



**Kentucky
Transportation
Cabinet**



**State of Ohio
Department of
Transportation**

***BRENT SPENCE BRIDGE
REPLACEMENT/REHABILITATION PROJECT***

ODOT Project HAM-71/75-0.00/0.22, PID 75119

KYTC PROJECT ITEM NO. 6-17

Project Development Process Step 6

FINAL - Value Engineering Study Report

October 2009

Design Engineering Consultant



Value Engineering Consultant

Lewis & Zimmerman Associates





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re: ODOT Project HAM-71/75-0.00/0.22, PID 75119
KYTC Project Item No. 6-17
Brent Spence Bridge Replacement/Rehabilitation Project
Final Value Engineering Study Report

Dear Ms. Braxton:

Date:
October 23, 2009

Lewis & Zimmerman Associates is pleased to submit 15 copies of the referenced final report on the value engineering (VE) study that took place on 24 - 26 August, 2009. The VE study focused on the project documents being developed by Parsons Brinckerhoff.

Contact:
Stephen Havens

During the workshop the team identified and developed several betterments, alternatives, and design suggestions which provide opportunities to improve the value of the project. Of particular interest are those alternatives related to improving access to central business districts and adjacent communities in Covington, KY and Cincinnati, OH; increasing the utilization of the existing Clay Wade Bailey Bridge; reducing impacts to 4(f) and 6(f) resources; and adjusting lane configurations to reduce the width of the new bridge by one lane per deck as detailed in Section Two of this report.

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MY096502.0000

We appreciate this opportunity to work with you and the ODOT, KYTC, and FHWA participants on this important project for the Ohio-Kentucky-Indiana Regional Council of Governments, and the cities of Covington, Kentucky, and Cincinnati, Ohio. Please feel free to contact me should you or any reviewer have questions concerning the information presented.

Sincerely yours,

LEWIS AND ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company

A handwritten signature in black ink that reads 'Stephen G. Havens'.

Stephen G. Havens, PE, CVS
Senior Project Manager

Attachment

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Section One

EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Ohio Department of Transportation (ODOT) and the Kentucky Transportation Cabinet (KYTC). The subject of the study was the Brent Spence Bridge Replacement/Rehabilitation Project (ODOT Project HAM-71/75-0.00/0.22, PID 75119 and KYTC Project Item No. 6-17). The project is being planned for ODOT and KYTC by a team led by Parsons Brinckerhoff.

The VE workshop was conducted August 24 - 26, 2009, at the Kentucky Transportation Cabinet District 6 Office in Ft. Mitchell, Kentucky and followed the six-phase VE Job Plan:

- Information Phase
- Function Identification and Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

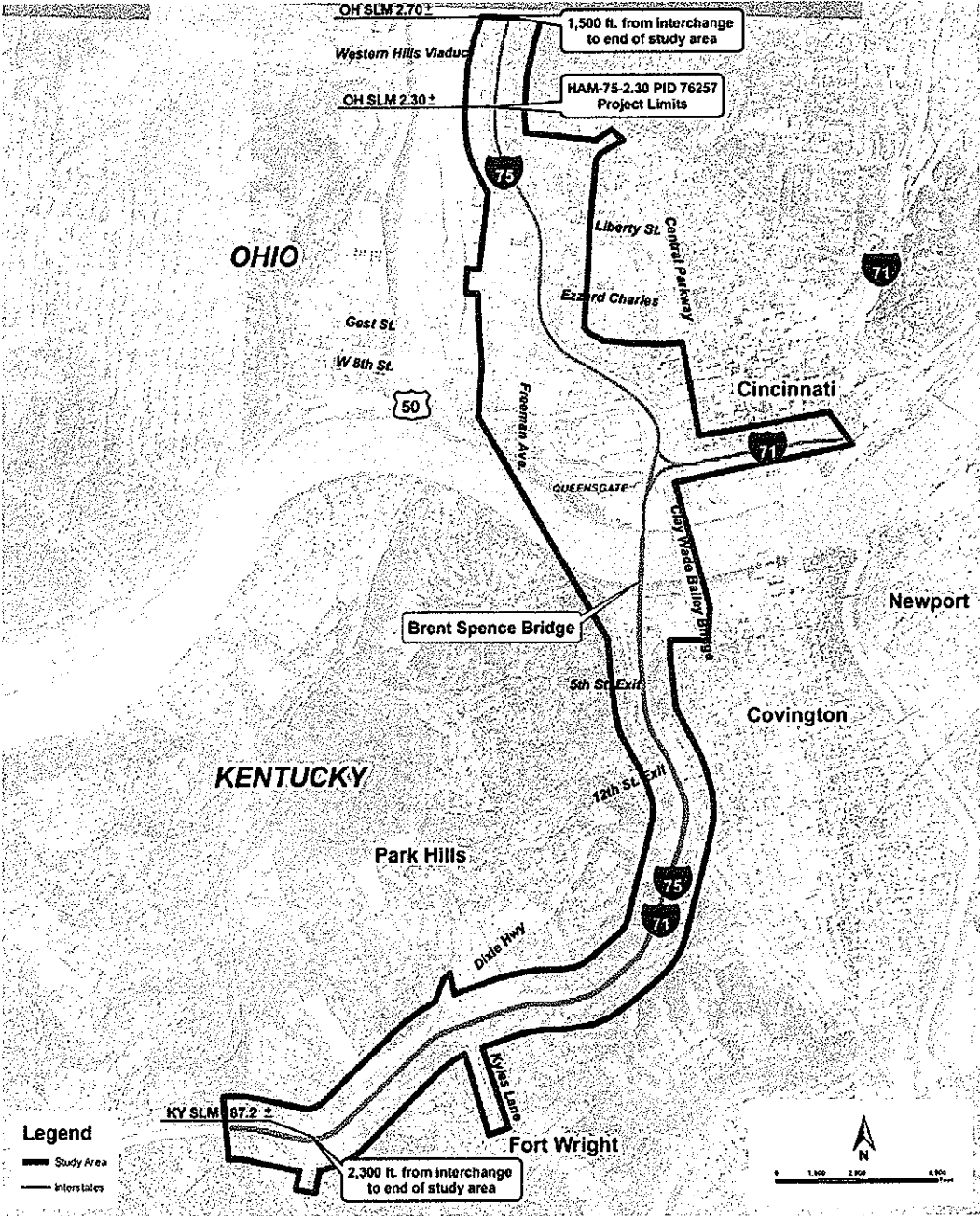
The multidisciplinary team comprised professionals with highway design, geometrics, structural engineering, traffic control, construction, transportation engineering, and geotechnical engineering experience and a working knowledge of VE procedures. The following is a list of the VE team members:

<u>Participant</u>	<u>Specialization</u>	<u>Affiliation</u>
Stefan Spinosa	Highway Design	ODOT District #8 Project Manager
John Eckler	Highway Design	KYTC District #6 Project Manager
Rob Hans	Highway Design	KYTC District #6 Chief Engineer
John Otis	Highway Design	ODOT District #8 Production
Walter Bernau	Construction/MOT	ODOT District #8 Construction
Reynaldo Stargell	MOT	ODOT C.O. Traffic Engineering
Jay Hamilton	Traffic	ODOT District #8 Planning & Programming
J.C. Pyles	Structures	KYTC Structural Design Office
Chris Howard	Structures	ODOT District #8 Production
Jeff Crace	Structures	ODOT C.O. Structural Engineering
Darrin Beckett	Geotechnical	KYTC C.O. Division of Materials
Joe Smithson	Geotechnical	ODOT District #8 Production
Kevin Rust	Construction	KYTC District #6 Construction
Nasby Stroop	Construction	KYTC C.O. Construction
Keith Smith	Environmental	ODOT District #8 Planning and Programming
Bernadette DuPont	Transportation	Kentucky FHWA
Scott Wolf	Transportation	Kentucky FHWA
Siamak Shafaghi	VE Coordinator	KYTC C.O. Production
Jeanne Braxton	VE Coordinator	ODOT C.O. Office of Production
Stephen Havens, CVS	VE Team Leader	Lewis & Zimmerman Associates

PROJECT DESCRIPTION

The project is located along a seven mile segment of I-75 within the Commonwealth of Kentucky and the State of Ohio. The southern limit of the project is 2,300 feet south of the midpoint of the interchange of I-75 and Dixie Highway (US 127/US 42/US 25) in Kentucky (KY SLM 187.2 +/-). The northern limit of the project is 1,500 feet north of the midpoint of the interchange of I-75 and the Western Hills Viaduct in Ohio (OH SLM 2.70 +/-). The eastern and western limits of the project follow the existing alignment of I-75. In Kentucky, the project area is a 1,500-ft.-wide corridor centered on I-75 south of the City of Covington. See Figure 1: Project Area below.

Figure 1: Project Area



The comparative analysis (ODOT Project Development Process Step 5) led to the recommendation of carrying forward two feasible alternatives. The two feasible alternatives consist of Alternative E and a combination of Alternatives C and D (Hybrid Alternative CD). Based on the analysis completed and feedback as part of community input, it was also recommended that certain design elements of Alternative G be incorporated into the two feasible alternatives in Step 6 of the Ohio Department of Transportation's Project Development Process (See Section 7.7 of the Conceptual Alternative Study). Additionally, the two feasible alternatives will be designed to provide three lanes in each direction on I-75.

HYBRID ALTERNATIVE CD

Hybrid Alternative CD uses the existing I-71/I-75 alignment from the southern project limits at the Dixie Highway Interchange north to the Kyle's Lane Interchange. The Dixie Highway and Kyle's Lane interchanges would be modified slightly to accommodate a collector-distributor roadway, which would be constructed along both sides of I-71/I-75 between the two interchanges. North of the Kyle's Lane Interchange, the alignment shifts to the west to accommodate additional I-71/I-75 travel lanes. Between Kyle's Lane and KY 12th Street, six lanes would be provided in each direction for a total of 12 travel lanes. Near KY 12th Street, the alignment separates into three routes for I-71, I-75 and a local collector-distributor roadway.

