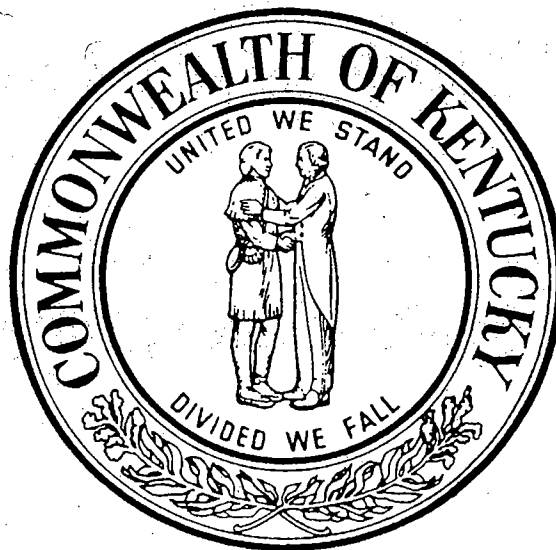


# PLANNING AND RESEARCH PROGRAM

SPR-PL-1-(39)  
JUNE 16, 2003 – JUNE 15, 2004



IN COOPERATION WITH  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

**COMMONWEALTH OF KENTUCKY  
TRANSPORTATION CABINET  
DEPARTMENT OF HIGHWAYS  
DIVISION OF PLANNING  
DIVISION OF MULTIMODAL PROGRAMS**

**AND**

**UNIVERSITY OF KENTUCKY  
KENTUCKY TRANSPORTATION CENTER**

**WORK PROGRAM AND COST ESTIMATE  
FOR  
PROJECT SPR-PL-1(39)  
June 16, 2003 through June 15, 2004**

**PART I  
PLANNING  
MULTIMODAL PROGRAMS**

**PART II  
RESEARCH AND DEVELOPMENT**

**PART III B  
RESEARCH AND DEVELOPMENT**

**PART IV  
RESEARCH AND DEVELOPMENT**

**PREPARED IN COOPERATION  
WITH  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION**

## FOREWARD

This Planning and Research Program SPR-PL-1(39) for the period June 16, 2003 to June 15, 2004 is submitted in compliance with the provisions of Section 307 of Title 23, United States Code, and describes programs and operations for planning activities in the Kentucky Transportation Cabinet (KYTC) and the Kentucky Cooperative Transportation Research Program (KCTRP). This program modifies and updates previous such programs and is specifically intended to reflect the needs of the Kentucky Transportation Cabinet. It is fully expected that products from this program will also have national applications.

The Divisions of Planning and Multimodal Programs are charged with the responsibility for recommending, advising, and assisting the chief administrators of the KYTC in the development of the overall goals, policies, project priorities, and procedures relating to the total transportation program of the Department. Proposed activities for Fiscal Year 2004 are reported in detail by Volume and Chapter in this Work Program.

The KCTRP is concerned with the development and conduct of a comprehensive research program in cooperation with the U.S. Department of Transportation, Federal Highway Administration (FHWA).

In addition to research developed in cooperation with FHWA, the KCTRP may perform other services for the KYTC on a nonparticipating basis. The scope of these services could include activities such as research studies and special investigations of various engineering and operation activities. The Research Program and Implementation Advisory Committee (RPIAC), headed by the State Highway Engineer and coordinated through the Research Coordinator, will give direction to the research program.

KENTUCKY TRANSPORTATION CABINET  
DEPARTMENT OF HIGHWAYS  
FISCAL YEAR 2004  
PLANNING AND RESEARCH WORK PROGRAMS

<u>PROGRAM IDENTITY</u>	<u>FEDERAL</u>	<u>STATE MATCH</u>	<u>LOCAL</u>	<u>TOTAL</u>
<b>PLANNING</b>				
SPR-PR Part I Planning	\$6,147,120	\$1,536,780		\$7,683,900
PL Funded Metropolitan Area Planning	\$1,550,000	\$96,875	\$290,625	\$1,937,500
Other Planning Activities	*\$300,000	*\$900,000		\$1,200,000
<b>Subtotal – Planning</b>	<b>\$7,997,120</b>	<b>\$2,533,655</b>	<b>\$290,625</b>	<b>\$10,821,400</b>
<b>RESEARCH</b>				
SPR-PR Part II Research	\$2,000,000	\$500,000		\$2,500,000
FY 02 Carryover Funds	\$296,000	\$74,000		\$370,000
Part III B Research		\$200,000		\$200,000
TRB Dues	\$105,285			\$105,285
NCHPR Dues	\$606,300			\$606,300
Pooled Funds	\$50,000			\$50,000
<b>Subtotal – Research</b>	<b>\$3,057,585</b>	<b>\$774,000</b>		<b>\$3,831,585</b>
<b>TOTALS – PLANNING &amp; RESEARCH</b>	<b>\$11,054,705</b>	<b>\$3,307,655</b>	<b>\$290,625</b>	<b>\$14,652,985</b>

\*Six Year Highway Plan charged to projects, not FH02.

# **PLANNING AND MULTIMODAL PROGRAMS**

<u>CHAPTER</u>	<u>TITLE</u>	<u>AMOUNT</u>
1	Administrative	\$212,500
2	Personnel Training	\$147,600
3	Equipment Management	\$764,700
4	Traffic Data Collection and Processing	\$1,501,900
5	Strategic Corridor Planning	\$1,142,800
6	Intermodal Statewide Planning	\$577,400
7	Roadway Systems	\$306,500
8	Geographic Information Systems	\$350,800
9	Cartography	\$297,300
10	GPS Processing	\$157,400
11	GPS Collection	\$339,600
12	Highway Information System	\$793,500
13	Special Analyses	\$115,250
14	Air Quality Conformity Analysis Program	\$268,300
15	Metropolitan Planning Organizations	\$248,200
16	Small Urban Areas Studies	\$53,700
17	Bicycle and Pedestrian Transportation Program	\$39,800
18	Traffic Congestion Management System	\$14,050
19	ITS Coordination	\$22,500
20	Traffic Data – Forecasting	\$190,600
21	Statewide Traffic Model	\$139,500
	TOTAL	\$7,683,900

**CHAPTER 1:** Administrative

**RESPONSIBLE UNIT:** Division of Planning  
Administrative Section (Internal Customer Service Team  
and External Customer Service Team)  
Division of Multimodal Programs

**PURPOSE AND SCOPE:** The Administrative Section is comprised of the Internal Customer Service Team and External Customer Service Team. The Internal Customer Service Team recommends, advises, and assists the chief administrators of the Kentucky Transportation Cabinet in the development of the overall goals, policies, project priorities, and procedures relating to the transportation program of the Cabinet. Additionally, it is the function of Internal Customer Service Team to plan, organize, direct, motivate, and control activities to accomplish its goals in accordance with Cabinet and federal transportation policies and procedures. The External Customer Service Team focuses on customers external to the Division for cartographic products, statistical reports, and responses to various kinds of data requests including responding to the Cabinet's web page. The administration of the Work Program also includes full consideration of Title VI and the Civil Rights Act of 1964 and other social, environmental, and economic implications and is in compliance with the Cabinet's approved Affirmative Action Program.

**PROPOSED ACTIVITIES FOR 2003-2004:** Service and respond to all internal and external customer requests in a precise, timely, and customer friendly manner regarding all inquiries for assistance.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	\$135,900	\$61,600	\$197,500
<b>OTHER</b>	*\$15,000	\$0	\$15,000
<b>TOTAL</b>	\$150,900	\$61,600	\$212,500

\*Outsourced for completion of the FHWA 536 report.

**CHAPTER 2:** Personnel Training

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Division of Planning

**PURPOSE AND SCOPE:** The training of personnel is essential to the transportation program in order to keep pace with changing techniques and evaluate new procedures and development. This is particularly essential to the Cabinet's multimodal/intermodal programs as more and better technical analyses and assistance are required.

**PROPOSED ACTIVITIES FOR 2003-2004:** An effort will be made to continue a level of staff training which will maintain the integrity of professional career development and improvement of technological skills.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICE</b>	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$80,000</b>	<b>\$21,000</b>	<b>\$35,800</b>	<b>\$136,800</b>
<b>OTHER</b>	<b>\$7,700</b>	<b>\$3,000</b>	<b>\$100</b>	<b>\$10,800</b>
<b>TOTAL</b>	<b>\$87,700</b>	<b>\$24,000</b>	<b>\$35,900</b>	<b>\$147,600</b>



**CHAPTER 3:** Equipment Management

**RESPONSIBLE UNIT:** Division of Planning  
Traffic and Equipment Management Activity Center  
Equipment Management Team

**PURPOSE AND SCOPE:** This team focuses on the identification, purchase, repair, placement, and operation of various pieces of traffic data collection equipment statewide with the Districts and within the Division.

**PROPOSED ACTIVITIES FOR 2003-2004:** Collect volume and classification data on fifty interstate index stations and volume data on forty non-index interstate stations.

Collect data at approximately 450 regularly scheduled volume and classification stations to assist District efforts.

Collect, process, and submit quarterly one week of weigh-in-motion (WIM) data at 28 permanent WIM stations.

Collect, process, and submit 48 hours of WIM data at ten portable WIM stations.

Install permanent vehicle sensors at approximately 30 high volume locations.

Maintain 77 Automatic Traffic Recorders (ATR) and install additional stations as necessary.

Investigate new technologies, sensors, data recorders, and communication devices developed for the traffic-counting industry.

Certify, repair, and maintain 600 traffic data recorders.

Inspect, repair, and maintain 400 permanent vehicle sensor locations.

Produce plans and specifications for new and replacement traffic sensor installations for submittal into construction and pavement rehabilitation contracts.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$312,700</b>	<b>\$8,000</b>	<b>\$320,700</b>
<b>OTHER</b>	<b>\$443,000</b>	<b>\$1,000</b>	<b>\$444,000</b>
<b>TOTAL</b>	<b>\$755,700</b>	<b>\$9,000</b>	<b>\$764,700</b>

**CHAPTER 4:**

## Traffic Data Collection and Processing

**RESPONSIBLE UNIT:**

Division of Planning  
Traffic and Equipment Management Activity Center  
Traffic Data Collection and Processing Team

**PURPOSE AND SCOPE:** To assign, process, and provide access to traffic volume and vehicle classification data for highway planning, design, and various other purposes. This involves making a significant number of short duration (usually 48 hours) portable machine counts on the State Highway System and state-maintained local roads. An adequate program of continuous traffic counting stations (ATRs) provides the basis for factoring short-term counts. Vehicle classification data will be assigned, processed, and made available to Cabinet staff for analytical and forecasting purposes. Traffic count station maps for all counties and incorporated areas will be updated with the latest available traffic count and station data.

**PROPOSED ACTIVITIES FOR 2003-2004:** Approximately 6,500 regularly scheduled short-duration portable machine counts will be performed statewide. These counts are one-third of all short duration traffic count stations in the state and are now performed on a three-year cycle.

Vehicle classification data at approximately 800 stations will be collected and processed. This is the beginning of an effort to increase the number of classification stations to 25-30% of all traffic count stations.

Review, assign, process, and distribute data for approximately 400 special count stations that have been requested by outside division organizations.

Download, process, and maintain data from 77 permanent ATR stations. Review operation with Equipment Management Team for proper operation, locations, and coverage for possible new ATR station installations.

Maintain, update, and make available data from more than 18,000 traffic count stations.

Update axle, monthly factors used in adjusting short counts, such as weekly, monthly, and axle correction factors from data collected at ATR and vehicle classification stations.

Update TVS to include any new stations or roadway alignment changes. Correct beginning and ending milepoints to better represent traffic generators.

Detect and adjust past bad volume counts while combining and creating additional stations where necessary.

Use GIS application software to automate the generation of station and count maps and to check the accuracy of milepoints and latitude longitude positions collected by field personnel when performing the count.

**CHAPTER 4:**

Traffic Data Collection and Processing

**RESPONSIBLE UNIT:**

Division of Planning  
 Traffic and Equipment Management Activity Center  
 Traffic Data Collection and Processing Team

**PROPOSED ACTIVITIES FOR 2003-2004 (continued):**

Explore alternative methods for collecting short duration (48 hour) machine counts on local roads as needed to acquire county level VMT estimates.

Update data summaries developed under the research study entitled "Estimation of Equivalent Axleloads,"

Implement recommendations from the Kentucky Transportation Center's "Analysis of Vehicle Classification Data" research study.

Begin the process of converting the existing vehicle classification file from a mainframe to a PC environment

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$284,900</b>	<b>\$856,700</b>	<b>\$1,141,600</b>
<b>OTHER</b>	<b>*\$325,000</b>	<b>\$35,300</b>	<b>\$360,300</b>
<b>TOTAL</b>	<b>\$609,900</b>	<b>\$892,000</b>	<b>\$1,501,900</b>

\*Includes \$300,000 outsourced for data collection.

