lieu of having the bridge width conform to the roadway geometry | Develop | R. Ballard<br>J. Hollenbaugh |
| 108 | Utilize the existing bridges and/or proposed bridges in lieu of temporary bridge T-12 for construction phasing | Develop | |
| 109 | Utilize Ramp 23 for eastbound I-64 to northbound I-71 and eliminate Ramp 42 | See 33 | |
| 110 | Utilize at grade roundabout intersections all along Witherspoon Street in lieu of utilizing signalized intersections | Comb with 12 | D. McGuinness |
| 111 | Utilize low maintenance vegetation in areas of aesthetic viewpoints in lieu of vegetation that requires a lot of maintenance and irrigation | DC | C. Smith |
| 112 | Utilize pervious pavement or other green technology in lieu of traditional pavement design | Eliminate | |
| 113 | Utilize a steel guardrail barrier system in lieu of barrier type A and handrail where aesthetics are not as critical | DC | C. Smith |
| 114 | Utilize self healing crash cushions in lieu of cartridge replace cushion | DC | C. Smith |
| 115 | Utilize left turn on to Frankfort Avenue so that BL 1 (Witherspoon Street westbound) lies parallel with BL-2 (Witherspoon Street eastbound) in lieu of running BL-1 under 3 bridges | Develop | P. Bick |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 116 | Provide a direct connection interchange between I-64 and I-71 and provide a direct connection interchange between I-64 and I-65 thus eliminating overlapping ramps and connectors | Eliminate | |
| 117 | Move northbound I-65 as far east as possible to minimize stacking of ramps at the I-64 and I-65 interchange | Eliminate | |
| 118 | Utilize multi-use agreement for the right-of-way area under structures | DC | N. Roush |
| 119 | Connect I-71 southbound to I-64 eastbound in lieu of not providing this connection | Eliminate | |
| 120 | Make all of the one-lane ramps the uniform width of 25' (applies to Ramps 6, 51A, 52 24, 26) | Develop | N. Roush |
| 121 | Use standard KYTC substructure units | Comb with 30 | |
| 122 | Detail all bridge columns to maximize reuse of the concrete form work | Comb with 30 | |
| 123 | Extend bridge parapet below bridge deck to create an aesthetic appearance and to hide bridge deck drainage | Comb with 105 | |
| 124 | Make all bridge parapets 42" high to allow for future overlay and paving in lieu of 32" high | DC | J. Feinauer |
| 125 | Use weathering steel on all bridge steel superstructure | Eliminate | |
| 126 | Move sidewalk to the backside of curb in lieu of providing a 3' grass strip between the sidewalk and the curb | DC | C. Smith |
| 127 | Use aesthetic fence (no chain link or farm fence) for all of the right-of-way | DC | C. Smith |
| 128 | Lower height of I-64 over the Great Lawn to existing (current) elevation | Eliminate | |
| 129 | Utilize the existing I-64 roadway west of I-65 in lieu of completely replacing I-64 | Eliminate | |
| 130 | Reduce the radius on Ramp 9 and Ramp 43 to increase the area where Witherspoon Street could be relocated | Develop | P. Bick |
| 131 | Check peak hour traffic volumes on links that are less than 10% ADT | DC with 143 | D. McGuinness |
| 132 | Divert traffic from work area by utilizing alternate routes, time shifts, and other methods | DC | G. Groves |
| 133 | Combine construction into fewer phases and long term traffic patterns to improve driver expectancy | Eliminate | |
| 134 | Control the amount of traffic going into the work area with entrance ramp closures and ramp metering | Eliminate | |
| 135 | Reduce the size of the project by stopping new construction on I-64 just south of the Melwood exit and north of the railroad | Develop | C. Smith |
| 136 | Modify the weave from Ramp 2 and 3 accessing Ramp 4 and 5 | Develop | S. Curless |
| 137 | Construct all shoulders to full depth in lieu of partial depth | DC | G. Groves |

| List of CREATIVE IDEAS | | | |
|---|---|---|---|
| **ID #** | **Name of Idea / Description** | **Develop Status** | **TM Resp.** |
| 138 | Add a ramp to connect southbound I-71 to eastbound I-64 as well as a ramp to connect westbound I-64 to northbound I-71 | Develop | D. McGuinness |
| 139 | Relocate Ramp 31 and Ramp 35 further away from I-71 mainline at Frankfort Avenue to improve the operation of the interchange | DC | B. Madden |
| 140 | Utilize a retaining wall on north side of Ramp 32 in lieu utilizing a 2:1 slope and right-of-way fence | Develop | C. Smith |
| 141 | Review retaining wall IW64-7 to verify location and dimensions on the plans and cross-sections | DC | R. Ballard<br>J. Hollenbaugh |
| 142 | Use diagrammatic signs for multiple exits to improve driver expectancy | Eliminate | |
| 143 | Construct the local streets in the first phase before any mainline construction takes place | Eliminate | |
| 144 | Eliminate tub girders throughout project due to fracture critical issues and fabrication issues during construction (could use false facade) | Develop reference 105 | R. Ballard<br>J. Hollenbaugh |
| 145 | Do not complete any work on I-65 until the new downtown Ohio River crossing bridge is complete | Eliminate | |
| 146 | Utilize Design-Build for the entire project in lieu of 9 construction phases and multiple contractors | Comb with 17 | K. True |
| 147 | Decrease the number of lanes on Ramp 26 generally from I-64 westbound to I-65 southbound | Develop | S. Curless |
| 148 | Decrease the number of lanes on Ramp 9 generally from I-65 southbound to I-64 eastbound | Develop | S. Curless |
| 149 | Utilize 5 lanes in lieu of 6 lanes for northbound I-65 for the new downtown bridge if the new design can accept a level of service of D or E (including comments on Ramp 51A needing to be widen) | Eliminate | |
| 150 | Verify FHWA has approved the interchange spacing within this project | Eliminate | |
| 151 | Review number of lanes on I-64 eastbound (3 lanes to 2 lanes to 4 lanes) | Eliminate | |
| 152 | Review the need to construct this project assuming only 20,000 more projected AADT in year 2025 (160,000 ADT in 1999 versus 180,000 ADT in 2025 ADT) | Comb with 68 | |
| 153 | Utilize a projected AADT for the year 20 years after project completion (approximately 2040) in lieu of a 2025 AADT | Comb with 131 | |
| 154 | Graffiti deterring measures | DC | C. Smith |

Development Status Legend:

| | |
|---|---|
| Develop: | Idea is considered by the VE Team to be a viable value enhancement possibility and is currently being developed as a VE recommendation |
| Eliminate: | Idea was not considered to enhance the value of the project and has been eliminated from further consideration by the VE Team |
| DC: | Idea is being developed as a Value Engineering Comment to the designers with no easily quantifiable cost associated |

# END OF REPORT

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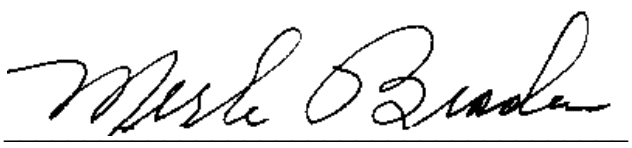

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