Access into Covington from the interstate would be accomplished by the local collector-distributor roadway; at KY 12th Street for northbound traffic and at KY 9th Street for southbound traffic. Direct access to I-71 from Covington would be provided at Pike Street with traffic to I-75 northbound using the collector-distributor roadway through downtown Cincinnati and connecting at the Ezzard Charles merge. Access for southbound interstate traffic is located at KY 12th Street. Bullock Street would be extended north from Pike Street to KY 9th, 5th, and 4th streets and Jillian's Way would be extended north from Pike Street to KY 9th, 5th, 4th, and 3rd streets. A U-turn before the KY 9th Street intersection would allow local southbound traffic to turn and travel northbound to KY 3rd, 4th, and 5th streets.

A new double deck bridge would be built just west of the existing Brent Spence Bridge to carry northbound and southbound I-75 (three lanes in each direction), two lanes for southbound I-71 and two lanes for southbound local traffic. The existing Brent Spence Bridge would be rehabilitated to carry two lanes for northbound I-71 and three lanes for northbound local traffic.

Hybrid Alternative CD reconfigures I-75 through the I-71/I-75/US 50 Interchange and eliminates all direct access to and from I-75 from KY 12th Street to just south of Ezzard Charles Drive in the northbound direction. Hybrid Alternative CD also eliminates direct access to I-75 southbound between KY 9th Street and the Western Hills Viaduct. US 50 would be realigned to provide a parallel roadway and access to and from the interstate would be via the collector-distributor roadway.

In Ohio, the northbound collector-distributor roadway would carry local traffic from the existing bridge and provide access ramps to OH 2nd Street, US 50 westbound, and OH 5th Street before reconnecting to I-75 just south of Ezzard Charles Drive. The northbound ramps from OH 6th, 9th Streets and Freeman Avenue to I-75 would be removed requiring traffic from these three points to utilize a new local roadway parallel to the northbound collector-distributor roadway for access to I-75 just before Ezzard Charles Drive. The southbound collector-distributor roadway would maintain access to I-71, downtown city streets as well as connecting to access ramps from OH 9th Street and US 50 eastbound. The collector-distributor roadway would continue south over the new bridge into Covington. Downtown

Cincinnati traffic would cross over I-75 and run parallel between I-75 northbound and the northbound collector-distributor roadway. The three-lane collector-distributor roadway into Cincinnati would carry traffic to OH 7th Street, OH 2nd Street and I-71 northbound. Access to OH 5th Street would be removed.

Between Ezzard Charles Drive and the Western Hills Viaduct, northbound I-75 would have five lanes, southbound I-75 would have two lanes, and the local southbound collector-distributor roadway would have four lanes, for a total of 11 travel lanes. The northbound ramps from OH 6th and 9th streets to I-75 would be removed requiring traffic from these two points to utilize a new local roadway parallel to the northbound collector-distributor roadway for access to northbound I-75. Ramps from Freeman Avenue, Winchell Avenue just north of Ezzard Charles Drive to the Interstate, and to Western Avenue would be eliminated.

Hybrid Alternative CD also improves Western and Winchell Avenues to facilitate traffic flow and increase capacity. The ramps to Western Avenue and from Winchell Avenue just north of Ezzard Charles Drive would be removed. The Western Hills Viaduct Interchange would be reconfigured to provide a full movement interchange.

See attached sketches in Section Three which show Alternatives C and D.

ALTERNATIVE E

Alternative E uses the existing I-71/I-75 alignment from the southern project limits at the Dixie Highway Interchange north to the Kyle's Lane Interchange. The Dixie Highway and Kyle's Lane interchanges would be modified slightly to accommodate a collector-distributor roadway, which would be constructed along both sides of I-71/I-75 between the two interchanges. North of the Kyle's Lane Interchange, the alignment shifts to the west to accommodate additional I-71/I-75 travel lanes. Between Kyle's Lane and KY 12th Street, six lanes would be provided in each direction for a total of 12 travel lanes. Near KY 12th Street, the northbound alignment separates into two routes; one for interstate traffic and one for a local collector-distributor roadway. Near KY 9th Street, the interstate separates into I-71 and I-75 only routes.

In Alternative E, there are two access points into Covington for both northbound and southbound traffic. In the northbound direction, access would be provided by the local collector-distributor roadway at KY 12th Street and KY 5th Street. In the southbound direction, access would be provided by the local collector-distributor roadway at KY 5th Street, and off of I-71 and I-75 at KY 9th Street. Bullock Street would be extended north from Pike Street to KY 5th and KY 9th streets. Jillian's Way would be extended north from Pike Street to KY 9th, 5th, and 4th streets and allow for access to the existing Brent Spence Bridge.

Access to the interstate system from Covington would be provided by local city streets. In the northbound direction, access to I-75 would be provided at KY 9th Street, access to I-71 would be provided at KY 5th Street. Access to I-75 northbound would also be provided at KY 4th by the local collector-distributor roadway across the lower deck of the existing Brent Spence Bridge and through downtown Cincinnati before connecting just south of the Linn Street Bridge. In the southbound direction, access to I-75/I-71 would be provided at KY 5th Street and KY 12th Street.

A new double deck bridge would be built just west of the existing Brent Spence Bridge to carry northbound and southbound I-71 and I-75 traffic. On the upper deck, I-71 southbound would have

three lanes and I-71 northbound would have two lanes. On the lower deck, I-75 would have three northbound and three southbound lanes. The existing Brent Spence Bridge would be rehabilitated to carry northbound and southbound local traffic with two lanes in each direction.

In Ohio, Alternative E reconfigures I-75 through the I-71/I-75/US 50 Interchange and eliminates some of the existing access points along I-75. Existing ramps to I-71, US 50 and downtown Cincinnati would be reconfigured. The existing direct connections between I-75 to westbound and from eastbound US 50 would be maintained in Alternative E. US 50 would be reconfigured to eliminate left-hand entrances and exits. The OH 5th Street overpass would be eliminated and the Sixth Street Expressway would be reconfigured as a two-way, six-lane elevated roadway with a new signalized intersection for US 50 access and egress. Access between southbound I-71 (Fort Washington Way) and northbound I-75 would be provided near OH 9th Street as a direct connection. Both I-75 southbound and the local southbound collector-distributor roadway would have access to northbound I-71 (Fort Washington Way).

A local collector-distributor roadway would carry local traffic northbound from the existing Brent Spence Bridge and provide access to OH 2nd, 5th, and 9th streets, Winchell Avenue and access from OH 4th and 6th streets before reconnecting to I-75 just south of the Linn Street overpass. The northbound ramp from OH 9th Street to I-75 would be removed requiring traffic from this point to utilize a new local roadway parallel to I-75 and access the interstate at Bank Street. Southbound I-75 traffic would separate from the local collector-distributor roadway near Ezzard Charles Drive. The southbound collector-distributor roadway would carry traffic over I-75 to OH 7th Street, allowing traffic to either; access downtown at 7th Street, travel south to OH 5th and 2nd streets, or travel across the existing Brent Spence Bridge into Covington. Access to the local southbound collector-distributor roadway would be provided at Western Avenue and at OH 4th and 8th streets.

Alternative E also improves Western and Winchell avenues to facilitate traffic flow and increase capacity. The ramps to Western Avenue and from Winchell Avenue just north of Ezzard Charles Drive would be removed. The northbound ramp from Freeman Avenue to I-75 would remain but the southbound ramp to Freeman would be eliminated. Between Ezzard Charles Drive and the Western Hills Viaduct, southbound I-75 would have six lanes; northbound I-75 would have five lanes, and one auxiliary lane to the Western Hills Viaduct. The Western Hills Viaduct Interchange would be reconfigured to provide a full movement interchange.

See attached sketches in Section Three which show Alternative E.

PROJECT SCHEDULE AND CONSTRUCTION COSTS

The following is the schedule for the Brent Spence Bridge Replacement/Rehabilitation Project, which follows construction of the Mill Creek Expressway and Thru the Valley projects.

- Completion of preliminary design and NEPA process – 2011
- Detailed design – 2011
- Right of way acquisition – 2012 - 2014
- Construction begins – 2015
- Midpoint of Construction – June 2017
- Completion of Construction – 2020

The total estimated project costs are construction costs which include a design contingency, a construction inflation factor, right-of-way for roadway and utility relocations, major utility, and total project development costs. The table below summarizes the total estimated project costs.

Total Cost Estimates for Mainline Alternatives in Projected Build Year Dollars

Alternative	Construction Costs (millions)	Construction Costs Inflation (59.5%) (millions)	Real Estate Costs (millions)	Utility Costs (millions)	Real Estate Utility Costs (millions)	Project Development Costs	Total Estimated Costs (millions)
Hybrid Alternative CD	\$1,261.7	\$750.7	\$18.0	\$39.4	\$1.0	\$210.4	\$2,281.2
Alternative E	\$1,431.6	\$851.8	\$15.4	\$39.4	\$1.0	\$236.3	\$2,575.5

CONCERNS AND OBJECTIVES

Concerns

The following conceptual alternative issues were compiled based upon information provided during the design overview and the Conceptual Alternatives Evaluation Matrix found on pages 173-184 of the Conceptual Alternatives Study (CAS) prepared by Parsons Brinckerhoff, dated April 2009:

Hybrid Alternative CD

- Would not maintain all existing connections – would remove local connections to I-75 by using a collector-distributor system from KY 12th Street to just south of Ezzard Charles Drive
- US 50 would remain geometrically deficient in several locations requiring a design exception
- Four acres of floodplain would be impacted by the proposed alignment
- Approximately two acres of Section 6(f) Parks (Goebel Park) would be impacted by the proposed alignment
- Five Section 4(f) resources would be impacted by the proposed alignment including Goebel Park, Lewisburg Historic District, Longworth Hall, Harriet Beecher Stowe Elementary School, and Queensgate Playground

Alternative E

- The proposed local collector-distributor roadway would be geometrically deficient in several locations requiring a design exception
- 35 businesses would be displaced in Ohio impacting up to 363 employees compared with approximately 30 businesses and 190 to 283 employees impacted by Hybrid Alternative CD

Both Alternatives (Hybrid Alternative CD and Alternative E)

- I-71 would remain geometrically deficient requiring a design exception
- The proposed alignments would require relocation of a radio tower in Goebel Park in Covington, KY
- Three wetland areas totaling 0.59 acres would be impacted in Kentucky
- Eight woodlots with potential Indiana Bat habitat and two woodlots with marginal Indiana Bat Habitat have been identified which would have an impact on construction start dates in these areas
- Harriet Beecher Stowe Elementary School would have potential visual and noise impacts
- The eastern portion of Longworth Hall would be impacted by the proposed alignment
- Notre Dame Academy School tennis courts would be impacted in Kentucky
- The contractor would have limited space for access and logistics
- The proposed alignments would require impacts to a portion of the Duke Energy Sub-station near Longworth Hall
- The proposed alignments may impact the Willow Run Sewer structure during construction

Objectives

The VE team was tasked with the following objectives:

- Identify betterments to improve the quality and function of the facility
- Identify cost reduction ideas

To meet these objectives, the VE team focused on the key elements associated with the project, paying particular attention to the advantages and disadvantages between the Purpose and Need Elements, Engineering Elements, Section 4(f) and 6(f) Resources, and Business Property Acquisitions identified in the Conceptual Alternatives Evaluation Matrix (pages 173-184) of the Conceptual Alternatives Study (CAS) prepared by Parsons Brinckerhoff, dated April 2009.