**CHAPTER 5:**

Strategic Corridor Planning

**RESPONSIBLE UNIT:**

Division of Planning  
 Strategic Planning Activity Center  
 Strategic Corridor Planning Team

**PURPOSE AND SCOPE:** To perform the necessary level of planning to develop a conceptual purpose and need statement, identify major environmental issues including environmental justice, initiate consultation with local officials, initiate agency coordination, involve the public early and often for projects listed in the Six Year Highway Plan and Statewide Transportation Plan (Long Range Plan), identify and evaluate alternatives, generate project cost estimates, and oversee outsourced activities. Also included are brief technical project studies, interchange justification studies, and/or other special studies. Also evaluate and research techniques to better inform and involve the public about the project development process.

**PROPOSED ACTIVITIES FOR 2003-2004:** Based on scheduled design starts, projects will be selected from the Six-Year Highway Plan (first priority) and additional projects will be selected from the Long Range Highway Element of the Statewide Transportation Plan (second priority) for analysis to include: develop a conceptual purpose and need statement; establish environmental footprint and identify major environmental issues for each project; coordinate with various agencies and organizations to solicit input and to identify support for and/or opposition to the project; initiate consultation with local officials and other stakeholders, including potential affected minority and low-income populations, as appropriate; participate in a public involvement process to solicit input and identify support and opposition; define project concepts and alternatives and select preferred concepts and/or alternatives, as appropriate; and develop cost estimates for project concepts and alternatives, as appropriate.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$343,600</b>	<b>\$280,700</b>	<b>\$624,300</b>
<b>OTHER</b>	<b>\$512,000</b>	<b>\$6,500</b>	<b>\$518,500</b>
<b>TOTAL</b>	<b>\$855,600</b>	<b>\$287,200</b>	<b>\$1,142,800</b>

\*Includes \$500,000 for intermediate planning activities. An additional \$2,400,000 (non SPR funds) is estimated for resources outside the Kentucky Transportation Cabinet.

**CHAPTER 6:** Intermodal Statewide Planning

**RESPONSIBLE UNIT:** Division of Planning  
Strategic Planning Activity Center  
Intermodal Statewide Planning Team

**PURPOSE AND SCOPE:** To conduct a comprehensive statewide transportation planning process with the Area Development Districts (ADDs) and the Highway District Offices (HDOs). To periodically update a fiscally-balanced, multimodal Statewide Transportation Plan (STP) and provide input to the Six-Year Highway Plan.

This process includes intermodal and statewide transportation planning programs, the Highway Safety Program through the ADDs, support of the Intermodal Advisory Panel (IAP), and support of the Rural Transportation Planning program through the fifteen ADDs. Tasks include identifying and analyzing intermodal facilities, access and systems; identifying needs based on data and local input; recommending strategies to enhance intermodal transportation and the Statewide Transportation Planning process; oversight of waterway transportation; recommending projects for the Six Year Highway Plan and STP; and assisting with other planning activities as needed, such as the Highway Safety Program through the ADDs.

**PROPOSED ACTIVITIES FOR 2003-2004:** Work closely with the ADDs/HDOs to enhance the statewide transportation planning process, including public involvement/coordination with the MPOs. Provide the ADDs with transportation systems information and guidance. Provide direction for special projects. Analyze, identify, and prioritize transportation projects. Provide support for the IAP and ADDs. Obtain input for the intermodal and statewide transportation planning process.

Conduct special studies as needed to analyze riverport issues, freight transportation, and highway access to intermodal facilities. Utilize data to identify needs. Respond to inquiries about proposed transportation projects. Review surplus property/right-of-way proposals and school site locations as related to long-range transportation needs. Make information on intermodal and statewide transportation available for public use.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$253,200</b>	<b>\$260,700</b>	<b>\$513,900</b>
<b>OTHER</b>	<b>*\$55,500</b>	<b>\$8,000</b>	<b>\$63,500</b>
<b>TOTAL</b>	<b>\$308,700</b>	<b>\$268,700</b>	<b>\$577,400</b>

\* This amount includes \$50,000 in outsourced assistance for support of intermodal transportation planning activities, directory, database, and web page. This chapter also includes \$698,600 (not financed with SPR funds) for the annual program with the Area Development Districts.

**CHAPTER 7:**

## Roadway Systems

**RESPONSIBLE UNIT:**

Division of Planning  
Transportation Systems Activity Center  
Roadway Systems Team

**PURPOSE AND SCOPE:** To maintain the official Department of Highways records for the State Primary Road System, National Highway System, Functional Classification System, Designated National Truck Network (NN), Coal Haul Highway System, Forest Highway System, and the Kentucky Scenic Highways and Byways System. To conduct the necessary research and evaluations relative to proposed system changes, prepare official documentation for approval and signature, and notify all necessary personnel of the approved changes. For the Coal Haul System gather and compile source data on the transportation of coal by truck in the Commonwealth of Kentucky.

**PROPOSED ACTIVITIES FOR 2003-2004:** Continue to examine systems change process to respond in a more timely fashion. Update, maintain, and publish for distribution to interested parties and the trucking industry an official listing of truck route descriptions, and a statewide map depicting the NN, send out forms semi-annually to coal companies and truck transporters for reporting the truck transportation of coal, update database and maps from information on returned semi-annual reports, provide ton-mile statistics to Department of Local Government, publish Kentucky's Official Coal Haul System Report, study possible legislative proposals to streamline and stabilize the Coal Haul Road System, provide the Secretary's Office with information for updating the "Extended Weight Coal Haul Road System" by Official Order, review applications requesting designation as a scenic highway or byway for meeting Transportation Cabinet guidelines and make recommendation for designation.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$190,500</b>	<b>\$102,000</b>	<b>\$295,500</b>
<b>OTHER</b>	<b>\$8,000</b>	<b>\$6,000</b>	<b>\$14,000</b>
<b>TOTAL</b>	<b>\$198,500</b>	<b>\$108,000</b>	<b>\$306,500</b>

**CHAPTER 8:****Geographic Information Systems (GIS)****RESPONSIBLE UNIT:**

Division of Planning  
Transportation Systems Activity Center  
GIS Team

**PURPOSE AND SCOPE:** To meet the needs of the Division, Cabinet, other state agencies, and entities outside state government for accurate GIS based electronic maps. To maintain the transportation layer base map to the highest map standard level and most up-to-date status possible. See that data links to the base map are always complete and accurate.

**PROPOSED ACTIVITIES FOR 2003-2004:** Create a seamless statewide transportation GIS base map using GPS to collect data on all public streets and roads; work with Data Management Activity Center to conflate data to new GIS transportation layer for all public roads, and link new data as required; develop new county maps using ArcInfo® and ArcView® showing all the transportation layers and other pertinent features; and maintain and update the GIS base maps to continually reflect the latest street and road alignments, road attribute data, and other map features.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$240,800</b>	<b>\$240,800</b>
<b>OTHER</b>	<b>*\$110,000</b>	<b>\$110,000</b>
<b>TOTAL</b>	<b>\$350,800</b>	<b>\$350,800</b>

\*Includes \$100,000 for University of Kentucky technical assistance.

**CHAPTER 9:**

Cartography

**RESPONSIBLE UNIT:**

Division of Planning  
 Transportation Systems Activity Center  
 Cartography Team

**PURPOSE AND SCOPE:** To meet the needs of the Division, Cabinet, other state agencies, and entities outside state government for general and special purpose maps. This continuing program involves creating, updating, printing, and distributing a wide variety of cartographic projects.

**PROPOSED ACTIVITIES FOR 2003-2004:** Continue development of electronic mapping for all city, county, state, and special-purpose cartographic products; maintain and publish electronic formats of cartographic products on the internet; use the large-format plotter to print city, county, and state maps as needed for distribution through the Division of Planning inter-account service and the Kentucky Geological Survey Map Sales function; update the Official State Highway Map and have necessary printing accomplished; create reports and exhibits for various Division projects and studies; and provide mapping and graphic assistance to other Divisions and Departments on request.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	\$236,000	\$6,300	\$242,300
<b>OTHER</b>	*\$54,000	\$1,000	\$55,000
<b>TOTAL</b>	\$290,000	\$7,300	\$297,300

\* Includes \$50,000 for the Official State Highway Map printing.



**CHAPTER 10:** Global Positioning System (GPS)

**RESPONSIBLE UNIT:** Division of Planning  
Data Management Activity Center  
GPS Processing Team

**PURPOSE AND SCOPE:** Match GPS centerline data collected and processed with existing Linear Referencing System (county, route, milepoint). Maintain the Cabinet's GIS transportation layer.

**PROPOSED ACTIVITIES FOR 2003-2004:** Match newly acquired centerline data to the existing highway network – includes updating and verifying roadway mileage, highway systems data, and use in maintaining and generating data driven maps. These include County Road Aid Series, functional, truck, state system, and traffic station maps. Make GIS base map changes as necessitated by changes to the highway network.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$139,400</b>	<b>\$139,400</b>
<b>OTHER</b>	<b>\$18,000</b>	<b>\$18,000</b>
<b>TOTAL</b>	<b>\$157,400</b>	<b>\$157,400</b>

**CHAPTER 11:** Global Positioning System (GPS)

**RESPONSIBLE UNIT:** Division of Planning  
Data Management Activity Center  
GPS Collection Team

**PURPOSE AND SCOPE:** Coordinate data collection activities for the statewide GIS transportation layer with Area Development Districts (ADDs). Maintain quality control by coordinating with the ADDs through review of data and training.

**PROPOSED ACTIVITIES FOR 2003-2004:** Collect roadway centerline data using GPS technology for all public roads, statewide. Collect intersection and control point data for verifying all centerline data submitted by ADDs and Central Office. Perform office reviews to verify data meets the required standards and confidence levels established by this Division and in accordance with the National Standard for Spatial Data Accuracy.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$282,100</b>	<b>\$31,500</b>	<b>\$313,600</b>
<b>OTHER</b>	<b>\$18,000</b>	<b>\$8,000</b>	<b>\$26,000</b>
<b>TOTAL</b>	<b>\$300,100</b>	<b>\$39,500</b>	<b>\$339,600</b>

**CHAPTER 12:** Highway Information System

**RESPONSIBLE UNIT:** Division of Planning  
Data Management Activity Center  
Highway Information System Team

**PURPOSE AND SCOPE:** Maintain and operate the HIS database. Use the Highway Performance Monitoring System (HPMS) to establish a baseline for measuring highway system performance and produce the highway data submittal required annually by FHWA. Provide information to the Transportation Cabinet, other governmental agencies, consultants, and private organizations. Continue development and maintenance of the HIS database interface with the (GIS); including maintenance of base map graphics, and link to associated network and data.

**PROPOSED ACTIVITIES FOR 2003-2004:** Work with the Office of Technology and other divisions within the Transportation Cabinet to: upgrade the HIS database to "Highways by EXOR"; consolidate the Cabinet's data maintenance efforts, and enhance the current reference system to identify routes in the Six Year Highway Plan. Make modest enhancement to improve HIS access through the Oracle Web Server until the new version is implemented; assist in the development and maintenance of a Cabinet GIS; maintain base map and database network for state maintained roads; assist the Office of Technology and the Division of Traffic with development of a procedure to provide up-to-date route network, DMI, functional class, NHS, and urban area information to the CRASH database. Utilize HPMS to update Rating Indices, Capacity, and Volume/Service Flow ratio in the HIS database. Use HIS to measure highway system performance and assist with analyses of the Unscheduled Needs List. Convert to new HPMS software, perform changes required by Federal legislation, regulations, policies, and/or guidelines, as needed to the HPMS. Perform field inventories and make updates to the HIS database.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICES</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$292,900</b>	<b>\$42,000</b>	<b>\$334,900</b>
<b>OTHER</b>	<b>\$453,600</b>	<b>\$5,000</b>	<b>\$458,600</b>
<b>TOTAL</b>	<b>\$746,500</b>	<b>\$47,000</b>	<b>\$793,500</b>

\* Includes \$413,600 for GPS maintenance.

**CHAPTER 13:**

Special Analysis

**RESPONSIBLE UNIT:**Division of Planning (Special Analysis Team)  
Division of Multimodal Programs

**PURPOSE AND SCOPE:** Numerous requests are made throughout the year for activities and information that may not directly relate to an applicable chapter of the work program. These requests vary from information assimilation requests that may require only hours to complete to technical analyses and reviews and policy review/recommendations, such as early project programming studies and other intermediate programming activities, that may require extensive efforts.