Additionally, the VE team focused on the CAS recommendation (page 172) that the following beneficial design features of Alternative G be carried forward for further analysis and incorporated into the feasible alternatives CD and E:

- Access to north end of Clay Wade Bailey Bridge from I-75 southbound using a collector-distributor roadway and US 50 eastbound;
- Two access points into Covington;
- Access from a northbound collector-distributor roadway from KY to I-71 northbound in Ohio; and
- An access ramp just north of Ezzard Charles Drive for Freeman Avenue and local traffic to I-75 northbound.

RESULTS OF THE STUDY

The VE team developed 11 VE alternatives and 10 design suggestions. The greatest opportunities for improved value centered on the rerouting of traffic to I-471 during construction; improving access to the central business districts and adjacent communities of both Covington, KY and Cincinnati, OH;

increasing the use of the existing Clay Wade Bailey Bridge; reducing impacts to 4(f) and 6(f) resources; and adjusting lane configurations to reduce the width of the new bridge by one lane per deck.

Rerouting of Traffic to I-471 during Construction

Three VE alternatives provide different lane configurations for adding a fourth lane on I-471 southbound that will support rerouting of traffic during construction of either Hybrid Alternative CD or Alternative E. The alternatives include replacement of the existing outside shoulder with a full depth pavement lane which could be used for future expansion of I-471 to four-lanes (Alt. No. MOT-1A), and two options (Alt. Nos. MOT-1B or MOT-1C) that would provide a temporary fourth lane by using the existing inside shoulder which would be adequate for carrying traffic in its existing condition.

Improve Access to Central Business Districts and Adjacent Communities

In Hybrid Alternative CD, three VE alternatives are recommended to improve access to central business districts and adjacent communities. Providing a shorter route for emergency response from the Fire Station at 5th Street and Central Avenue to the Fort Washington Way Trench similar to Alternative E would shorten the response distance by nearly one mile (Alt. No. P-7). Providing a direct connection from the southbound collector-distributor to 2nd Street in Ohio and adding an additional connection to the US 42/3rd Street Intersection would increase the use of the Clay Wade Bailey Bridge by local traffic. This alternative would improve local access to Covington, KY from Ohio (Alt. No. P-8). Adding a drop lane from the collector-distributor and merging this with the frontage road between 9th Street and Linn Street would provide a more direct access to the Museum Center and Amtrak railroad from Kentucky and Fort Washington Way (Alt. No. S-1).

In Alternative E, replacing the 5th Street northbound ramp to I-71 in Kentucky with an indirect ramp connection from the collector-distributor roadway to I-71 in Ohio would improve access from KY 12th, Pike, 9th, 5th, and 4th Streets to I-71 northbound (Alt. No. P-3).

Reduce Impacts to 4(f) and 6(f) Resources

In all options, significant construction and right-of-way cost avoidances may be realized by widening one-half mile of I-71/I-75 on the east side from 2,000 feet south of KY 12th St. to 4,500 feet south of KY 12th St. This would possibly eliminate the need for excavation and/or a proposed retaining wall on the west side of I-71/I-75 in Kentucky in the "Cut in the Hill" Section (Alt. No. R-1). Additionally, the use of tie-back retaining walls in selected areas from Kyle's Lane to approximately 7,000 feet north of Kyle's Lane and other applicable areas on the west side of I-75 southbound in Kentucky would reduce right-of-way acquisition requirements.

Reduce the Width of the New Bridge by One Lane

Since the proposed new bridge design for Hybrid Alternative CD calls for 10 travel lanes between the two 6-lane decks, adjusting the lane configurations on each deck would save one lane per deck and reduce the overall bridge width by 12 ft. (Alt. No. S-6A).

Since the proposed new bridge design for Alternative E calls for 11 travel lanes between the two 6-lane decks, adjusting the lane configurations on each deck and eliminating the third lane for I-71 southbound would save one lane per deck and reduce the overall bridge width by 12 ft. (Alt. No. S-6B).

IMPLEMENTATION

This VE report is a formalization of the draft materials provided to the project team during the out-briefing discussion which occurred on August 26, 2009. The project team should conduct a formal implementation meeting in which the alternatives and design suggestions are considered and their disposition established in an implementation report. To that end, the Summary of VE Alternatives table should help record the results. An electronic copy of this table is being provided for your convenience.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: **ODOT HAM-71/75-0.00/0.22, PID 75119, KYTC Project Item No. 6-17** PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS			
				INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS	
	ROADWAY (R)						
R-1	For all options, realign Section 1 near the cut in the hill to the east to reduce right-of-way and excavation requirements.			DESIGN SUGGESTION			
R-2	Specify that recycled concrete pavement is acceptable for use as sub-grade stabilization in Kentucky.			DESIGN SUGGESTION			



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: ODOT HAM-71/75-0.00/0.22, PID 75119, KYTC Project Item No. 6-17		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
PAVEMENT/RAMPS (P)						
P-3	In Alternative E, replace the 5th Street northbound ramp to I-71 in Kentucky with an indirect ramp connection from the collector-distributor roadway to I-71 in Ohio.	\$398,710	\$863,892	(\$465,182)		(\$465,182)
P-5	Eliminate the KY 9th Street intersection with the collector-distributor roadway from all options.					
P-7	For the Hybrid Alternative CD, identify a shorter route for emergency responses from the Fire Station at 5th Street and Central Avenue to the Fort Washington Way Trench.					
P-8	For the Hybrid Alternative CD, provide a direct connection from southbound collector-distributor roadway to 2nd Street in Ohio and add an additional connection to the US 42/3rd Street intersection to improve access and increase the use of the Clay Wade Bailey Bridge.	\$0	\$1,437,344	(\$1,437,344)		(\$1,437,344)
P-10	For the Hybrid Alternative CD, provide access from Winchell Avenue just north of Ezzard Charles Drive to northbound I-75.	\$0	\$999,433	(\$999,433)		(\$999,433)
P-11	For the Hybrid Alternative CD, update the cost estimate to reflect the additional lane on the I-75 mainline.					
P-13	For Alternative E, shift the collector-distributor roadway to minimize impacts to Goebel Park and avoid relocating the radio station tower.					



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: ODOT HAM-71/75-0.00/0.22, PID 75119, KYTC Project Item No. 6-17							PRESENT WORTH OF COST SAVINGS			
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS				
STRUCTURES (S)										
S-1	For Hybrid Alternative CD, provide an exit from the northbound collector-distributor roadway to Ezzard Charles Drive similar to that shown in the Alternative E design.						DESIGN SUGGESTION			
S-2	With all options, use tie-back walls on the west side of southbound KY I-75 and in other applicable areas in Kentucky to reduce excavation and right-of-way requirements.						DESIGN SUGGESTION			
S-4	With all options, provide a means to mitigate potential structural impacts to Willow Run Sewer during construction.						DESIGN SUGGESTION			
S-6A	For the Hybrid Alternative CD, adjust the lane configurations on each deck on the new bridge to save one lane per deck.	\$567,401,472	\$513,809,472	\$53,592,000		\$53,592,000				
S-6B	For Alternative E, make the traffic operations directional on each deck on the new bridge to save one lane per deck.	\$567,401,472	\$513,809,472	\$53,592,000		\$53,592,000				

Section Two

STUDY RESULTS

INTRODUCTION

The results of this value engineering study conducted on the Brent Spence Bridge Replacement/ Rehabilitation Project portray the benefits that can be realized by KYTC, ODOT, the Ohio-Kentucky-Indiana Regional Council of Governments, and the cities of Covington, Kentucky, and Cincinnati, Ohio. During the course of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical feasibility, applicability to the project, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (without cost estimates). For each alternative developed the following information has been provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design, if appropriate;
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

A composite markup of 59.5%, as described in Section Four of the report, was used to generate the cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed or included for reasons other than cost. Examples of these reasons may include improved traffic flow, ease of maintenance, ease of construction, safer working conditions, and reduced project risk. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value analysis process and facilitate referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Value Engineering Alternatives table. The Alt. No. includes a prefix that refers to one of the following major project elements:

PROJECT ELEMENT	PREFIX
Maintenance of Traffic	MOT
Roadway	R
Pavement	P
Structures	S

Summaries of the alternatives are provided on the Summary of Value Engineering Alternatives tables. The tables are divided into project elements for the reviewer's convenience and are used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows the Summary of Value Engineering Alternatives tables.

KEY ISSUES

Two alternatives, including a Hybrid Alternative CD and Alternative E were selected as feasible alternatives for further development as part of the ODOT Project Development Process (PDP) for Major Projects, PDP Step 6. The following conceptual alternative issues were compiled based upon information provided during the design overview and the Conceptual Alternatives Evaluation Matrix found on pages 173-184 of the Conceptual Alternatives Study (CAS) prepared by Parsons Brinckerhoff, dated April 2009:

Hybrid Alternative CD

- Would not maintain all existing connections – would remove local connections to I-75 by using a collector-distributor system from KY 12th Street to just south of Ezzard Charles Drive
- US 50 would remain geometrically deficient in several locations requiring a design exception
- Four acres of floodplain would be impacted by the proposed alignment
- Approximately two acres of Section 6(f) Parks (Goebel Park) would be impacted by the proposed alignment
- Five Section 4(f) resources would be impacted by the proposed alignment including Goebel Park, Lewisburg Historic District, Longworth Hall, Harriet Beecher Stowe Elementary School, and Queensgate Playground

Alternative E

- The proposed local collector-distributor roadway would be geometrically deficient in several locations requiring a design exception
- 35 businesses would be displaced in Ohio impacting up to 363 employees compared with approximately 30 businesses and 190-283 employees impacted by Hybrid Alternative CD

Both Alternatives (Hybrid Alternative CD and Alternative E)

- I-71 would remain geometrically deficient requiring a design exception
- The proposed alignments would require relocation of a radio tower in Goebel Park in Covington, KY
- Three wetland areas totaling 0.59 acres would be impacted in Kentucky

- Eight woodlots with potential Indiana Bat habitat and two woodlots with marginal Indiana Bat Habitat have been identified which would have an impact on construction start dates in these areas
- Harriet Beecher Stowe Elementary School would have potential visual and noise impacts
- The eastern portion of Longworth Hall would be impacted by the proposed alignment
- Notre Dame Academy School tennis courts would be impacted in Kentucky
- The contractor would have limited space for access and logistics
- The proposed alignments would require impacts to a portion of the Duke Energy Sub-station near Longworth Hall
- The proposed alignments may impact the Willow Run Sewer structure during construction

STUDY OBJECTIVES

The VE team was tasked with the following objectives:

- Identify betterments to improve the quality and function of the facility
- Identify cost reduction ideas

To meet these objectives, the VE team focused on the key elements of the project, paying particular attention to the advantages and disadvantages between the Purpose and Need Elements, Engineering Elements, Section 4(f) and 6(f) Resources, and Business Property Acquisitions identified in the Conceptual Alternatives Evaluation Matrix (pages 173-184) of the CAS.

Additionally, the VE team focused on the CAS recommendation (page 172) that the following beneficial design features of Alternative G be carried forward for further analysis and incorporated into the feasible alternatives CD and E:

- Access to the north end of Clay Wade Bailey Bridge from I-75 southbound using a collector-distributor roadway and US 50 eastbound;
- Two access points into Covington;
- Access from a northbound collector-distributor from KY to I-71 northbound in Ohio; and
- An access ramp just north of Ezzard Charles Drive for Freeman Avenue and local traffic to I-75 northbound.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 11 VE alternatives and 10 design suggestions for consideration by the project team. The greatest opportunities for improved value centered on the rerouting of traffic to I-471 during construction; improving access to central business districts and adjacent communities of both Covington, KY and Cincinnati, OH; increasing the use of the existing Clay Wade Bailey Bridge; reducing impacts to 4(f) and 6(f) resources; and adjusting lane configurations to reduce the width of the new bridge by one lane per deck.

Rerouting of Traffic to I-471 during Construction

Three VE alternatives provide different lane configurations for adding a fourth lane on I-471 southbound that would support rerouting of traffic during construction of either Hybrid Alternative CD or Alternative E. The alternatives include replacement of the existing outside shoulder with a full depth pavement lane

which could be used for future expansion of I-471 to four-lanes (Alt. No. MOT-1A), and two options (Alt. Nos. MOT-1B or MOT-1C) that would provide a temporary fourth lane by using the existing inside shoulder which would be adequate for carrying traffic in its existing condition.

Improve Access to Central Business Districts and Adjacent Communities

In the Hybrid Alternative CD, three VE alternatives are recommended to improve access to central business districts and adjacent communities. Providing a shorter route for emergency response from the Fire Station at 5th Street and Central Avenue to the Fort Washington Way Trench similar to Alternative E would shorten the response distance by nearly one mile (Alt. No. P-7). Providing a direct connection from the southbound collector-distributor to 2nd Street in Ohio and adding an additional connection to the US 42/3rd Street Intersection would increase the use of the Clay Wade Bailey Bridge by local traffic. This alternative would improve local access to Covington, KY from Ohio (Alt. No. P-8). Adding a drop lane from the collector-distributor and merging this with the frontage road between 9th Street and Linn Street would provide a more direct access to the Museum Center and Amtrak railroad from Kentucky and Fort Washington Way (Alt. No. S-1).

In Alternative E, replacing the 5th Street northbound ramp to I-71 in Kentucky with an indirect ramp connection from the collector-distributor roadway to I-71 in Ohio would improve access from KY 12th, Pike, 9th, 5th, and 4th Streets to I-71 northbound (Alt. No. P-3).

Reduce Impacts to 4(f) and 6(f) Resources

In all options, significant construction and right-of-way cost avoidance may be realized by widening one-half mile of I-71/I-75 on the east side from 2,000 ft. south of KY 12th St. to 4,500 ft. south of KY 12th Street. This would possibly eliminate the need for excavation and/or a proposed retaining wall on the west side of I-71/I-75 in Kentucky in the "Cut in the Hill" Section (Alt. No. R-1). Additionally, the use of tie-back retaining walls in selected areas from Kyle's Lane to approximately 7,000 feet north of Kyle's lane and other applicable areas on the west side of I-75 southbound in Kentucky would reduce right-of-way acquisition requirements.

Reduce the Width of the New Bridge by One Lane

Since the proposed new bridge design for Hybrid Alternative CD calls for 10 travel lanes between the two 6-lane decks, adjusting the lane configurations on each deck would save one lane per deck and reduce the overall bridge width by 12 ft. (Alt. No. S-6A).

Since the proposed new bridge design for Alternative E calls for 11 travel lanes between the two 6-lane decks, adjusting the lane configurations on each deck and eliminating the third lane for I-71 southbound would save one lane per deck and reduce the overall bridge width by 12 ft. (Alt. No. S-6B).

Summary

Each of the aforementioned alternatives should be given careful consideration for the potential cost savings and/or schedule improvement that they offer compared to the tradeoffs which may include additional rerouting of traffic during construction.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the project team should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are “mutually exclusive,” so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

The project team should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: ODOT HAM-71/75-0.00/0.22, PID 75119, KYTC Project Item No. 6-17		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
MAINTENANCE OF TRAFFIC (MOT)						
MOT-1A	For all options in Kentucky, replace the outside shoulders on I-471 southbound with full depth pavement to support rerouting of traffic during construction.	\$0	\$2,868,946	(\$2,868,946)		(\$2,868,946)
MOT-1B	For all options in Kentucky, use the inside shoulders on I-471 southbound with 12-ft.-wide travel lanes and no inside shoulder to support rerouting of traffic during construction.	\$0	\$843,260	(\$843,260)		(\$843,260)
MOT-1C	For all options in Kentucky, use the inside shoulders on I-471 southbound with 11.5-ft.-wide travel lanes and a 2-ft.-wide inside shoulder to support rerouting of traffic during construction.	\$0	\$920,106	(\$920,106)		(\$920,106)
MOT-2	For all options in Ohio, add alternative Newport Exit Signing from I-71 via US27 to reroute traffic during construction.					
DESIGN SUGGESTION						
MOT-4A	For all options, use Ohio Option 1 as a contractor lay-down area for use during construction of the main river crossing.	\$0	\$3,100,000	(\$3,100,000)		(\$3,100,000)
MOT-4B	For all options, use Ohio Option 2 as a contractor lay-down area for use during construction of the main river crossing.	\$0	\$789,500	(\$789,500)		(\$789,500)
MOT-4C	For all options, use Kentucky Option 1 as a contractor lay-down area for use during construction of the main river crossing.					

VALUE ENGINEERING ALTERNATIVE



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:
MOT-1A

DESCRIPTION: **FOR ALL OPTIONS IN KENTUCKY, REPLACE THE OUTSIDE SHOULDER ON I-471 SOUTHBOUND WITH FULL DEPTH PAVEMENT TO SUPPORT REROUTING OF TRAFFIC DURING CONSTRUCTION**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN:

The original design includes the rerouting of traffic to I-471 southbound during construction with no mention of replacing the existing outside shoulders with full-depth pavement.

ALTERNATIVE:

Replace the outside shoulders on I-471 Southbound with full-depth pavement to support rerouting of traffic during construction.

ADVANTAGES:

- Prevents shoulder failure during construction thereby preventing significant traffic delays
- Provides full-depth shoulders for any future construction requirements or detours

DISADVANTAGES:

- Added pavement adds cost to the current project for temporary lanes during construction

DISCUSSION:

I-471 crosses over the river running south into I-275 and then to I-75. I-275 has extra capacity available. Only I-471 needs shoulder work. Ramp work will be required at I-71/I-471, I-471/I-275, and I-275/I-75 in Kentucky.