**PROPOSED ACTIVITIES FOR 2003-2004:** It is anticipated that a large volume of special requests will continue to be received and processed by these Divisions.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>PLANNING</b>	<b>DISTRICT OFFICE</b>	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$76,900</b>	<b>\$5,500</b>	<b>\$25,800</b>	<b>\$108,200</b>
<b>OTHER</b>	<b>\$5,000</b>	<b>\$2,000</b>	<b>\$50</b>	<b>\$7,050</b>
<b>TOTAL</b>	<b>\$81,900</b>	<b>\$7,500</b>	<b>\$25,850</b>	<b>\$115,250</b>

**Additional PL funds (\$368,000 matched with \$23,000 – 5% Road Fund and \$69,000 – 15% local) will be used by the MPOs for additional training and special projects.**

**CHAPTER 14:**

## Air Quality Conformity Analysis Program

**RESPONSIBLE UNIT:**

Division of Multimodal Programs  
Urban Planning Branch

**PURPOSE AND SCOPE:** Coordinate and perform analyses necessary for Air Quality Conformity Determinations for both rural and some MPO areas to allow for the timely advancement of projects. Coordinate with Division for Air Quality, EPA-Atlanta, FHWA, FTA, MPOs, and KYTC for conformity approvals. Review and comment on the air quality rules, proposed rules, regulations, and guidance that impact transportation. Maintain a working knowledge of EPA's air quality modeling software, as well as, review and comment on model updates. Develop new modeling methods for rural conformity. Establish and maintain conformity consultation processes, which specifies each agency's roles and responsibilities.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Establish conformity consultation agreements statewide.
- Develop sub-area models from the Statewide Traffic Model for proposed rural nonattainment areas.
- Review and comment on the guidelines for the 8-Hour Ozone Standard, MOBILE Model 6, Air Quality Regulations, and nonattainment designations.
- Run the MOBILE Model for all necessary regional air quality conformity analyses. DMP will be responsible for performing Air Quality Conformity analysis for the 5 nonattainment (or maintenance) areas for the one-hour standard. DMP coordinates with the MPOs, Division of Environmental Analysis, Division for Air Quality, FHWA, FTA, and EPA. DMP will provide traffic model output in the form of vehicle miles of travel (VMT) and speeds for the three maintenance areas (Ashland, Lexington, and Owensboro) that will be used to determine conformity of the MPOs' Transportation Plans and TIPs.
- Bowling Green, Henderson, and Hopkinsville are proposed nonattainment areas for the 8-hour Standard. DMP will coordinate air quality conformity analyses for these new areas, too.
- Review and comment during the preparation of mobile budgets for the State Implementation Plan (SIP) for the updates to the One-Hour Air Quality Standards, 8-Hour Standard Designations and for SIP amendments and budget adjustments.

**CHAPTER 14:****Air Quality Conformity Analysis Program****RESPONSIBLE UNIT:**Division of Multimodal Programs  
Urban Planning Branch**PROPOSED ACTIVITIES FOR 2003-2004 (Continued):**

- Promote and educate the Cabinet, public officials, and general public about air quality, conformity analysis, and federal guidelines.
- DMP staff will continue to monitor and coordinate various CMAQ projects in the nonattainment and maintenance areas. Projects will include ozone awareness programs, traffic management and operation centers, inspection and maintenance programs, and other programmed projects.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$136,300</b>	<b>\$136,300</b>
<b>OTHER</b>	<b>* \$132,000</b>	<b>\$132,000</b>
<b>TOTAL</b>	<b>\$268,300</b>	<b>\$268,300</b>

\*Includes \$100,000 for Air Quality Models for new NONattainment areas and \$31,000 for KTC Research. Other expenses \$1,000.

**CHAPTER 15:** Metropolitan Planning Organizations  
(Areas over 50,000 Population)

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**PURPOSE AND SCOPE:** Provide technical assistance and coordination to the metropolitan planning organizations (MPOs) for developing and maintaining a continuing, cooperative, and comprehensive (3C) transportation planning process. The results are plans or programs consistent with the comprehensively planned development of the urbanized areas (areas over 50,000 population) in accordance with the 1991 Intermodal Surface Transportation and Efficiency Act, and the 1997 Transportation Equity Act For the 21st Century, as amended (Title 23, United States Code, Section 134). This process ensures that KYTC and local transportation projects remain eligible to receive federal funding. The scope of work for the 3C planning process is in accordance with the annual unified work programs, which describe all anticipated urban transportation and transportation related planning activities to be performed with planning assistance provided under Section 5303 of the Federal Transit Administration Act, and under Title 23, U.S.C. 104 (f) and 307 (c).

**PROPOSED ACTIVITIES FOR 2003-2004:**

- The continuing technical assistance and review of MPO activities and documents, plus attendance at technical, policy, and other committee meetings to represent the Cabinet. The Division of Multimodal Programs (DMP) staff will continue to ensure consistency between local and state plans and programs, including MPO and State transportation improvement programs, congestion management plans, the Cabinet's Six-Year Highway Plan, MPO Long Range Transportation Plans, and the Cabinet's Statewide Long Range Plan. The DMP will continue to provide technical assistance for MPO traffic model updates through participation in the Traffic Model Users Group.
- Special traffic assignments and analyses for the design and implementation of various highway and street projects. The DMP maintains traffic models for the Ashland, Bowling Green, and Radcliff-Elizabethtown areas and does analyses for projects in these areas. The Owensboro MPO has traffic modeling software and is assuming some responsibility for performing traffic assignments and analysis of projects. Traffic assignments for the other urbanized areas are done by the local MPOs (with assistance from this Division) but are coordinated through our Division for distribution throughout the Cabinet.
- Census 2000 and FHWA have designated two additional areas as MPOs in Kentucky: Bowling Green and the Radcliff-Elizabethtown-Vine Grove-Fort Knox Area. Additionally, Henderson-Evansville became a TMA area (exceeding 200,000 population). DMP will assist in organizing, coordinating, and educating the new MPO staffs, technical, and policy members.

**CHAPTER 15:** Metropolitan Planning Organizations  
(Areas over 50,000 Population)

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**PROPOSED ACTIVITIES FOR 2003-2004 (Continued):**

- DMP staff will continue to coordinate with the Transportation Cabinet's Office of Transportation Delivery on transit and transit planning issues.
- MPOs will continue to provide traffic data for Cabinet projects. The Cabinet will do traffic projections for some projects in MPO areas.
- The MPOs will continue transportation planning activities as outlined in their UWPs. Several special planning efforts are expected to be continued or are new this year including: Louisville's Bridges and Transportation Tomorrow, and Cincinnati's Brent Spence Bridge and the N/S Initiative.
- DMP staff will continue to monitor and coordinate MPO rideshare programs.
- The MPOs will continue transportation planning activities as outlined in their UWPs. Several special planning efforts are expected for the new year such as: major corridor studies in Louisville, Lexington, and Northern Kentucky; traffic management programs and Congestion Management Programs in Evansville-Henderson, Louisville, Lexington, and Northern Kentucky; and various sub-area analyses. Continuing effort will be directed toward the updating or amending long range transportation plans in all MPO areas.
- The Cabinet and the MPOs will continue to expand the use of TransCAD, the new GIS based transportation modeling software program. DMP will continue to support the use of both MINUTP and TransCAD for MPO area transportation modeling.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$246,200</b>	<b>\$246,200</b>
<b>OTHER</b>	<b>*\$2,000</b>	<b>\$2,000</b>
<b>TOTAL</b>	<b>\$248,200</b>	<b>\$248,200</b>

\*PL funds passed thru to MPOs (\$1,550,000-Federal and \$96,875-Road Fund as well as \$290,625 local funds for the PL Program that does not flow through the Cabinet).



**CHAPTER 16:** Small Urban Areas Studies

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**PURPOSE AND SCOPE:** Identify and analyze traffic operational and transportation system deficiencies in small urban areas (5,000 to 50,000 population). The purpose of this analysis is to provide highway administrators with urban transportation needs and information sufficient to determine an urban improvement project priority program. These prioritized projects are used as input to KYTC's Six-Year Plan and Long Range Needs Plan. Coordination with the Cabinet's Divisions of Planning, Traffic, Environmental Analysis, and Design, District Offices, and ADDs is required. The emphasis of this effort will be to provide a timely response to transportation system issues.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Small Urban Area Transportation Study Updates will be completed by consultant engineering firms for the areas of Madisonville, Maysville, and Mason County. Cabinet staff from the Division of Multimodal Programs provides general oversight and guidance, along with some data input, and serves on advisory committees set up with local representatives for providing input to the studies. State road funds are used to fund the contracts with the consultants.
- New Urban Area Transportation Studies will be initiated for Georgetown and Somerset. The procedure and funding will be the same as above.
- With the availability of updated socioeconomic data and microcomputer modeling techniques, efforts will be directed toward the translation of existing models to TransCAD. The models, in conjunction with other analytical tools, will be utilized to study, at a level of detail dependent on the complexity of the issues, the transportation system impacts of various proposals. Proposals and requests are routinely received from local governments. Project and priority recommendations will be made as appropriate.
- Existing MINUTP models will be converted to TransCAD on an as-needed basis. Procedures will be developed to incorporate GIS data and tools in the model development process. DMP will continue to support both MINUTP and TransCAD models as approved.

**CHAPTER 16:** Small Urban Areas Studies

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$51,700</b>	<b>\$51,700</b>
<b>OTHER</b>	<b>\$2,000</b>	<b>\$2,000</b>
<b>TOTAL</b>	<b>\$53,700</b>	<b>\$53,700</b>

\* An additional \$400,000 of State Road Funds are identified in the Cabinet's Six-Year Highway Plan for Urban Transportation Studies for areas with 5,000-50,000 population.

**CHAPTER 17:****Bicycle & Pedestrian Transportation Program****RESPONSIBLE UNIT:**

Division of Multimodal Programs

**PURPOSE AND SCOPE:** Coordinate with the state bicycle and pedestrian program, develop a statewide bikeway system, work and coordinate with the Kentucky Bicycle & Bikeway Commission to provide assistance to the general public, municipal governments and other state agencies in the planning and development of bicycle and pedestrian facilities and programs. This assistance will be in the form of technical advice, assisting in the development of plans, and coordinating studies.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- To develop procedures for implementing the Pedestrian & Bicycle Travel Policy to be incorporated into the Long Range Plans of the State and MPOs.
- To coordinate the revisions and updates of the statewide bike route system and associated maps.
- Answer requests for bicycle and pedestrian information concerning KYTC's facilities.
- Promote and facilitate the increased use and public education of non-motorized modes of transportation, including developing pedestrian and bicycle facilities. As well as, assist and expand safety programs for using such facilities.
- Review Planning Studies for bicycle and pedestrian facilities.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$39,700</b>	<b>\$39,700</b>
<b>OTHER</b>	<b>\$100</b>	<b>\$100</b>
<b>TOTAL</b>	<b>\$39,800</b>	<b>\$39,800</b>

**CHAPTER 18:****Traffic Congestion Management System****RESPONSIBLE UNIT:**

Division of Multimodal Programs  
 Urban Planning Branch

**PURPOSE AND SCOPE:** Coordinate the development and implementation of traffic congestion management systems in the Louisville, Northern Kentucky, and Lexington urbanized areas of the state. The traffic management systems in these urbanized areas shall be developed by the MPOs.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Coordinate with the MPOs in Louisville, Northern Kentucky, and Lexington in the development and implementation of required Traffic Management Programs for their areas.
- Coordinate with the ARTIMIS Regional Traffic Management System for the Cincinnati-Northern Kentucky area. This involves work with ODOT, ITS Branch of Operations, and the MPO.
- Coordinate with the TRIMARC Freeway Incident Management System for Louisville. This involves work with ITS Branch of Operations, INDOT, and the MPO.
- During the normal statewide transportation planning process, traffic congestion is and will be routinely considered in selecting and prioritizing projects that are considered for the Six-Year Plan, the State Long Range Transportation Plan, and Small Urban Area Transportation Studies.
- Test using the Texas Transportation System performance measures in the Simpson County model.
- Coordinate urban mobility team and serve as Kentucky liaison for the *Annual Urban Mobility Study*.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$14,000</b>	<b>\$14,000</b>
<b>OTHER</b>	<b>\$ 50</b>	<b>\$ 50</b>
<b>TOTAL</b>	<b>\$14,050</b>	<b>\$14,050</b>

**CHAPTER 19:** Intelligent Transportation System (ITS) Coordination

**RESPONSIBLE UNIT:** Division of Multimodal Programs

**PURPOSE AND SCOPE:** To coordinate with the Intelligent Transportation System (ITS) Branch of the Division of Operations. The Cabinet is active in several aspects of the national ITS program both at the state level and at the national level.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Coordinate any new ITS project(s) approved for funding by the U.S. Department of Transportation in MPO or SUA areas.
- Assist in developing a comprehensive and integrated statewide ITS plan including a statewide ITS architecture in order to promote coordinated and integrated ITS projects to obtain maximum benefits. This project will be a continuation of work previously assigned to the UKTC and is included in the KYTC Research Program as KYSPR-98-188.
- Manage Archived Data Management System research study which uses data from various ITS operations.
- Coordinate and communicate ITS as a component of the MPO and SUA transportation planning process.
- Coordinate with Lexington Traffic Information Center and the Bluegrass ITS (BITS) group. This involves work with the ITS Branch of Operations, District 7 Traffic and Planning, Bluegrass ADD, and the Lexington Traffic Information Center.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$22,400</b>	<b>\$22,400</b>
<b>OTHER</b>	<b>100</b>	<b>100</b>
<b>TOTAL</b>	<b>\$22,500</b>	<b>\$22,500</b>

**CHAPTER 20:** Traffic Data - Forecasting

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**PURPOSE AND SCOPE:** To maintain traffic trends, provide current and projected traffic volume estimates, and associated elements such as design hour volumes, directional distribution, composition of traffic, and truck loadings for project development and design purposes.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Numerous traffic estimates will be prepared for planning studies, design projects, environmental analysis, and other purposes as needed. Various procedures, including trendline analysis and the use of computerized traffic models (including statewide traffic model and small urban models) will be utilized to determine traffic assignments. Traffic trends will be monitored to assure usage of accurate K-factors, directional factors, and growth rates. Socioeconomic and site data will be reviewed for usage in traffic model analysis and forecasting.
- Monitor and provide quality review for traffic projections provided by the MPOs and planning consultants.
- Administer statewide traffic forecasting contract and provide quality review for traffic projections made by the consultant.
- Provide assistance and training to users of the ESAL Forecasting for Superpave computer program.
- Maintain databases that track traffic forecasts and traffic forecast parameters. Make databases available to other user offices. Maintain the traffic forecasting web page.
- Update the 2002 Traffic Forecasting Report.
- Future year forecasting factors will be provided for the Highway Performance Monitoring System.
- \$40,000 of this budget estimate will be utilized by the Kentucky Transportation Center for producing ESAL tables and vehicle classification summary files.
- Coordinate with the Division of Planning to insure that traffic forecasting data needs are met.
- Work on Commercial Vehicle Monitoring (CVM) Team to provide traffic forecasts of heavy truck usage of existing and proposed new CVM stations. Also provide assistance with reviewing consultant work on ongoing CVM scoping study.
- Chair the Traffic Model Users Group which is a peer group for traffic forecasters and traffic modelers composed of members from government, academia, and the private sector.