Replacement of the outside shoulders on I-471 Southbound with full-depth pavement will prevent the failure of shoulders during construction as well as provide additional capacity for future construction requirements or detours.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 2,868,946	—	\$ 2,868,946
SAVINGS (Original minus Alternative)	\$ (2,868,946)	—	\$ (2,868,946)

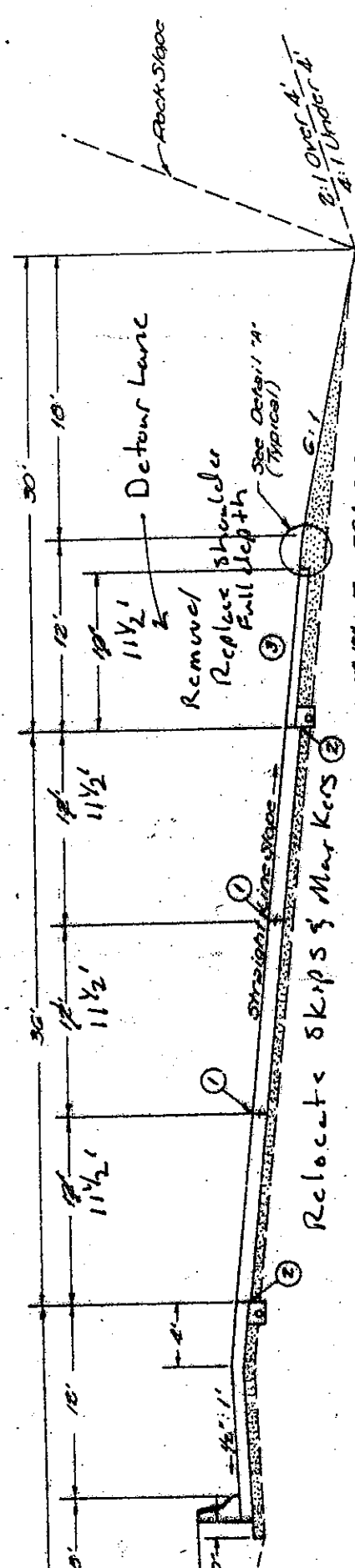
471-4(17)2

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
Camden		29	52

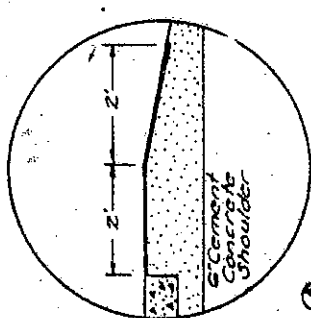
ALT. No. MOT-1A
Sheet No. 2 of 5

Looking South

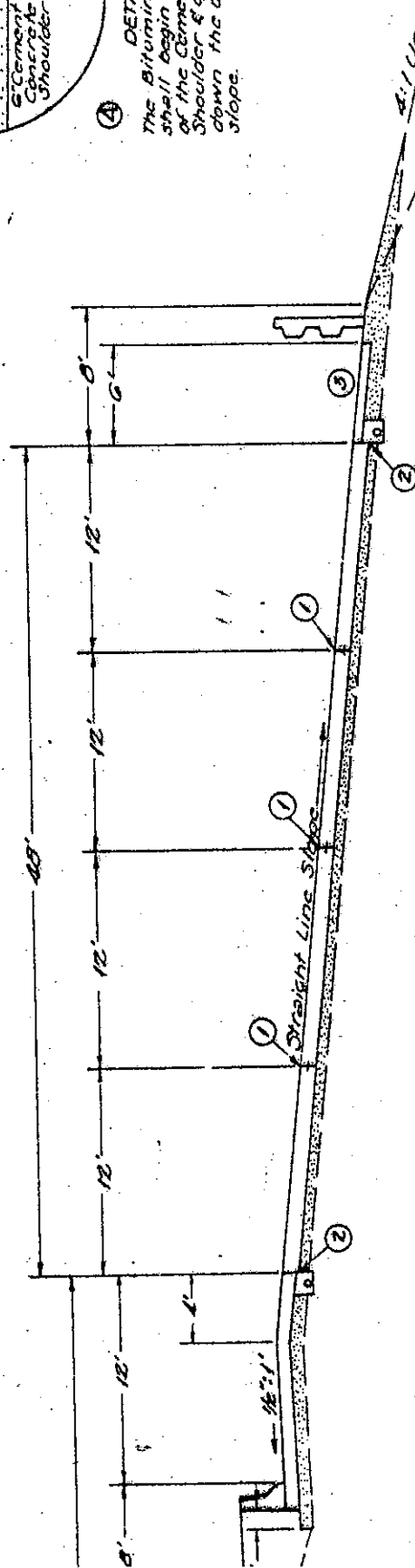
TYPICAL SECTIONS



MOT-1A
Outside Shoulder
ALTERNATIVE DESIGN



DETAIL "A"
The Bituminous Seal Coat shall begin at the edge of the Cement Concrete Shoulder & extend 2' down the ditch or fill slope.



CALCULATIONS



PROJECT: **HAM-71/75-0.00/.022, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALT. NO.:

MOT-1A

SHEET NO.: **3 of 5**

Use of outside shoulder on I-471 for travel lane

Use 10 ft. outside shoulder on southbound I-471 for an 11½ ft. travel lane, and reduce the other three southbound travel lanes from 12 ft. down to 11½ ft. This leaves no room for a shoulder on the outside.

- Cost to remove outside shoulders. These shoulders are not full depth and would have to be removed.
- Cost to replace full depth outside shoulders
- Remove white edge line and two lines of skips
- Place three skip lines, edge lines and three lines of pavement markers

CALCULATIONS



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.: **MOT-1A**

SHEET NO.: **4 of 5**

Pavement Removal to Full Depth Pavement Replacement

$$5 \text{ miles} \times 5280 \text{ ft/mile} \times \underset{\substack{\uparrow \\ \text{width}}}{10 \text{ ft.}} = 264,000 \text{ sf} \times \left(\frac{54}{9 \text{ sf}} \right) \\ = 29,333 \text{ sy}$$

Edge Lines (Remove to Replace)

$$5 \text{ miles} \times 5280 \text{ ft/mile} = 26,400 \text{ ft.}$$

Skip Lines (Remove to Replace)

$$26,400 \text{ ft} \times 25\% \times 3 \text{ lines} = 19,800 \text{ ft.}$$

Pavement Markers (Remove to Replace)

$$26,400 \text{ ft.} \times 1 \text{ per } 80 \text{ ft.} \times 3 \text{ lines} = 990 \text{ markers}$$

COST WORKSHEET



PROJECT: HAM-71/75-0.00/0.22, PID 75119	ALTERNATIVE NO.: MOT-1A
<i>State of Ohio, Department of Transportation</i>	
PROJECT ITEM NO. 6-17	
<i>Kentucky Transportation Cabinet</i>	
SHEET NO.:	5 of 5

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Pavement Removal	SY				29,333	22.96	673,486
Full Depth Pavement	SY				29,333	35.36	1,037,215
Edge Line Removal	LF				26,400	0.47	12,408
Edge Line Replacement	LF				26,400	0.31	8,184
Skip Line Removal	LF				19,800	0.47	9,306
Skip Line Replacement	LF				19,800	0.31	6,138
Pavement Markers Removal	EA				990	17.50	17,325
Pavement Markers Replacement	EA				990	35.00	34,650
Subtotal							1,798,712
Markup (%) at	59.50%						1,070,234
TOTAL							2,868,946

VALUE ENGINEERING ALTERNATIVE



PROJECT: HAM-71/75-0.00/0.22, PID 75119 <i>Ohio Department of Transportation</i> PROJECT ITEM NO. 6-17 <i>Kentucky Transportation Cabinet</i>	ALTERNATIVE NO.: <p style="text-align: center;">MOT-1B</p>
DESCRIPTION: FOR ALL OPTIONS IN KENTUCKY, USE THE INSIDE SHOULDER ON I-471 SOUTHBOUND TO SUPPORT REROUTING OF TRAFFIC DURING CONSTRUCTION	SHEET NO.: 1 of 5

ORIGINAL DESIGN:

The original design includes the rerouting of traffic to I-471 southbound during construction.

ALTERNATIVE:

Use the inside shoulder in lieu of the outside shoulder on I-471 southbound to support rerouting of traffic during construction.

ADVANTAGES:

- No full-depth pavement replacement required
- Maintains 12-ft.-wide lanes during construction

DISADVANTAGES:

- Requires travel near drainage structures
- No inside shoulder provided during construction

DISCUSSION:

I-471 crosses over the river running south into I-275 and then to I-75. I-275 has extra capacity. Only I-471 needs shoulder work. Ramp work will be required at I-71/I-471, I-471/I-275, and I-275/I-75 in Kentucky.

Therefore, use an inside shoulder/lane shift as a detour during construction to prevent full-depth pavement replacement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0		\$ 0
ALTERNATIVE	\$ 863,260		\$ 863,260
SAVINGS (Original minus Alternative)	\$ (863,260)		\$ (863,260)

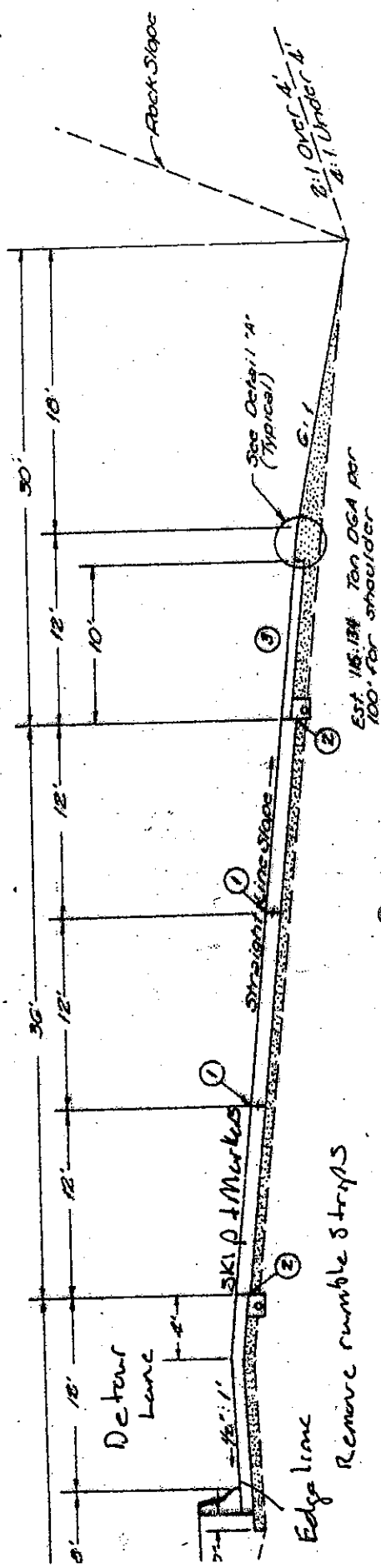
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2 of 5