**CHAPTER 20:** Traffic Data - Forecasting

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>*\$115,100</b>	<b>\$115,100</b>
<b>OTHER</b>	<b>**\$75,500</b>	<b>\$75,500</b>
<b>TOTAL</b>	<b>\$190,600</b>	<b>\$190,600</b>

\* Charges will be made to SYP projects for some forecasts.

\*\*Includes up to \$75,000 for use of resources outside the Kentucky Transportation Cabinet:

1. Statewide Forecasting Contract - \$200,000 (\$30,000 FH02, \$170,000 will be charged to projects).
2. Kentucky Transportation Center Intern - \$5,000.
3. Kentucky Transportation Center Equivalent Axleload Processing - \$40,000.
4. Other office expenses --\$500.

**CHAPTER 21:** Statewide Traffic Model

**RESPONSIBLE UNIT:** Division of Multimodal Programs  
Urban Planning Branch

**PURPOSE AND SCOPE:** To update and maintain the Statewide Traffic Model (KySTM). To collect data on vehicular movement on the highway system through origin-destination surveys. Process and assemble data to aid in determining travel desires for the location of new routes, relocation of existing routes, decisions between alternate route improvements, or as input into KySTM.

**PROPOSED ACTIVITIES FOR 2003-2004:**

- Oversee and update the statewide traffic model by consultant forces.
- Use upgraded model for corridor studies, air quality conformity, and special requests.
- This chapter provides for the coding and processing of data for a few O-D surveys to be made upon request or as needed on a project by project basis.
- Incorporate NPTS (National Personal Transportation Survey) data and Census 2000 data in the appropriate models.
- Use KySTM to develop sub-area studies on a county-wide basis for air quality analysis.

**DISTRIBUTION OF ESTIMATED COST FOR 2003-2004**

	<b>MULTIMODAL PROGRAMS</b>	<b>TOTAL</b>
<b>PERSONNEL</b>	<b>\$29,400</b>	<b>\$29,400</b>
<b>OTHER</b>	<b>*\$110,100</b>	<b>\$110,100</b>
<b>TOTAL</b>	<b>\$139,500</b>	<b>\$139,500</b>

\*Includes \$50,000 for STM maintenance by consultant and \$60,000 for KTC Research Study and intern services. Other expenses --\$100.



# **RESEARCH AND DEVELOPMENT**

**KENTUCKY PLANNING AND RESEARCH PROJECT  
WORK PROGRAM--PART II  
FISCAL YEAR 2004**

<b>LINE ITEM NO.</b>	<b>STATE STUDY NO.</b>	<b>STUDY TITLE</b>	<b>PRINCIPAL INVESTIGATOR</b>	<b>ESTIMATED COST FY 2004</b>
1	04-50	General Administration	Toussaint	\$249,200
2	04-56	Unforeseen Investigations	Toussaint	233,000 <sup>1</sup>
3.	85-107	Long-Term Monitoring of Experimental Features	Toussaint	90,000
4	00-206	Seismic Evaluation of the I-24 Corridor for Moderate Seismic Events	Harik	36,000
5	00-210	Environmental Commitment Follow-up	Hopwood	27,400 <sup>1</sup>
6	01-225	Case Study of 4f Litigation and Rulings	Hopwood	14,100 <sup>1</sup>
7	01-228	Reduction of Stresses on Buried Rigid Highway Structures Using the Imperfect Ditch Method and Expanded Polystyrene (Geofoam)	Hopkins	90,800 <sup>1</sup>
8	01-229	Resilient Modulus of Compacted, Crushed Stone Aggregate Bases	Hopkins	67,500
9	01-234	Earthquake Response Training and Assessment of Future Earthquake Study Needs in Western Kentucky	Harik	49,500
10	02-238	Bearing Capacity Analysis and Design of Highway Base Materials Reinforced with Geofabrics	Hopkins	58,500
11	02-239	Corrosion Evaluation of Mechanical Stabilized Earth Walls	Hopkins	45,000
12	02-242	Analysis of Procurement Processes and Development of Recommendations for ITS Procurements	Crabtree	20,000 <sup>1</sup>
13	02-243	Evaluation of Current Incentive/Disincentive Procedures in Construction	Allen	67,500
14	02-244	Evaluation of NDT and Geo-Physical Techniques	Allen	112,000 <sup>1</sup>
15	02-245	Evaluation of Aggregate Segregation on Pavement Performance	Allen	45,000
16	02-246	Seismic Evaluation of the Parkways in Western Ky	Harik	40,500
17	02-251	Access Management Guidelines	Pigman	67,500
18	03-257	Effect of Pavement Resurfacing on Traffic Safety	Pigman	100,000 <sup>1</sup>
19	03-258	Traffic Crashes and Control at Intersections	Pigman	112,500
20	03-259	Effect of Warning Signs on Operating Speeds	Stamatiadis	74,000 <sup>1</sup>
21	03-260	Implementation of Remote Sensing Technology	Harik	51,000 <sup>1</sup>
22	03-261	Multi-Barge Flotillas Impact Forces on Bridges	Harik	45,000
23	03-263	Kentucky Highway User Survey	Grossardt	54,000 <sup>1</sup>
24	03-264	State TVS Count Estimation Process	Grossardt	18,000
25	03-265	Evaluation of the Pavement Management System and Maintenance Rating Systems	Allen	81,000
26	03-266	Utilization of Pavement Profiling Equipment to Determine As-built Transverse and Longitudinal Profiles of Existing Highways	Allen	130,000 <sup>1</sup>
27	03-267	Development of a Pavement Distress Identification Manual	Allen	45,000
28	03-268	Safety and Health Concerns for KyTC and Contractor Personnel	Hopwood	54,000
29	03-270	Engineering Properties of the Soft Soil Layer at the Top of Highway Soil Subgrades	Hopkins	81,000

LINE ITEM NO.	STATE STUDY NO.	STUDY TITLE	PRINCIPAL INVESTIGATOR	ESTIMATED COST FY 2004
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**PROPOSED NEW STUDIES**

30	04-271	Requirements Document for Payout Schedule	Grossardt	22,500
31	04-272	Developing A Database of Materials, Design, Construction, and Experimental Techniques of Pavements	Allen	67,500
32	04-273	Evaluation and Implementation Issues for the 2002 Pavement Design Guide	Allen	67,500
33	04-274	Best Management Practices for Erosion Control	Hopwood	45,000
34	04-275	Implementation, Maintenance, and Full Development of the Kentucky Geotechnical Database	Hopkins	45,000
35	04-276	Usage of GPS Technology for Traffic Crash Location	Pigman	67,500
36	04-277	Evaluation of Auto Incident Recording System	Pigman	45,000
37	04-278	Highway Cost Allocation Analysis	Pigman	58,500
38	04-279	Develop an Archived Data Management System Prototype	Crabtree/Chen	90,000
39	04-280	Evaluate Methods to Limit the Time to Investigate Crash Sites	Crabtree	67,500
40	04-281	Testing and Calibration of the Bridge Management System	Harik	45,000
41	04-282	Impact of Outsourcing KyTC Project Services	Hancher	54,000
42	04-283	Innovative Rapid Construction Methods	Hancher	36,000

**REVISED PROGRAM TOTAL**      \$2,870,000

<sup>1</sup> Includes FY03 Carryover Funds

**Carryovers:**

P56 - \$80,000	P257 - \$32,500
P210 - \$27,400	P259 - \$20,000
P225 - \$14,100	P260 - \$15,000
P228 - \$35,000	P263 - \$54,000
P242 - \$20,000	P266 - \$40,000
P244 - \$40,000	

**Underruns:**

P236 - \$ 1,000
P241 - \$20,000
P262 - \$ 1,000

Total Approved Carryover \$400,000

Note: Items 2 through 42 do not include 10% set aside for general administrative purposes in item 1; however, they do include 30% university overhead.

**GENERAL ADMINISTRATION  
KYSR 04-50**

The general administrative costs associated with payroll distribution, personnel actions, accounts, receptionist, office equipment, and preparation of line items, proposals, and detailed work plans are combined in this section inasmuch as a pro rata apportionment of time and other accountable costs among the several studies would be impractical from the standpoint of accounting.

**PROGRAMMED COST FY 2004:**

\$249,200

**UNFORESEEN INVESTIGATIONS**  
**KYSPR 04-56**

**OBJECTIVE:** To conduct, upon request, impromptu investigations and analyses, and provide quick response to requests for short-term investigations or evaluations.

**BACKGROUND:** Frequently, Kentucky Transportation Center investigators are called upon to conduct impromptu investigations for the evaluation of materials' performances, construction procedures, analyses of failures, and other related features of highway design, construction, and maintenance. These investigations vary in complexity and nature, depending upon the situation and information desired. Most frequently, the investigations serve as a means of providing a tentative solution or analysis for immediate problems. In some cases, a full-scale study may result from what initially began as a minor investigation. These impromptu investigations serve a vital function through provision of an immediate report relative to a particular problem.

As technology advances and industry expands, there is an ever increasing number of new products that become available for potential use in highway construction or maintenance. Some of those products may be used under current specifications or special provisions. Others may not be covered, and it is essential that such products be evaluated prior to widespread use.

Pavement blowups, deck slab failures, landslides, culvert collapses, etc. are all causes for immediate concern. In such cases, quick remedial actions are necessary to protect motorists from potentially dangerous situations and for restoration of services. Hurried stop-gap repairs may be effected. Later, investigations of distresses are used in determining the causes of failures and provide information for development of more permanent solutions. Information gained during these investigations also may provide useful evidence leading to recommendations for design, construction, or maintenance guideline changes. Occurrences of problems may prove beneficial in the event adequate investigations or evaluations are undertaken and solutions evolve. Cost-effective preventative countermeasures may later be adopted for routine use. The benefit-cost ratios for those investigations may often be unusually high.

**PROGRAMMED COST FY 2004:** \$233,000

**LONG-TERM MONITORING OF EXPERIMENTAL FEATURES  
KYSPR 85-107**

Continuation of an Approved Study  
Work Plan Submitted July 18, 1984; Approved December 3, 1984  
Anticipated Completion Date: Continuing

**OBJECTIVE:** To provide a procedure for long-term monitoring and reporting of experimental design, construction, or maintenance features utilized in transportation facilities.

**BACKGROUND:** As technology advances, there is a continually increasing number of somewhat unique or innovative approaches used as experimental features in transportation design, construction, or maintenance phases. Provisions are generally made for short-term evaluations of experimental features; however, most formal studies or projects are frequently finalized in rather nominal time periods and no provisions are made for long-term evaluations. Long-term evaluations provide significant information at relatively nominal costs.

**FY 2004 PROPOSED WORK:** Field inspections and data analyses will continue. Additional projects containing experimental features will be scheduled for monitoring as they evolve. Monitoring of projects presently included under this study will continue.

**PROGRAMMED COST FY 2004:** \$90,000

**TOTAL ESTIMATED COST:** Continuing

**SEISMIC EVALUATION OF THE I-24 CORRIDOR  
FOR MODERATE SEISMIC EVENTS  
KYSPR 00-206**

Continuation of an Approved Study  
Work Plan Submitted July 1999; Approved August 1999  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** The objective of this study is to conduct a seismic evaluation of bridges, and their corresponding approaches and embankments, on and/or over I-24 in Kentucky. With the exception of the I-24 bridge at Cumberland River crossing, and the I-24 bridge at Tennessee River crossing, which will be evaluated for 250-years and 500-years events, all other bridges on/and over the I-24 corridor are to be evaluated for 50-years and 250-years events. During a 50-year event, the bridges are to remain in the elastic range without any disruption to traffic. During a 250-year event, partial damage will be permitted on the bridges; however, they are to remain accessible to emergency and official vehicles. The expected benefit of this study is to mitigate partial or total collapse of bridges along the I-24 corridor as a result of a moderate seismic event, and to identify roadway embankments anticipated to require rapid rehabilitation to restore the functional utility of the corridor after a seismic event.