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
Compton		29	52

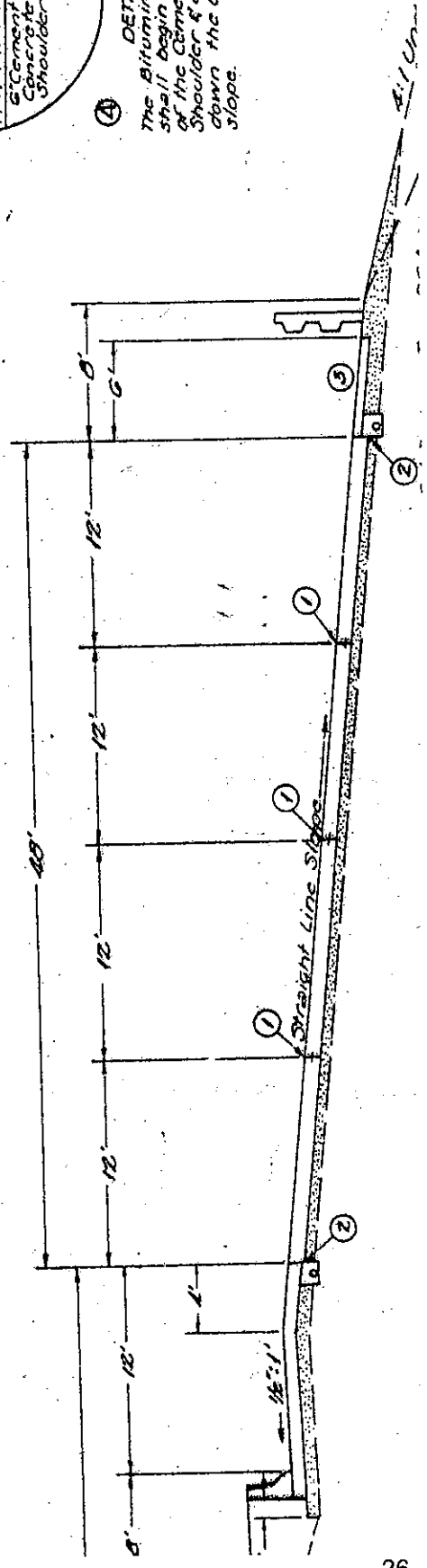
471-4(7)2

TYPICAL SECTIONS

Looking South



MOT-1B
 Inside Shoulder Only
 ALTERNATIVE DESIGN



CALCULATIONS



PROJECT: **HAM-71/75-0.00/.022, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALT. NO.:

MOT-1B

SHEET NO.: **3 of 5**

Use of inside shoulder on I-471 for travel lane

Use 12 ft. inside shoulder on southbound I-471 for a 12 ft. travel lane. This option provides no shoulder for this lane.

- Cost to remove rumble strips
- Remove yellow edge line
- Paint a skip line, edge line and place one line of pavement markers

CALCULATIONS



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:
MOT-1B

SHEET NO.: **4 of 5**

Rumble Strip (Remove & Patch)

$$5 \text{ miles} * 5280 \text{ ft/mile} * \frac{1}{45} \text{ ft} * 24 \text{ sf/rumble} \\ = 14080 \text{ sf}$$

Edge Line (Remove & Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} = 26,400 \text{ LF}$$

Skip Line (Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} * 25\% = 6600 \text{ LF}$$

Pavement Marker (Remove & Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} * \frac{1}{80} \text{ ft} = 330 \text{ Markers}$$

COST WORKSHEET

PROJECT: HAM-71/75-0.00/0.22, PID 75119 <i>State of Ohio, Department of Transportation</i> PROJECT ITEM NO. 6-17 <i>Kentucky Transportation Cabinet</i>	ALTERNATIVE NO.: MOT-1B SHEET NO.: 5 of 5
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PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Edge Line Removal	LF				26,400	0.47	12,408
Edge Line Replacement	LF				26,400	0.31	8,184
Skip Line Removal	LF				26,400	0.47	12,408
Skip Line Replacement	LF				6,600	0.31	2,046
Pavement Markers Removal	EA				330	17.50	5,775
Pavement Markers Replacement	EA				330	35.00	11,550
Partial Depth JPC Repair	SF				14,080	34.72	488,858
Subtotal							541,229
Markup (%) at	59.50%						322,031
TOTAL							863,260

VALUE ENGINEERING ALTERNATIVE



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:
MOT-1C

DESCRIPTION: **FOR ALL OPTIONS IN KENTUCKY, USE THE INSIDE SHOULDER ON I-471 SOUTHBOUND TO SUPPORT REROUTING OF TRAFFIC DURING CONSTRUCTION WITH 11.5-FT.-WIDE TRAVEL LANES AND A 2-FT.-WIDE INSIDE SHOULDER**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (See attached sketch)

The original design includes the rerouting of traffic to I-471 southbound during construction.

ALTERNATIVE: (See attached sketch)

Use the inside shoulder in lieu of the outside shoulder on I-471 southbound to support rerouting of traffic during construction. Use 11.5-ft.-wide lanes during construction.

ADVANTAGES:

- No full-depth pavement replacement required
- Maintains a 2-ft.-wide inside shoulder

DISADVANTAGES:

- Narrower travel lanes are necessary to accommodate the 2-ft.-wide inside shoulder

DISCUSSION:

I-471 crosses over the river running south into I-275 then to I-75. I-275 can carry extra capacity. Only I-471 needs shoulder work. Ramp work will be required at I-471/I-71, I-471/I-275, and I-275/I-75 in Kentucky.

Therefore, use an inside shoulder/lane shift as a detour during construction to prevent full-depth pavement replacement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 920,106	—	\$ 920,106
SAVINGS (Original minus Alternative)	\$ (920,106)	—	\$ (920,106)

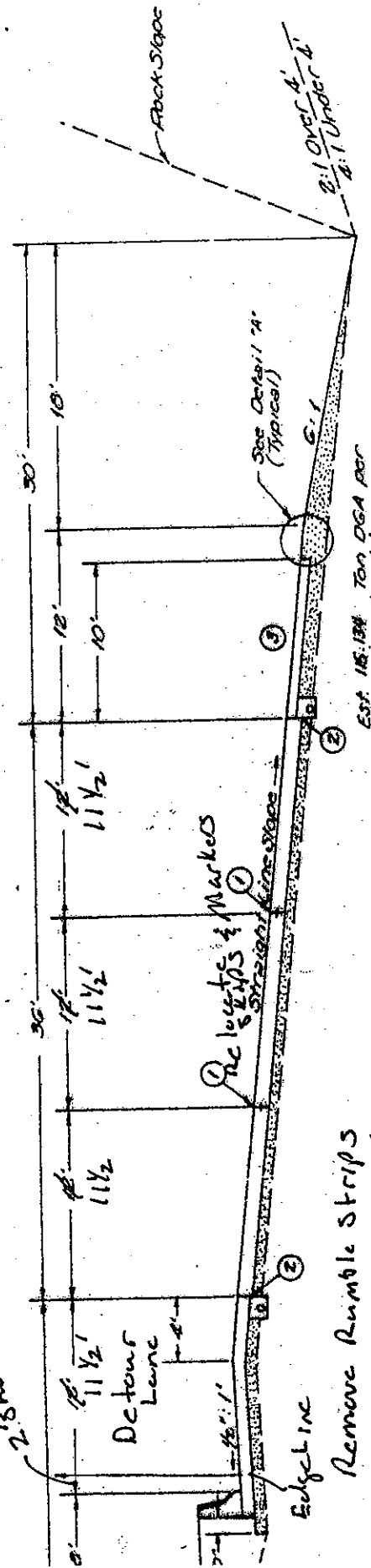
471-4(7)2

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
Camden		28	52

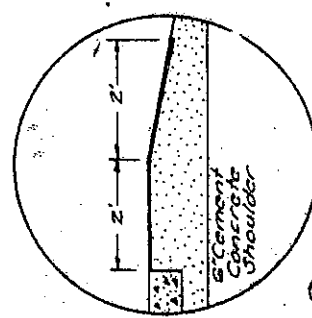
TYPICAL SECTIONS

Looking South

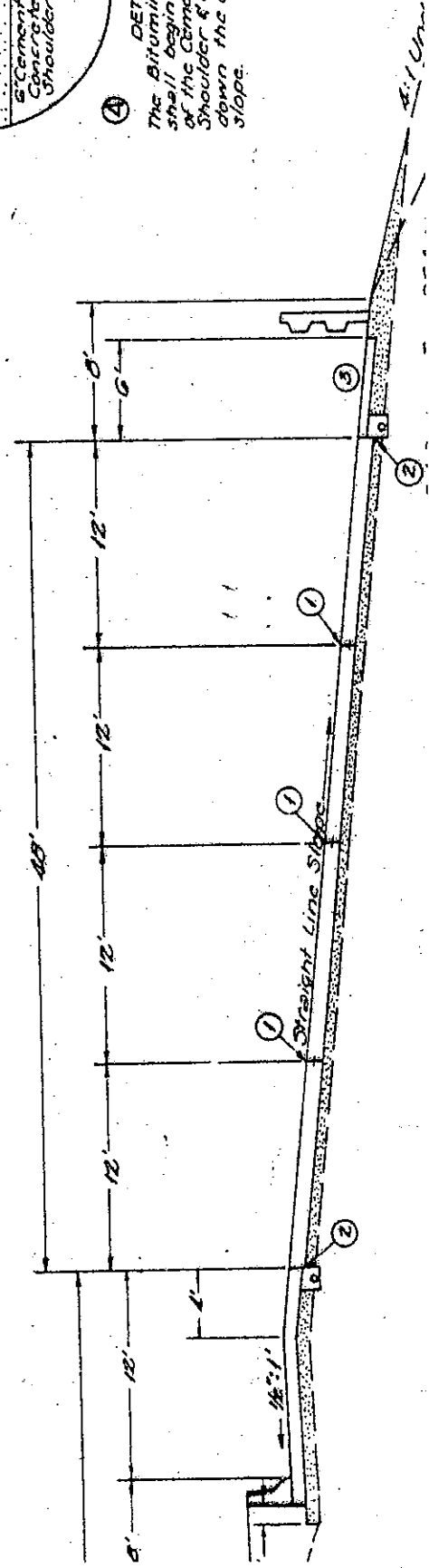
ALT. No. MOT-1C
Sheet No. 2 of 5



MOT-1C
 Inside Shoulder with narrow lanes
 ALTERNATIVE DESIGN



DETAIL "A"
 The Bituminous Seal Coat shall begin at the edge of the Cement Concrete Shoulder & extend 2' down the ditch or fill slope.