**BACKGROUND:** Bridges, their corresponding approaches and embankments, along the I-24 corridor have not been evaluated for a seismic event along the New Madrid seismic zone. Due to the potential economic impact on the western part of the Commonwealth, a seismic evaluation for a 250-years seismic event is essential for determining the seismic vulnerability of the corridor. A 250-years seismic event is defined as an event with a 10% probability of being exceeded in 250 years, or a seismic event with a 90% probability of occurrence in the next 2,500 years.

**FY 2003 ACCOMPLISHMENTS:** (1) Prioritization of the seismic evaluation was completed; (2) Preliminary seismic evaluation of the I-24 bridges in all counties was completed, (3) Modeling and evaluation of the Cumberland River and Tennessee River bridges was completed; (4) Detailed evaluation of twelve critical bridges was initiated; and (5) The drafting of six reports for the study was initiated.

**FY 2004 PROPOSED WORK:** (1) Complete the detailed seismic evaluation of twelve critical bridges on and over I-24; and (2) Complete the final draft of the reports for the study.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$273,500
<b>PROGRAMMED COST FY 2004:</b>	\$36,000
<b>TOTAL ESTIMATED COST:<sup>1</sup></b>	\$320,000

<sup>1</sup> Original estimate \$180,000 (revised by SAC)

**ENVIRONMENTAL COMMITMENT FOLLOW-UP  
KYSR 00-210**

Continuation of an Approved Study  
Work Plan Submitted August 25, 1999; Approval Pending  
Anticipated Completion Date FY 2004

**OBJECTIVES:** This study will provide a needed review of several recent projects to assess the effectiveness of KyTC initiatives in promoting the implementation of environmental commitments. Both state and federally funded projects will be reviewed to ascertain that funding sources/permitting issues did not play significant roles in determining the extent of follow-through on environmental commitments. Not only will the environmental commitments be reviewed for initial enactment, but also for follow-through with commitments requiring continuing actions/monitoring and for stakeholder satisfaction with the measures that were implemented. Determinations will be made on environmental commitments that arose or were altered due to situations encountered during construction. Differences in implementation of environmental commitments between state and federally funded projects will be assessed.

**BACKGROUND:** In recent years, KyTC has responded effectively to impacts on its operations brought about by environmental statutes and regulations. KyTC officials are cognizant of the issues related to compliance with environmental mitigation commitments and are working diligently to resolve any problems that might arise. A gradual shift is occurring within KyTC toward adopting a more proactive stance to ensure in-house environmental sensitivity and gain public support. KyTC officials have emphasized follow-through on environmental commitments as a major element in obtaining better rapport with both resource agencies and the public. KyTC officials have made significant efforts to ensure that environmental commitments were properly implemented on all projects. The need exists to review completed projects to assess how well those KyTC initiatives have translated into effective implementation of environmental commitments made throughout those projects and to identify steps that could be taken to improve their institution. The assessment methods and metrics developed under this study will provide the basis for a more in-depth review in the future.

**REPORT ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** Work began on reviewing environmental commitments on several projects selected by the Study Advisory Committee.

**FY 2004 PROPOSED WORK:** KyTC officials will identify several recent projects that reflect the current emphasis on follow-through of environmental commitments. KTC researchers will identify environmental commitment procedures in place during those projects. KTC researchers will conduct investigations of those projects to assess KyTC implementation. They will obtain all environmental review/permitting documentation and will interview key KyTC personnel to ascertain all environmental commitments on those projects, when and how those were obtained, and any problems related to their implementation and continuation. KTC researchers will conduct site audits to review the completed projects and determine the extent of implementation of environmental commitments, any problems/defects and effectiveness of follow-on (maintenance) work. They will interview project stakeholders (e.g. local governments, resource agencies, interest groups and individuals) to determine their level of satisfaction with KyTC implementation of environmental commitments. A final report will be prepared outlining the research process, documenting findings, providing a rational procedure for future evaluations of environmental commitments and recommendations for resolving any problems that might exist.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$88,500
<b>PROGRAMMED COST FOR FY 2004:</b>	\$27,400
<b>TOTAL ESTIMATED COST:<sup>1</sup></b>	\$112,000

<sup>1</sup> Original estimate was \$108,000



**CASE STUDY OF 4f LITIGATION AND RULINGS  
KYSR 01-225**

Continuation of an Approved Study  
Work Plan Submitted September 27, 2000; Approved August 2002  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** KTC will review recent/significant literature on 4f litigation and court rulings impacting KyTC and other transportation agencies. This will include review of specific claims against the FHWA, case circumstances, resulting court rulings and ensuing project impacts. Based upon this review and a literature review of related documents, identify the actions the Cabinet should consider to provide complete, effective 4(f) documentation, promote stakeholder/official consensus on 4(f) decisions, and preclude/limit the potential for litigation. A focus of those actions will center on evaluation of alternatives to determine whether they are "feasible and prudent"; whether they would not address transportation problems; or they would result in substantial adverse social, environmental, or economic impacts when weighed against 4(f) takings and impairments. Another focus would be on actions to identify mitigation measures to minimize harm from 4(f) takings or impairment.

**BACKGROUND:** Section 4(f) of the 1966 DOT Act (and its antecedents) places severe restrictions on the use of federal funds to impact public/wildlife/historic properties for transportation projects. The intent of that law is clearly to limit/prevent proposed projects from impacting those properties. Proposed projects that do not directly impact 4f properties, but whose proximity constitutes "constructive use" are also subject to 4f restrictions by reason of substantial impairment. Federal, state or local officials may designate impacted properties and a determination of major purpose is key to determining whether Section 4(f) applies. Project impacts on 4f properties are allowed where "no prudent and feasible" alternative exists and where minimization mitigation actions are employed. Since the promulgation of the 1966 DOT Act, the law has been rewritten and courts have provided increasingly lenient rulings allowing highway agencies to impact some 4f properties.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** A draft reference document was prepared for assisting KyTC personnel in addressing projects that contain potential 4f issues. This reference document will serve as the primary deliverable under this study and will be appended in the study final report. It was provided to the Study Advisory Committee for review and comment

**FY 2004 PROPOSED WORK:** The 4f reference document will be revised as required by the Study Advisory Committee. A final report containing the revised reference document will be prepared for distribution to KyTC.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$85,000
<b>PROGRAMMED COST FY 2004:</b>	\$14,100
<b>TOTAL ESTIMATED COST: <sup>1</sup></b>	\$100,800

<sup>1</sup> Original estimate was \$67,500

**REDUCTION OF STRESSES ON BURIED RIGID HIGHWAY STRUCTURES  
USING THE IMPERFECT DITCH METHOD AND EXPANDED  
POLYSTYRENE (GEOFOAM)  
KYSR 01-228**

Continuation of an Approved Study  
Work Plan Submitted September 2000; Approved September 2000  
Anticipated Completion Date: FY 2005<sup>2</sup>

**OBJECTIVES:** The objective of this study is to examine the use of expanded polystyrene (geofoam) and the imperfect ditch method for reducing the vertical stresses on rigid buried highway structures, such as pipes and culverts.

**BACKGROUND:** Construction of highway embankments above highway pipes and culverts has great practical significance because of the stresses imposed by the fill on the buried structure. Relative stiffnesses of the culvert and soil control the magnitude and distribution of earth pressure on the buried structure. The vertical earth pressure on a flexible culvert is less than the weight of the soil about the culvert due to positive arching. However, the vertical earth pressure on a rigid culvert, or pipe, is greater than the weight of the soil above the structure because of negative arching. Experiments have shown that the loads on rigid embankment culverts were some 90 to 95 percent greater than the weight of the soil directly above the structure. In model tests performed by Hoeg (1968), the crown pressure was about 1.5 times the applied surcharge. Penman et al. (1975) measured the earth pressure on a rigid reinforced concrete earth pressure below 174 feet of rock fill and found that the vertical earth pressure on the culvert crown was about 2 times the overburden stress due to the fill above the top of the culvert. To avoid high stresses on rigid buried structures, the imperfect trench, or induced, ditch method of construction was invented. The imperfect trench method involves installing a compressible layer above the culvert within the backfill. Traditionally, such compressible materials as baled straw, leaves, old tires (used in France), or compressible soil, have been used. As the embankment is constructed, the soft zone compresses more than the surrounding fill. This process induces positive arching which reduces the stresses on the buried structure.

**FY 2003 ACCOMPLISHMENTS:** A potential culvert construction site was identified for constructing the imperfect trench method and backfilling with geofoam. Construction is scheduled for Sept. 2003. An additional software program, FLAC, was purchased to analyze stress distribution on structures. Several analyses were performed at the proposed site using different thicknesses, widths, and elevations of geofoam above the culvert. The preliminary analyses show that the stresses acting on a rigid culvert (unyielding foundation) can be reduced considerably using the imperfect ditch method.

**FY 2004 PROPOSED WORK:** In collaboration with the Kentucky Transportation Cabinet, the potential site will be instrumented and stresses monitored during and after construction. Other culverts may be analyzed. Finite element analyses will be performed to determine the optimum shape of the geofoam filled trench.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$135,000
<b>PROGRAMMED COST FY 2004:</b>	\$90,800
<b>TOTAL ESTIMATED COST:</b>	\$267,000

<sup>2</sup> KTC Director extended two years

**RESILIENT MODULUS OF COMPACTED, CRUSHED STONE  
AGGREGATE BASES  
KYSPR 01-229**

Continuation of an Approved Study  
Work Plan Submitted September 2002; Approved September 2002  
Anticipated Completion Date: FY 2005<sup>2</sup>

**OBJECTIVES:** The objective of this study is to determine the resilient modulus of compacted, crushed stone aggregate bases used in highway pavements in Kentucky.

**BACKGROUND:** In July 1993, FHWA performed a process review of the Kentucky Transportation Cabinet's procedure for pavement design. FHWA found the Cabinet's procedures to be in accordance with past experience and knowledge. However, the most significant concern that FHWA had "was the possible lack of a geotechnical study on a project due to inadequate design time for sampling and testing." FHWA recommended "that an in-depth assessment be made of the most appropriate strength test to accommodate Kentucky's future needs and that resilient modulus testing be given consideration for informational design values, evaluation of other research efforts, and keeping up with state-of-the-art practices."

The trend in designing highway pavements in recent years consists of using mechanistic models based on the theory of elasticity or linear or nonlinear finite elements. In these approaches, the coefficients of pavement layers, as proposed by the AASHTO (1960) Road Test Design Guide, are replaced by elastic moduli. The 1986 and 1993 AASHTO Pavement Design Manuals suggest using resilient modulus in place of the soil support value. The guides also suggest using correlations to determine resilient modulus because testing is complex and time consuming. Resilient modulus testing is difficult on a production basis. Also, the Kentucky Transportation Cabinet and consultants, who perform design work for the Cabinet, are not currently equipped to perform resilient modulus tests. Hence, relationships between resilient modulus of different aggregate bases are needed to design pavements in Kentucky using mechanistic models.

Over the past four years, the geotechnical section of the Kentucky Transportation Center has been performing numerous resilient modulus tests on Kentucky soils. The necessary equipment was purchased some four years ago. With slight modification and an additional chamber, resilient modulus of aggregates could be performed using this existing equipment.

**FY 2003 ACCOMPLISHMENTS:** Tests were performed on several types of aggregate base materials. Some samples were collected from aggregate producers. Samples tested were submitted by the KyTC Division of Materials. Several pavement resilient modulus models were evaluated. A new model is being developed to overcome deficiencies in current models.

**FY 2004 PROPOSED WORK:** Testing of various base aggregates will continue. Work will continue on developing a model to use resilient modulus values in pavement design. Existing pavement models will be analyzed.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$99,300
<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COST:</b>	\$162,000

<sup>2</sup> KTC Director extended one year

**EARTHQUAKE RESPONSE TRAINING AND ASSESSMENT OF FUTURE  
EARTHQUAKE STUDY NEEDS IN WESTERN KENTUCKY  
KYSR 01-234**

Continuation of an Approved Study  
Work Plan Submitted May 2000; Approved June 2000  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The primary objectives of this study are: (1) to develop a training and information manual for post earthquake investigation and evaluation of Kentucky's highway infrastructure (bridges, embankments, dams, retaining walls, etc.); (2) to conduct workshops and offer training sessions and hands on experience for post earthquake response to engineers in the Kentucky Transportation Cabinet and to district engineers in each of the twelve districts in Kentucky; (3) to coordinate efforts with the Division of Disaster and Emergency Services of the Department of Military affairs, and with the Departments of Transportation in Tennessee, Missouri, Illinois, and Indiana; and (4) to assess and prioritize future earthquake study needs for Western Kentucky.

**BACKGROUND:** From the early 1980s to the early 1990s, and under the guidance and leadership of the Division of Disaster and Emergency Services of the Department of Military affairs, various state and public agencies joined efforts to prepare for responding to various natural disasters in Kentucky (e.g., flooding, earthquakes, etc.). For earthquake preparedness, the Kentucky Society of Professional Engineers took the lead in recruiting engineers and offering training sessions for inspection of buildings and bridges following an earthquake. The majority of the engineers were volunteers from the private practice. Participation in the earthquake response effort was large and active at first. At present, there is no activity in the area of post earthquake response, and in case of a major seismic event, the Transportation Cabinet and the state will not be able to provide adequate response. In addition, a detailed assessment of future earthquake study needs in Western Kentucky will effectively allocate the limited financial resources.

**FY 2003 ACCOMPLISHMENTS:** Work continued on the development of instruction manuals for post earthquake response training and evaluation.

**FY 2004 PROPOSED WORK:** Work will continue on the development of the instruction manuals for post earthquake response.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$219,500
<b>PROGRAMMED COST FY 2004:</b>	\$49,500
<b>TOTAL ESTIMATED COST:</b>	\$270,000

**BEARING CAPACITY ANALYSIS AND DESIGN OF HIGHWAY BASE MATERIALS  
REINFORCED WITH GEOFABRICS  
KYSR 02-238**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved July 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The primary objective of this study is to develop and implement a mathematical bearing capacity model for analyzing and designing highway bases and flexible pavements reinforced with polymer geogrids or geotextiles.

**BACKGROUND:** Chemical stabilization is often used to improve the bearing capacity of soft soil subgrades. Improvement of the subgrade ultimately improves performance. There are circumstances when chemical stabilization cannot be used because of temperature constraints (chemical stabilization is not recommended when the temperature is below 45° F). Also, a curing time is required for chemical stabilization that is not practical in areas where traffic must be rerouted immediately onto the partially completed pavement. Geofabrics are often used when chemical stabilization is not an option. Geofabrics are used in conjunction with aggregate bases. However, the thickness of aggregate required to support traffic (including construction traffic) is unknown. A reliable design approach is needed to determine when to use aggregates and geofabrics and how much aggregate thickness is required. The thickness required is not constant; it varies with traffic loadings, type of geofabric, and soil strength. Bearing capacity models, which are based on limit equilibrium concepts, can be used to evaluate the stability of aggregate bases reinforced with geosynthetics.

**FY 2003 ACCOMPLISHMENTS:** A windows-based computer program was developed for analyzing highway bases and flexible pavements reinforced with geotextiles. Graphical user interfaces were developed for entering and retrieving data. A procedure was developed which allowed combining newly developed graphical user interface screens for data entry and old theoretical limiting equilibrium models and old computer programs originally developed using Fortran IV (Dos programs). The graphical user interfaces were written using PowerBuilder 8.0.

**FY 2004 PROPOSED WORK:** Attention will focus on evaluating the newly developed windows program and theoretical model by solving numerous problems. Results obtained from the new program of pavement sections without geotextiles will be compared to pavements containing geotextiles. Results obtained from the newly developed program will be compared to other methods proposed by others. An actual field problem will be analyzed provided a site(s) can be identified. To make the new program widely accessible, it will be added to the "Applications" section of the Kentucky Geotechnical Database, which is accessible to district and central offices of the Kentucky Transportation Cabinet.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$110,900
<b>PROGRAMMED COST FY 2004:</b>	\$58,500
<b>TOTAL ESTIMATED COST:</b>	\$175,500

**CORROSION EVALUATION OF MECHANICALLY STABILIZED EARTH WALLS**  
**KYSPR 02-239**

Continuation of an Approved Study  
Work Plan Submitted September 2001; Approved October 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The primary objectives of this study are to monitor mechanically stabilized earth (MSE) walls to determine the long-term deterioration of the reinforcing elements, monitor wall stability, and to build a computer-based system for managing initial and long-term wall data.

**BACKGROUND:** Retaining walls are frequently used to stabilize earth slopes. Walls are typically used when right of way constraints prevent construction of soil or rock slopes. Retaining walls require less space than slopes, but are more expensive. Mechanically stabilized earth walls and slopes are widely used in highway design and construction. These walls are constructed with interlocking panels supported by horizontal reinforcing strips attached to the panels, or by attaching reinforcing strips to timbers or concrete facing materials. The strips are placed in select backfill (usually granular) behind the wall. The most commonly used type of reinforcing strip is galvanized metal in a strip or grid configuration. Walls with galvanized metal strips have been widely used since the late 1970's. The long-term durability of the reinforcing materials is a major concern for MSE walls and slopes because of suspected corrosion or degradation due to chemical and other actions in a soil-water environment. More recent applications have used polymer type reinforcing strips. Some walls are constructed with polymer type reinforcing elements by wrapping geofabrics around the backfill to form the face of the wall. The long-term effects on polymer type reinforcing elements are also unknown.

**FY 2003 ACCOMPLISHMENTS:** Personnel with the FHWA provided training using corrosion monitoring equipment. Attributes of MSE walls located on Kentucky highway routes were obtained. Attributes obtained included height, length, function (retaining wall, bridge abutment, etc.), overall condition, and location were noted using mapping grade Global Positioning System equipment. A database was developed in a client-server environment to store all wall attributes.

**FY 2004 PROPOSED WORK:** An inventory of MSE walls located on Kentucky highway routes will continue. Refinement of the database will continue including a risk analysis feature. A few selected walls will be instrumented and corrosion rates obtained if the equipment is available from FHWA.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$76,200
<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$175,500

**ANALYSIS OF PROCUREMENT PROCESSES AND  
DEVELOPMENT OF RECOMMENDATIONS FOR  
INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PROCUREMENTS  
KYSPR-02-242**

Continuation of an Approved Study  
Work Plan Submitted June 28, 2001; Approved August 6, 2002  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To analyze Kentucky's existing procurement processes, identify strengths and weaknesses of each, and develop recommendations for a revised process that will incorporate the best features of each existing process and meet the unique requirements of ITS procurements.

**BACKGROUND:** ITS deployments present many challenges, not least of which is the difficulty in procuring ITS equipment and services. Traditional procurement processes were designed for highway construction projects, and they are usually intended to purchase a specified, standard item at the lowest possible cost. Traditional processes are often cumbersome and slow, requiring substantial lead times and providing little flexibility. This can be a major impediment to ITS procurements, where technologies are new and rapidly changing, and where specifications and standards may not exist. ITS procurements require speed, flexibility, and much cooperation between the public agency and the contractor. ITS procurements may involve multiple agencies and cross jurisdictional boundaries. As a result, traditional procurement processes can create frustration and inefficiency when they are used for ITS procurements.

The Kentucky Transportation Cabinet currently has four different procurement processes available for different types of procurements. Each process has advantages and disadvantages, but no single process is well-suited to ITS procurements.

**FY 2003 ACCOMPLISHMENTS:** The analysis of existing procurement processes was continued, focusing on identifying the strengths and weaknesses of each process. The key attributes of the "ideal" procurement process were identified and described. An assessment of legislative and regulatory issues was begun.

**FY 2004 PROPOSED WORK:** The legislative and regulatory assessment will be completed. Based on this analysis, specific recommendations will be developed for implementing the best possible procurement process (or processes) for ITS. These recommendations will be included in a final report.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$62,600
<b>PROGRAMMED COST FY 2004:</b>	\$20,000
<b>TOTAL ESTIMATED COST:</b>	\$76,500

**EVALUATION OF CURRENT INCENTIVE/DISINCENTIVE PROCEDURES  
IN CONSTRUCTION  
KYSR-02-243**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved July 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** 1) To review current incentive/disincentive programs in Kentucky for highway construction projects. 2) To review other state DOT's incentive/disincentive programs for highway construction projects. 3) To identify project completion incentives/disincentives based on either lane rental, and/or road user costs generated from life-cycle cost analysis in pavement design. 4) To determine project quality incentives/disincentives based on material characteristics/performance data, i.e.: densities, percent air voids, pavement thickness, rideability, etc. 5) To develop a computer model to optimize incentives/disincentives of highway construction projects based on both project completion and quality of construction.

**BACKGROUND:** In almost every highway construction project undertaken in Kentucky, the users of the facility will incur some type of economic burden during and possibly after the construction phase. Predominately the main associated cost will be linked to construction delays. However, users can experience long term economic burdens if quality standards were neglected during construction. This occurs mostly when transportation facilities deteriorate at an accelerated rate due to inferior products or constructions means, thus increasing future maintenance efforts. Therefore, in almost any highway construction project there should be a system in place to identify incentives/disincentives for project completion and quality of construction for those performing the work. The most common forms of incentives/disincentives for highway construction projects are evaluated in terms of dollars. In efforts to enhance overall quality of highway construction projects and minimize user delay costs, this report will try to develop a model that will be used to balance project completion incentives/disincentives and project quality incentives/disincentives.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** A review of the procedures used to determine time incentives/disincentives and lane rental fees has been initiated. The review of the procedures used by other agencies has also been initiated.

**FY 2004 PROPOSED WORK:** Work will begin on project quality incentives/disincentives that are based on material characteristics and/or performance data, i.e., densities, percent air voids, pavement thickness, rideability, etc.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$130,800
<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COSTS:</b>	\$202,500



**EVALUATION OF NDT AND GEO-PHYSICAL TECHNIQUES  
KYSR-02-244**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved July 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** 1) To review NDT and geophysical techniques (resistivity, conductivity, micro gravity, ground penetrating radar, seismic reflection/refraction, cross hole tomography, electromagnetic, and etc.) currently being used by other DOTs and other agencies, 2) Determine the NDT and geophysical methods and equipment to be utilized in test projects for the Kentucky Transportation Cabinet, 3) Evaluate test projects and consultants utilizing various NDT and geophysical techniques and compile results, 4) Determine the benefit/cost of each method utilized, and 5) Develop draft specifications for the potential use of NDT and geophysical methods by the Transportation Cabinet.

**BACKGROUND:** Many states throughout the country have been using NDT and geophysical techniques to assist in the design, construction, and maintenance of their transportation systems for decades. Various techniques have been successfully utilized to identify potential collapse zones in karst terrain, locate voids under pavements and bridge approaches, identify in-filled scour pockets around bridge foundations, and for a number of other transportation related applications.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** The review of the RFP's has been completed, and the selected contractor has completed the initial field work. These results are currently being reviewed by both Center and Transportation Cabinet Personnel.

**FY 2004 PROPOSED WORK:** The review of the completed project by the contractor will be continued. Once these reviews have been completed, guidelines for evaluating the field projects and the geophysical methods will be developed and approved by the committee.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$136,000
<b>PROGRAMMED COST FY 2004:</b>	\$112,000
<b>TOTAL ESTIMATED COST:</b>	\$247,500

**EVALUATION OF AGGREGATE SEGREGATION ON  
PAVEMENT PERFORMANCE  
KYSR-02-245**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved July 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** 1) Review segregation specifications used by other transportation agencies and review current research being conducted on segregation, 2) Evaluate state-of-the-art technology (infrared camera, photo-imaging, ground penetrating radar, ROSAN) for identifying and measuring segregation, 3) Determine the major causes of thermal segregation, and 4) Evaluate the effects of both thermal and aggregate segregation on pavement performance.

**BACKGROUND:** For decades transportation agencies have been aware of aggregate segregation. Recently, thermal segregation has been added to the list of problems in hot mix pavements. Equipment such as remixing pavers and load transfer devices have reduced the amount of segregation. Although equipment changes have helped reduce this problem, it is still a cause for concern, and little is known about the long-term effects that it has on pavement performance.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** Additional field projects have been identified for analysis during the 2003 construction season. Reviews of several methodologies for measurement of segregation have begun. Preliminary testing of infrared cameras was tried to identify areas of thermal segregation. Reviews of other agency guidelines and specifications has also begun.

**FY 2004 PROPOSED WORK:** Methodologies which have been identified will be further reviewed on selected construction projects during the 2003 construction season. Once these methods have been reviewed, guidelines for implementation will be developed.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$174,000
<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$216,000

**SEISMIC EVALUATION OF THE PARKWAYS  
IN WESTERN KENTUCKY  
KYSR 02-246**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved August 2001  
Anticipated Completion Date: FY 2006

**OBJECTIVES:** The objective of this study is to conduct a seismic evaluation of the bridges on and/or over the Parkways in Western Kentucky.

**TASKS:** The following tasks will be carried out on bridges on and over the Parkways in Western Kentucky:

**A- Field Inspection:** Conduct field inspection of bridges, their approaches and embankments along the Parkways, and compare bridge plans with "as built" bridges.

**B- Prioritization:** Prioritize the seismic evaluation of bridges/approaches/embankments, and conduct an evaluation based on a projected moderate seismic event (or 50-year event) along the New Madrid seismic zone.

**C- Retrofit Measures:** Propose retrofit measures as needed.

**BACKGROUND:** Bridges, their corresponding approaches, and embankments on and over the Parkways in Western Kentucky have not been evaluated for a seismic event along the New Madrid seismic zone. Due to the potential economic impact on the western part of the Commonwealth, a seismic evaluation is essential for determining the seismic vulnerability of the corridor.