CALCULATIONS



PROJECT: **HAM-71/75-0.00/.022, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALT. NO.:

MOT-1C

SHEET NO.: **3** of 5

Use of inside shoulder on I-471 for travel lane with narrower lane

Use 12 ft. inside shoulder on southbound I-471 for an 11½ ft. travel lane and reduce the other three southbound travel lanes from 12 ft. to 11½ ft. This leaves 2 ft. for a shoulder on the inside.

- Cost to remove rumble strips
- Remove yellow edge line and two lines of skips
- Paint three skip lines, edge lines, and place three lines of pavement markers

CALCULATIONS



PROJECT: HAM-71/75-0.00/0.22, PID 75119
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:

MOT-1C

SHEET NO.:

4 of 5

Rumble Strip (Removal & Patching)

$$5 \text{ miles} * 5280 \text{ ft/mile} * \frac{1}{45} \text{ ft} * 24 \text{ sf/rumble} \\ = 14,080 \text{ SF}$$

Edge Line (Remove & Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} = 26,400 \text{ LF}$$

Skip Line (Remove & Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} * 25\% * 3 \text{ Lines} = 19,800 \text{ LF}$$

Pavement Marker (Remove & Replace)

$$5 \text{ miles} * 5280 \text{ ft/mile} * \frac{1}{80} \text{ ft} * 3 \text{ Lines} = 990 \text{ markers}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: HAM-71/75-0.00/0.22, PID 75119 <i>Ohio Department of Transportation</i> PROJECT ITEM NO. 6-17 <i>Kentucky Transportation Cabinet</i>	ALTERNATIVE NO.: MOT-2
DESCRIPTION: FOR ALL OPTIONS IN OHIO, ADD ALTERNATIVE NEWPORT EXIT SIGNING FROM I-71 VIA US 27 TO REROUTE TRAFFIC DURING CONSTRUCTION	SHEET NO.: 1 of 2

ORIGINAL DESIGN:

The original design includes a proposed Maintenance of Traffic (MOT) Scheme for all alternatives which removes I-71 southbound (SB) traffic (with the potential of also removing I-71 northbound traffic) from downtown Covington/Cincinnati Brent Spence Bridge via a detour using I-471 and I-275 in Northern Kentucky. The proposed detour will require upgrades to I-471 and I-275 to accommodate the increased traffic.

ALTERNATIVE: (See attached sketch)

Provide alternative signing on I-71 SB in Ohio for traffic bound for Newport, KY and the Newport Entertainment District (NED) to use the Third Street exit in Downtown Cincinnati and access Newport via the Taylor Southgate Bridge (US 27). If I-71 northbound traffic is maintained along the existing corridor, Newport bound traffic on I-71 northbound and I-71 southbound could be signed to use the Second Street Exit as well.

ADVANTAGES:

- Reduces congestion on the I-471/I-71 southbound combined MOT route and I-471/KY 8 interchange by removing Newport bound traffic, especially during peak hour and event traffic scenarios
- Uses available capacity on Taylor Southgate Bridge
- Alternative signing could remain as a permanent installation for I-71 southbound

DISADVANTAGES:

- Additional Newport bound traffic using the Third Street exit in downtown Cincinnati may cause operational issues and increased congestion on the downtown street network
- The alternative Newport/NED signing idea was not very well received by the City of Cincinnati during prior meetings regarding the I-471/KY 8 interchange

DISCUSSION:

The low cost of providing additional signing could have a dramatic impact to traffic flow and safety to the combined I-471/I-71 southbound MOT route by removing Newport bound traffic. This is especially true when considering the backups/congestion at the I-471/KY 8 interchange during peak hour and event traffic scenarios. Additionally, I-71 southbound signing could remain as a permanent installation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

SKETCH



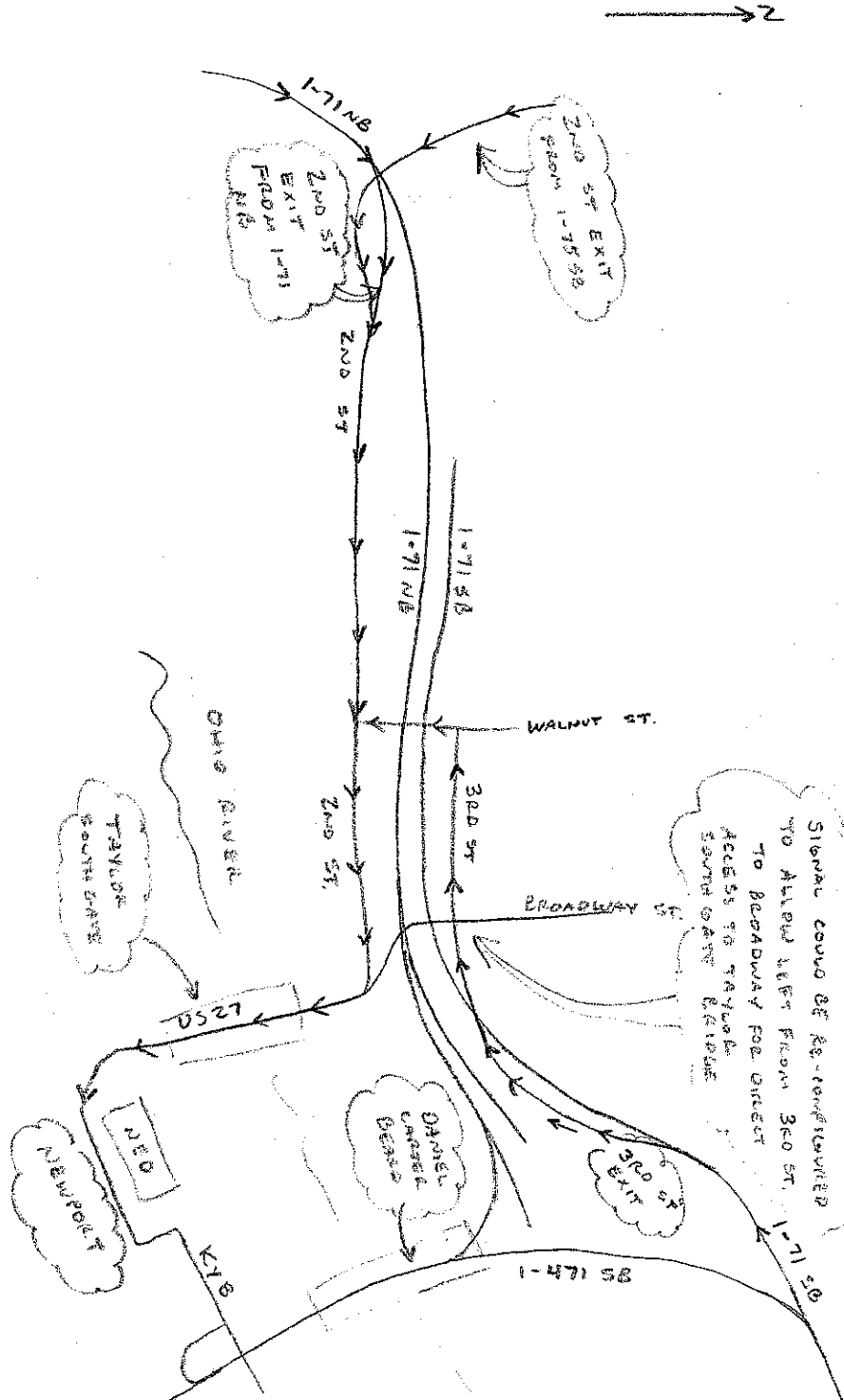
PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
 Ohio Department of Transportation
PROJECT ITEM NO. 6-17
 Kentucky Transportation Cabinet

ALTERNATIVE NO.: **MOT-Z**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 2**

DESIGN SUGGESTION: POTENTIAL ALTERNATIVE
 TRAFFIC SCHEME FOR NEWPORT, KY / NEWPORT
 ENTERTAINMENT DISTRICT (NEED) ROUND TRAFFIC
 TO REMOVE FROM COMBINED I-71 / I-75 SB
 MAINTENANCE OF TRAFFIC ROUTE



VALUE ENGINEERING ALTERNATIVE



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:
MOT-4A

DESCRIPTION: **FOR ALL OPTIONS, USE OHIO OPTION 1 AS A
 CONTRACTOR LAYDOWN AREA FOR USE DURING
 CONSTRUCTION OF THE MAIN RIVER CROSSING**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The original designs make no mention of contractor lay-down areas for the bridge construction.

ALTERNATIVE: (See attached sketch)

Use Ohio Option 1 and designate the hilltop between I-71/75/Mehring Way and the railroad to the east as a potential contractor lay-down area. The contractor would use Mehring Way to access the site.

ADVANTAGES:

- Provides a laydown area near the construction site
- Provides a large area
- Provides a potential green space at completion of project

DISADVANTAGES:

- Requires right-of-way acquisition
- May interfere with traffic along Mehring Way when materials are being moved
- May have to use numerous surface streets to access the lay-down area

DISCUSSION:

The contractor will need a lay-down area when constructing the new I-71/75 bridge over the Ohio River. The hilltop between I-71/I-75/Mehring Way and the railroad was identified as an area close to the site having minimal impact to traffic. This area also has the potential of being reclaimed as green space at the completion of the project.