**EXPECTED BENEFITS:** To mitigate partial or total collapse of bridges along the Parkways in Western Kentucky as a result of a moderate seismic event, and to identify roadway embankments anticipated to require rapid rehabilitation to restore the functional utility of the Parkways after a seismic event.

**FY 2003 ACCOMPLISHMENTS:** Completed 100% of Task A and a total of 50% of Task B.

**FY 2004 PROPOSED WORK:** Complete an additional 30 % of Task B and 30% of Task C.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$97,500
<b>PROGRAMMED COST FY 2004:</b>	\$40,500
<b>TOTAL ESTIMATED COST:</b>	\$405,000

**ACCESS MANAGEMENT GUIDELINES**  
**KYSPR-02-251**

Continuation of an Approved Study  
Work Plan Submitted July 2001; Approved July 2001  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To evaluate the effectiveness of the currently used ad-hoc access control procedures; design and evaluate access control measures for different transport system conditions; and recommend the most effective procedures for access control.

**BACKGROUND:** Balancing transportation needs and land development is a fundamental concept in access management in order to sustain economic growth and maintain a safe and smooth operation of the surrounding road system. To achieve this goal, access management utilizes a series of policies that aim in identifying guidelines and standards for allowable access levels, access spacing criteria, access permit procedures, and means for enforcing these standards. It is not difficult to envision a "major" arterial that has far more intersections and driveways than local roads which would severely restrict flow and alter the functional purpose of the arterial. Improperly located driveways and intersections, excessive traffic signals, insufficient storage areas, and lack of turning lanes or tapers contribute not only to crashes and congestion but they also reduce the capacity of the roadway system and degrade the character area. The lack of a universal approach through access management often leads communities to a continuous investment in roadway improvements that typically follow development and attempt to address the traffic problems after the fact. Effective access management translates into fewer conflict points, lower traffic delays, higher travel speeds, and improved roadway capacity.

**REPORTS ISSUED:** Recommended Guidelines for Access Management in Kentucky

**FY 2003 ACCOMPLISHMENTS:** Literature related to access management practices was reviewed and documented. Existing access management practices in Kentucky were documented as well as KRS and KAR laws and regulations. A classification system and a scheme for access spacing was developed. A draft report was prepared documenting recommended guidelines for access management in Kentucky.

**FY 2004 PROPOSED WORK:** A plan for implementation of previously developed access management guidelines will be developed. Variance and exemptions to recommended guidelines will be developed. A model ordinance for local governments' use of the guidelines will be developed. Access management procedures will be disseminated in the form of a workshop or seminar to KyTC and local personnel. A final report will be prepared documenting guidelines for access management in Kentucky.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$116,400
<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COST:</b>	\$180,000

**EFFECT OF PAVEMENT RESURFACING ON TRAFFIC SAFETY**  
**KYSPR-03-257**

Continuation of an Approved Study  
Work Plan Submitted July 2002; Approved February 2003  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To analyze the before and after crash history, speed, and volumes on routes which have been resurfaced to determine which improvements should be made in conjunction with the resurfacing project to improve the overall safety of the roadway.

**BACKGROUND:** Hundreds of miles of various types of road are resurfaced each year in Kentucky. These projects typically consist of applying an overlay on the existing surface. A review of fatal crashes on two-lane rural roads as part of a previous research study resulted in the conclusion that several of the countermeasures identified in the analysis could be addressed as part of the resurfacing program. Results from that study titled "Countermeasures for Fatal Crashes on Two-Lane Rural Roads" indicated that the most common factor contributing to crashes on these types of roads was failure to stay within the proper lane or running off the road. While a typical resurfacing project on a two-lane rural road cannot be expected to bring the roadway up to the level of a reconstructed roadway, several factors were identified which could be included in resurfacing contracts beyond the placement of pavement overlays to increase safety. Issues to be addressed include analyses to determine the effect of past resurfacing projects and whether the identified countermeasures would have a positive effect on traffic safety at these locations. A more detailed examination of case study sites on two-lane rural roads where resurfacing projects have been completed would permit determination of potential benefits of including various safety improvements as part of resurfacing projects.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** A work plan was approved by the Study Advisory Committee in February 2003. A detailed outline of the data analysis procedures was prepared and presented. Case study sites were identified and preliminary data collection was begun to determine the consequences of resurfacing projects with and without supplemental safety improvements.

**FY 2004 PROPOSED WORK:** The focus of work for the upcoming year will be to finalize selection of case study sites where resurfacing projects have been completed and initiate a data collection effort. Site selection will be influenced by availability of data and inclusion of a range of resurfacing projects in terms of contract amount, highway type, and geographic location. Specific data collection will include crash histories, speeds, volumes, and overall geometric conditions at the case study sites. Analysis will be performed to determine the potential effects of including safety improvements as part of resurfacing projects. Results from the data collection and analysis will be documented as a final report.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$35,000
<b>PROGRAMMED COST FY 2004:</b>	\$100,000
<b>TOTAL ESTIMATED COST:</b>	\$135,000

**TRAFFIC CRASHES AND CONTROL AT INTERSECTIONS**  
**KYSPR-03-258**

Continuation of an Approved Study  
Work Plan Submitted July 2002; Approved November 2002  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The overall objectives of this project are as follows: a) determine average crash rates for various categories of at-grade intersections, b) determine the typical characteristics of crashes at intersections, c) develop a methodology to use to determine intersection traffic control, d) evaluate the effectiveness of U-turns at signalized intersections, and e) evaluate traffic control at stop sign approaches.

**BACKGROUND:** In 1998 through 2000 (excluding interstates and parkways), approximately 35 percent of all traffic crashes and 36 percent of injury and fatal crashes in Kentucky occurred at an intersection. The causes of these crashes vary with most related to driver error. The types of crashes vary with angle crashes the most severe. There is a need to determine average rates and typical characteristics for crashes occurring at intersections in order to analyze high crash intersections. A part of the analysis would be to develop a methodology to determine the intersection traffic control that would be appropriate for the characteristics at specific intersections. This would include an evaluation of new types of traffic control such as the use of U-turns at signalized intersections and a review of traffic control used at specific types of intersections such as stop sign approaches. There is a need to develop more up-to-date information to use to identify high crash intersections and typical characteristics for crashes at intersections. Comparisons of the results of using various traffic control measures can provide useful information when determining the optimum traffic control to use at a specific intersection.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** A work plan was approved by the Study Advisory Committee in November 2002. A literature review was finalized and a report was prepared in draft form to document results of an analysis of traffic control at stop sign approaches. Preliminary data analysis was begun to investigate intersection crashes and develop crash rates for at-grade intersections. Work was accomplished to summarize characteristics of crashes at intersections.

**FY 2004 PROPOSED WORK:** The report on stop sign approaches will be finalized and distributed after receipt of review comments. Additional analyses will be undertaken to complete the analyses to determine crash rates for various categories of at-grade intersections. Comparisons will also be made of the typical characteristics of crashes at intersections as compared to all crashes in Kentucky. Work will begin on the task related to evaluating the effectiveness of U-turns at signalized intersections. A report will be prepared to document analyses of crash rates at intersections and the characteristics of crashes at intersections. A report will be prepared to document results of the U-turn effectiveness task.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$67,500
<b>PROGRAMMED COST FY 2004:</b>	\$112,500
<b>TOTAL ESTIMATED COST:</b>	\$180,000

**EFFECT OF WARNING SIGNS ON OPERATING SPEEDS**  
**KYSPR-03-259**

Continuation of an Approved Study  
Work Plan Submitted July 2002; Approved November 2002  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To identify the operational effectiveness of warning signs on reducing operating speeds on highways.

**BACKGROUND:** Warning signs are typically placed to inform drivers of situations ahead that may require adjustment to their operating speed. Guidelines exist that govern the placement of these signs and certain types are augmented with advisory speed signs or flashing lights to properly communicate the intended warning level to drivers. Warning signs for curvature are such a type of signs, since curves often require an adjustment on operating speeds. There is a suspicion however that these signs are often disregarded and motorists do not reduce their speeds to reflect the intended operating speed. Thus, the effectiveness of such signs is reduced and some times not moderating speeds may lead to a crash. A study that would examine the effectiveness of these signs and identify potential safety concerns is proposed here. The evaluation of speed reductions due to warning signs would allow for the development of guidelines based on the effectiveness of location and warning signs to be used in addition to those presented in the MUTCD. The proposed research will augment existing guidelines for the implementation of warning signs and identify areas where potential improvements can be made by increasing the compliance with the intended operating speed.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** A review of literature was completed and documented in draft form for inclusion in a final report. A data collection plan was developed with input from the Study Advisory Committee. Work was undertaken to identify case study sites for evaluation of speed-altering treatments.

**FY 2004 PROPOSED WORK:** Data collection will be accomplished at several case study sites to evaluate speed-altering treatments. Those treatments tentatively identified for evaluation include; 1) supplementing curve warning signs with flashing beacons, 2) applications of chevrons and large arrow signs, 3) speed advisories painted on the pavement, and 4) rumble strips on the shoulder and centerline as advance warning. Results from the data collection will be analyzed and documented as a final report.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$47,500
<b>PROGRAMMED COST FY 2004:</b>	\$74,000
<b>TOTAL ESTIMATED COST:</b>	\$135,000

**IMPLEMENTATION OF REMOTE SENSING TECHNOLOGY  
KYSR 03-260**

Continuation of an Approved Study  
Work Plan Submitted July 2002; Approved August 2002  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The objective of this study is to demonstrate the capabilities afforded by remote sensing technology on a bridge in Kentucky. For illustrative purposes one or two bridges will be instrumented with strain gauges, LVDTs, temperature gauges, etc. to remotely measure strains, deflections, temperature, etc. The data can be viewed in real time on a web site that, if desired, will require a password for access.

**BACKGROUND:** Availability of inexpensive remote sensing and communications systems enables bridge owners to remotely monitor real time data transmitted from an in-service bridge.

**EXPECTED BENEFITS:** This will be the first bridge that is instrumented for remote sensing in Kentucky. The lessons learned will be instrumental in monitoring of critical bridges in the future (e.g. Maysville and Owensboro cable-stay bridges, Brent-Spence Bridge, etc.)

**FY 2003 ACCOMPLISHMENTS:** The I-64 bridge over US 60 was identified as the candidate bridge and the instrumentation plan has been prepared.

**FY 2004 PROPOSED WORK:** Instrument and monitor the I-64 bridge over US 60.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$12,000
<b>PROGRAMMED COST FY 2004:</b>	\$51,000
<b>TOTAL ESTIMATED COST:</b>	\$63,000



**MULTI-BARGE FLOTILLAS IMPACT FORCES ON BRIDGES**  
**KYSPR 03-261**

Continuation of an Approved Study  
Work Plan Submitted July 2002; Approved August 2002  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** (1) To conduct theoretical finite element analysis on various types of flotillas impacting bridge piers. The flotillas and their barges will be of the type traversing Kentucky's waterways; and (2) To generate design equations for barge/flotilla impact loads.

**BACKGROUND:** On November 22, 1993, two major bridges over the Ohio River were struck by barge flotillas causing one of them to be closed for several days while repairs were completed. This is not an unusual occurrence. According to the Coast Guard reports, hundreds of accidents between flotillas and bridge piers take place every year. For this reason, AASHTO requires that all navigable waterway bridges be designed to resist flotilla impact forces. However, recent studies at the Kentucky Transportation Center have shown that AASHTO accurately predicts impact forces for single barge flotillas while considerably overestimating the multi barge flotilla impact forces, consequently increasing the cost of the substructure by up to 30%. On one bridge alone, savings could be over \$10 million if accurate prediction of flotilla forces are used.

**EXPECTED BENEFITS:** The current AASHTO equations for barge impact loads are based on scale models of barges, and generally predict excessive loads on bridge piers leading to overdesign of the substructure. The results of this study will produce more realistic flotilla impact design loads, leading to savings in the millions of dollars for one bridge over a navigable waterway in Kentucky.

**FY 2003 ACCOMPLISHMENTS:** Generation and evaluation of different nonlinear finite element models for single and multi-barge flotillas was initiated, and comparison with the AASHTO Code.

**FY 2004 PROPOSED WORK:** Generate a simplified model of barge flotillas and generate impact load spectrums for different barge flotillas.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$27,000
<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$126,000

**KENTUCKY HIGHWAY USER SURVEY**  
**KYSPR 03-263**

Continuation of an Approved Study  
Work Plan Submitted February 2003; Approved May 2003  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To survey the Kentucky commercial vehicle motor carrier community in order to determine what services they would like to see offered by Kentucky Motor Vehicle Regulation. Additionally, the survey will focus on the issue of why motor carriers are not using the technologies that are already in place.

**BACKGROUND:** In the past ten years, Kentucky Motor Vehicle Regulation has made improvements within the motor vehicle registration process that have been nationally recognized as being at the forefront of the nation. However, with the successes that the state has had at a national level and at the state level, many motor carriers are still not using the systems that are in place. This survey will help to address areas wherein better services can be offered to the motor carriers.