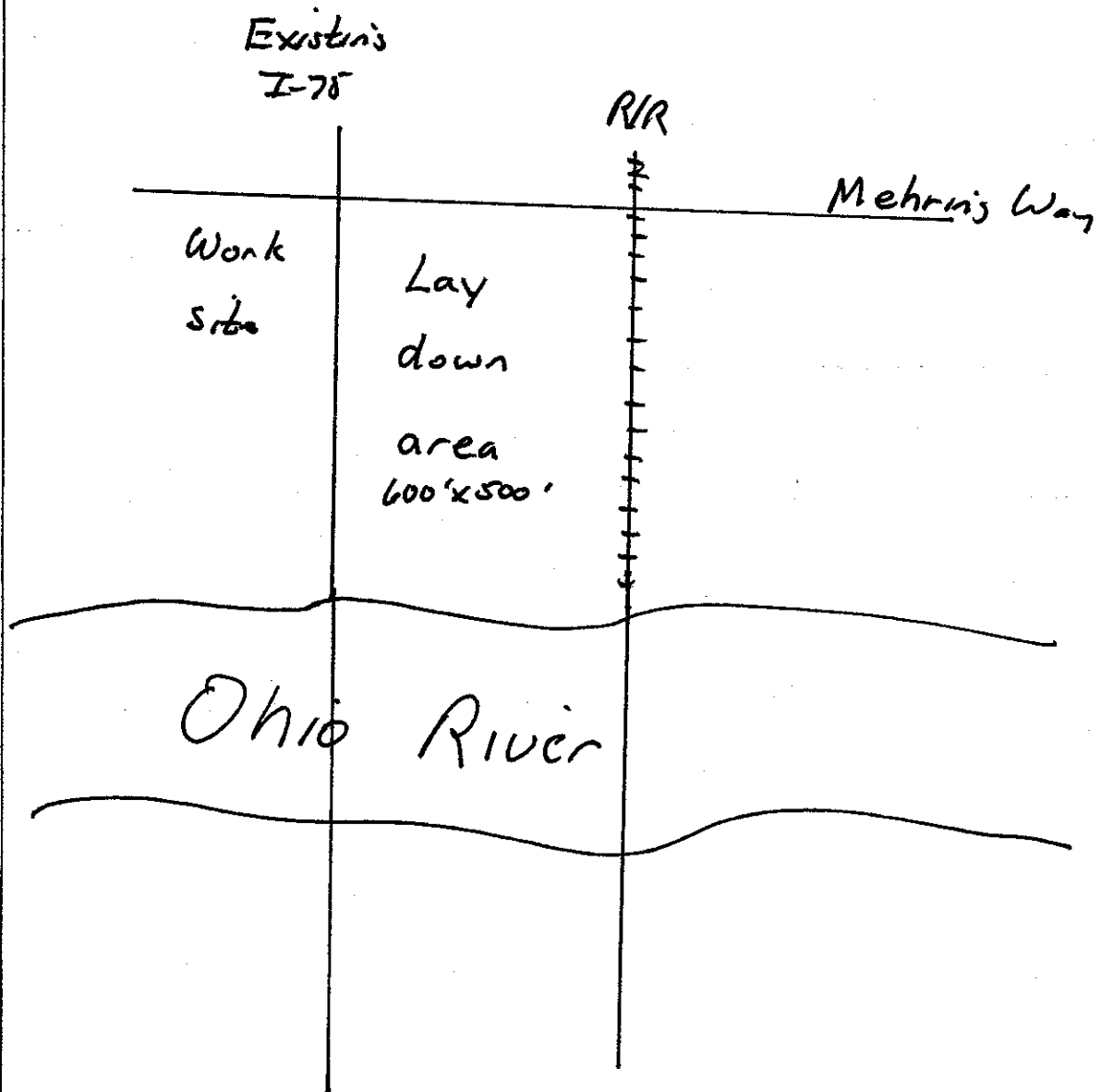
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 3,100,000	—	\$ 3,100,000
SAVINGS (Original minus Alternative)	\$ (3,100,000)	—	\$ (3,100,000)

PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.: **4A**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 3**



VALUE ENGINEERING ALTERNATIVE



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:

MOT-4B

DESCRIPTION: **FOR ALL OPTIONS, USE OHIO OPTION 2 AS A CONTRACTOR LAY-DOWN AREA FOR USE DURING CONSTRUCTION OF THE MAIN RIVER CROSSING**

SHEET NO.:

1 of 3

ORIGINAL DESIGN:

The original designs make no mention of contractor lay-down areas for the bridge construction.

ALTERNATIVE:

Use Ohio Option 2 and designate the east quadrant of the Duke Energy parking lot as a contractor lay-down area. The existing lot is accessible from Mehring Way.

ADVANTAGES:

- Less expensive right-of-way cost
- The new parking area can remain undisturbed
- Near the construction site
- Minimal surface streets to use to access the lay-down area

DISADVANTAGES:

- Requires temporary right-of-way acquisition
- Area to the west of the Duke Energy Substation would require pavement and fencing
- Smaller than other areas proposed

DISCUSSION:

The contractor will need a lay-down area when constructing the new I-71/I-75 bridge over the Ohio River. The east quadrant of the Duke Energy parking lot is smaller than other areas but will have a lower right-of-way cost and will only be needed during construction. Access to the work site is optimal.

If this site is selected, consideration should be given to closing Mehring Way during bridge construction.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	\$	\$ 0
ALTERNATIVE	\$ 789,500	\$	\$ 789,500
SAVINGS (Original minus Alternative)	\$ (789,500)	\$	\$ (789,500)

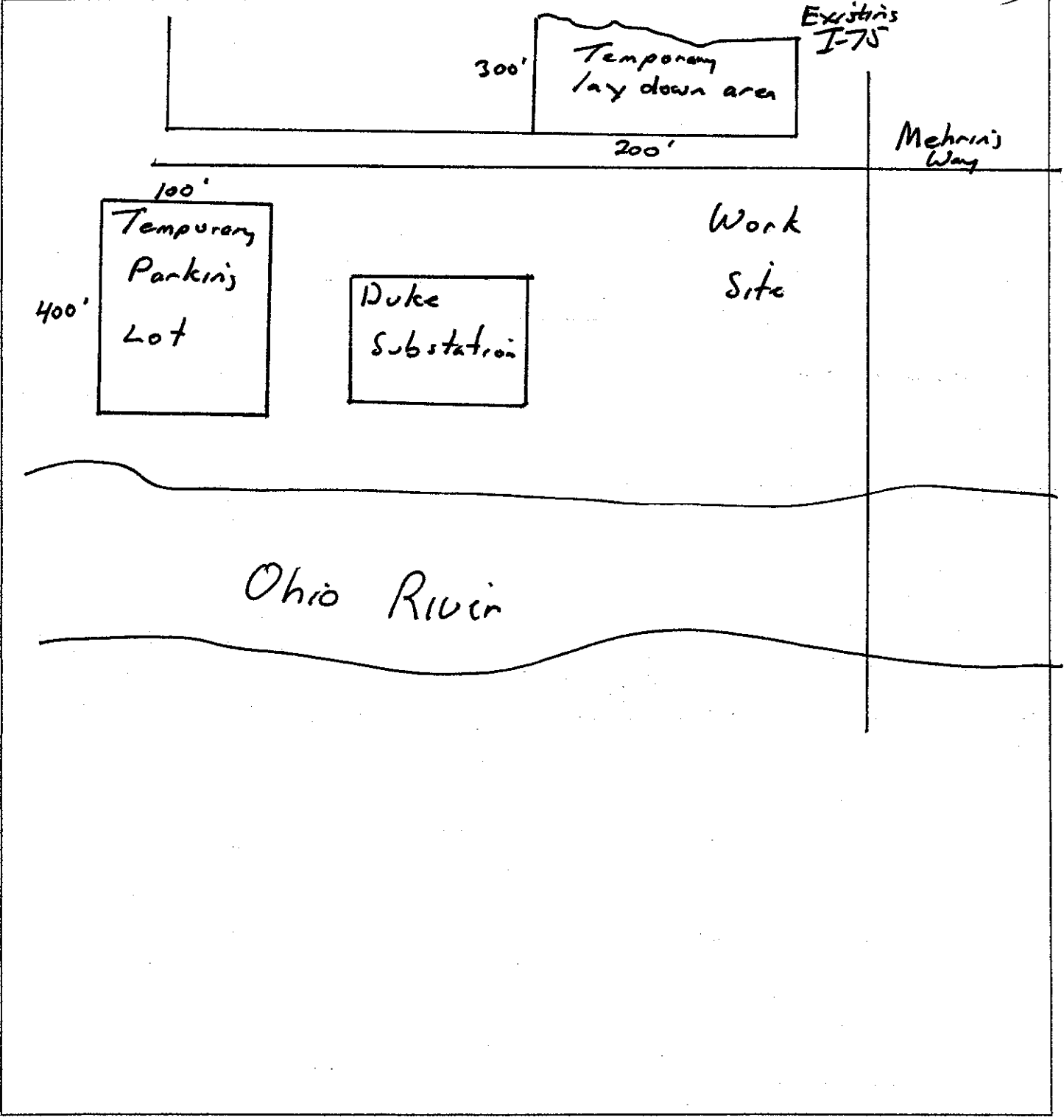
SKETCH

PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.: **4B**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **3**



VALUE ENGINEERING ALTERNATIVE



PROJECT: **HAM-71/75-0.00/0.22, PID 75119**
Ohio Department of Transportation
PROJECT ITEM NO. 6-17
Kentucky Transportation Cabinet

ALTERNATIVE NO.:
MOT-4C

DESCRIPTION: **FOR ALL OPTIONS, USE KENTUCKY OPTION 1 AS A CONTRACTOR LAY-DOWN AREA FOR USE DURING CONSTRUCTION OF THE MAIN RIVER CROSSING**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The original designs make no mention of contractor lay-down areas for the bridge construction.

ALTERNATIVE:

Designate the area bordered by Crescent Avenue to the west, 3rd Street to the north, I-75 to the east, and 4th Street to the south in Kentucky as a contractor lay-down area.

ADVANTAGES:

- Uses existing right-of-way
- Close to the construction site
- Good access to the lay-down area from the interstate

DISADVANTAGES:

- Smaller than other areas proposed

DISCUSSION:

The contractor will need a lay-down area when constructing the new I-71/I-75 bridge over the Ohio River. This area is an existing right-of-way owned by KYTC. It is close to the south approach of the new bridge with a short haul distance from the lay-down area to the new bridge.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE			
SAVINGS (Original minus Alternative)			
	DESIGN SUGGESTION		

ALT No. MOT-9C

Sheet 2/2

Covington

Philadelphia St.

ALT. No.
MOT-4C
Sht 2 of 2

3rd St.

CENTRAL BUSINESS DISTRICT

4th St.

5th St.

Crescent Ave.

Western Ave.

LEWISBURG

KENTUCKY

Library
clean
area

KY-55

KY-54

KY-3

KY-38

KY-2

KY-51

KY-57

KY-14

KY-13

KY-12

KY-11

KY-9

KY-8

KY-7

KY-6

KY-5

KY-4

KY-29

KY-73

KY-72

KY-10

KY-74

KY-26

KY-27

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KY-16

KY-17

KY-18

KY-19

KY-20