**FY 2003 ACCOMPLISHMENTS:** A customized survey was prepared for the Department of Vehicle Regulation's commercial vehicle clients. The survey will be administered before the end of the fiscal year in support of the DVR's new effort to expand use of its electronic filing and clearance programs. This is a new cooperative effort between DVR and the Office of Quality, and marks a more focused effort to respond to each segment of the Transportation Cabinet's user base.

**FY 2004 PROPOSED WORK:** A survey for the motor carrier community will be developed in conjunction with Kentucky Motor Vehicle Regulation. The survey will be completed and results compiled within the work period stated.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$13,500
<b>PROGRAMMED COST FY 2004:</b>	\$54,000
<b>TOTAL ESTIMATED COST:</b>	\$67,500

**STATE TVS COUNT ESTIMATION PROCESS**  
**KYSPR 03-264**

Continuation of an Approved Study  
Work Plan Submitted February 2003; Approved May 2003  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The purpose of this project is to research the current state TVS system to determine possible changes in the system that would better reflect the traffic estimation process. In fiscal year 2004, part two of the project will begin. This will focus on development of the new system with application of the research that has taken part in the first year of the project.

**BACKGROUND:** The information that is provided as a result of the TVS system is used statewide for traffic estimation processes. This data is then used by the Transportation Cabinet, districts, and various other organizations and agencies. Therefore, the data provided from the TVS system is fundamental to many derivative applications that rely on the accuracy of the traffic count data.

**FY 2003 ACCOMPLISHMENTS:** During fiscal year 2003 the main focus of the TVS Count Estimation Process Project was on documenting the current system and determining areas within which changes to the system can maximize user benefit. The background work for stage one of the project has been completed as well as recommendations for changes.

**FY 2004 PROPOSED WORK:** The results from research conducted in part one of the project will be implemented into the state TVS system.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$22,500
<b>PROGRAMMED COST FY 2004:</b>	\$18,000
<b>TOTAL ESTIMATED COST:</b>	\$40,500

**EVALUATION OF THE PAVEMENT MANAGEMENT SYSTEM AND  
THE PAVEMENT MAINTENANCE RATING SYSTEMS  
KYSR-03-265**

Continuation of an Approved Study  
Work Plan Submitted October 15, 2002; Approval Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** (1) To evaluate Kentucky's Pavement Management System; (2) To evaluate Kentucky's Pavement Maintenance Rating System; and (3) To attempt to determine if the data in both databases might be made compatible with each other.

**BACKGROUND:** Kentucky has had a pavement management system (PMS) for over 20 years. This system is based on visual inspections that are performed periodically and on roughness measurements. This information is then compiled to yield a composite number identified as rideability index (RI) for each section of the highway network tested. This information is used to determine the condition and the needs of a particular highway network. From this, future funding needs can be estimated. Also, information in the PMS database has been used to assist researchers and designers in developing performance models or estimating remaining life of an existing pavement. As methods of collecting distress and performance data evolve, review of collecting techniques, methods of rating or assigning distress numbers, methods of storing or retrieving data must be reviewed or updated periodically, in order to be able to extract the best information from the data.

Kentucky has used a Pavement Maintenance Rating System for the last several years to assess the methods and efficiency of maintenance activities. This information has also been used to evaluate on a district level the condition of the various components of the highway system. Some of these components include, but are not limited to, such items as guardrail, mowing, drainage systems, signs, various bridge components, paint striping, cut slopes, ditching and some pavement items. This information gives the administrator or policy makers some measure of the overall condition of the highway system.

**REPORTS ISSUED:** None

**FY 2003 ACCOMPLISHMENTS:** An initial review of the new Pavement Management System software was initiated. The review of the Maintenance Rating System has also been initiated, and analysis has begun with regard to the sampling procedures which have been utilized. The review of the performance factors used to calculate the maintenance rating has also been initiated.

**FY 2004 PROPOSED WORK:** The review of the Pavement Maintenance Rating System will continue. Initial recommendations will be developed to enhance the functionality of the system based on the feedback which has been received from the Cabinet. The review of the Pavement Management System will also continue and the requirements for the 2002 Pavement Design Guide will be documented and recommendations will be made regarding changes which might be necessary to collect appropriate data for implementation of the new design guide.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$81,000
<b>PROGRAMMED COST FY 2004:</b>	\$81,000
<b>TOTAL ESTIMATED COST:</b>	\$243,000

**UTILIZATION OF PAVEMENT PROFILING EQUIPMENT TO DETERMINE  
AS-BUILT TRANSVERSE AND LONGITUDINAL PROFILES  
OF EXISTING HIGHWAYS  
KYSR-03-266**

Continuation of an Approved Study  
Work Plan Submitted August 20, 2002; Approval Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** (1) Determine the feasibility of utilizing inertial pavement profiling equipment to determine both transverse and longitudinal profile of existing highways; and (2) Compare these types of surveys with traditional rod and level surveys for determining profile grade and leveling and wedging quantities for pavement construction.

**BACKGROUND:** In rehabilitation and resurfacing of pavements it is necessary to ensure proper longitudinal and transverse grades are maintained. In the establishment of the final grade for a rehabilitation or resurfacing, accurate existing longitudinal and transverse profiles are necessary. Once existing conditions are determined, calculations may be made to determine the quantity of asphaltic concrete leveling and wedging which is necessary to correct any discontinuities. Historically the existing conditions have been determined from as-built plans, low level ariel surveying, or conventional surveying techniques. Each of these methods presents different challenges to the highway designer. Using as-built plans do not allow for the changes in profile which may occur during the life of the roadway surface. Both ariel and conventional surveys can be very costly and dangerous on high volume facilities. In the absence of actual pavement surface surveys, estimates are typically made based on experience with similar projects across the state. For some interstate projects leveling and wedging may cost as much as \$100,000 per lane mile. Therefore, accurate estimation of these quantities is extremely important.

Recent advancements in the Global Positioning System (GPS), inertial vehicle orientation, and laser surface scanning of highway pavements has permitted the determination of longitudinal and transverse highway profiles at highway speeds. This data can then be used to establish the quantities necessary to bring an existing roadway structure to a desired grade. The use of this technology will allow highway designers to produce better estimates of required leveling and wedging requirements on projects; therefore, better utilizing the available funding resources.

**FY 2003 ACCOMPLISHMENTS:** The review of available technologies has begun. Initial contacts have been made to establish potential pilot projects across the state which will be used to demonstrate the available technology.

**FY 2004 PROPOSED WORK:** Pavement profiling of pilot projects will be initiated. In addition, the review of available technologies will continue along with interviews of states which have also begun the use of this type of technology.

<b>PROJECTED COST THROUGH FY 2003</b>	\$50,000
<b>PROGRAMMED COST FY 2004:</b>	\$130,000
<b>TOTAL ESTIMATED COST:</b>	\$180,000

**DEVELOPMENT OF A PAVEMENT DISTRESS IDENTIFICATION MANUAL  
KYSPR-03-267**

Continuation of an Approved Study  
Work Plan Submitted October 15, 2002; Approval Pending  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** (1) Document the types of distresses observed in Kentucky; (2) The establishment of levels of severity and evaluation of extent of each distress will also be documented; (3) This manual will provide photographic examples of each type of distress at several severity levels and extent of occurrence; (4) Evaluate the current method of condition rating in order to determine if changes or modifications should be made to maintain uniform condition rating.

**BACKGROUND:** Pavement management is an integral part of the transportation system. Essential to an effective pavement management system is a uniform method of identifying and quantifying pavement distresses. Kentucky currently does not have a formal documented methodology for quantifying and identifying pavement distresses. A distress manual developed by SHRP does not match the general observed distresses in Kentucky. A distress manual identifying distresses in Kentucky would provide a uniform assessment of pavement conditions throughout the state. By standardizing pavement distress identification, a more uniform evaluation of Kentucky's pavements would be achieved. This manual would allow for calibration of an engineer's pavement distress identification technique. A "calibrated" technique for distress identification will provide a means for consistent comparison of both historical and future pavement performance evaluations. The 2002 Pavement Design Guide currently under development by NCHRP requires inputs relating to specific pavement distress. Information is required regarding both the severity and extent of these distresses based on an agency's past experience. This information is utilized to establish the performance thresholds which are then used for pavement structural design. Therefore, a consistent documented methodology is required to implement this procedure.

**FY 2003 ACCOMPLISHMENTS:** A literature review has been initiated and information has been gathered from other agencies who maintain various types of distress identification manuals. Work has begun to identify the distresses which will be required by the new pavement design guide being developed by NCHRP. This information will be finalized during the next fiscal year once the NCHRP project has been completed.

**FY 2004 PROPOSED WORK:** A review of the pavement management input requirements of the 2002 Pavement Design Guide will be continued. Documentation of typical distresses which occur in Kentucky will be completed.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$45,000
<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$90,000

**SAFETY AND HEALTH CONCERNS FOR KYTC AND CONTRACTOR PERSONNEL**  
**KYSPR-03-268**

Continuation of an Approved Study  
Work Plan Submitted February 2003; Approval Pending  
Anticipated Completion Date FY 2004

**OBJECTIVES:** The objectives of the study include:

1. Identify all safety and health requirements mandated by regulations that are applicable to KyTC construction/maintenance projects. Determine current KyTC oversight/accommodations for worker safety/health regulations impacting KyTC personnel.
2. Determine current KyTC training, policies and guidance related to worker safety and health impacting both KyTC and contractor personnel on construction/maintenance projects.
3. Identify KyTC needs for additional safety and health initiatives including sources of funding
4. Provide recommendations for a partnering program with contractors to make contractors aware of KyTC expectations for their training of employees. Review making training available in a variety of technical areas for both KyTC and contractor personnel.
5. Evaluate the viability of establishing a contractor safety inspection program to be used for determining both inspection frequency and for rating contractors and subcontractors as part of the pre-qualification process.
6. Provide recommendations for providing KyTC construction personnel with a prioritized series of safety and health training courses to be taken in conjunction with other training programs or offered electronically, i.e., CD ROM or Internet.

**BACKGROUND:** KYOSHA is becoming more aggressive in monitoring KyTC construction activities. To date, significant fines have been levied and regulatory oversight may increase. Additionally, regulatory agencies are placing more responsibility on owners for construction activities by contractors. KyTC needs to take further steps to identify safety and health problems impacting KyTC and contractor personnel and to enact proactive measures to limit (and hopefully eliminate) unfavorable exposures.

**FY 2003 ACCOMPLISHMENTS:** Work began on identifying safety and health requirements that impact KyTC construction/maintenance projects.

**FY 2004 PROPOSED WORK:** KTC researchers will conduct reviews of pertinent Kentucky OSHA (and US OSHA) regulations impacting KyTC and contractor personnel working on construction projects. All safety requirements mandated by those regulations that are applicable to KyTC construction/maintenance practices will be identified, and current KyTC oversight/accommodations for worker safety/environmental regulations impacting KyTC personnel and any liabilities that KyTC may incur for the actions of contractor personnel working on KyTC projects.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$31,500
<b>PROGRAMMED COST FY 2004:</b>	\$54,000
<b>TOTAL ESTIMATED COST:</b>	\$85,500

**ENGINEERING PROPERTIES OF THE SOFT SOIL LAYER AT THE TOP  
OF HIGHWAY SOIL SUBGRADES  
KYSR 03-270**

Continuation of an Approved Study  
Work Plan Submitted May 2002; Approved May 2002  
Anticipated Completion Date: FY 2006

**OBJECTIVES:** Major objectives are to identify and examine the engineering properties and behavior of the “soft layer” of material that has frequently been observed at the top of highway pavement soil subgrades. This study is intended to determine the frequency of occurrence of this weak layer of material in pavement subgrades. The study will focus on determining the causes and engineering properties of the weak layer at numerous sites. Alternative methods of preventing the development of the soft layer will be studied. The means of minimizing the effects of this soft zone of soil on pavement performance will be examined.

**BACKGROUND:** Past research studies that have focused on soil subgrades have frequently shown the presence of a “soft layer” of soil located at the top of the subgrade and lying directly below the aggregate base material. For instance, at many highway sites in a recently completed study, moisture contents near the surface of the soil subgrade were consistently greater, by some 3 percent, than the moisture contents measured at some depth below the surface of the subgrade soils. The data demonstrated that a soft, or weak, layer of material is frequently present near the surface of soil subgrades. The presence and prevalence of a soft layer of soil located at the top of the soil subgrade has great engineering significance in the design and performance of highway pavements. The presence of such a zone can cause cracking of the pavement and influence future pavement performance. Moreover, this weak zone of material directly affects the amount of thickness needed to prevent pavement failure.

What needs to be known is how prevalent and the general depth of this layer of soft soil. Since strength of the subgrade determines the thickness of a pavement, the presence of this zone of weak soil greatly influences the performance, service life, future maintenance requirements, and costs of the pavement. Findings of this study could lead to great economical benefits to the Cabinet and provide new improved methods of designing pavements and soil subgrades

**FY 2003 ACCOMPLISHMENTS:** Swell and consolidation tests were performed on recompacted laboratory samples to determine long-term swell properties and pre-consolidation pressures.

**FY 2004 PROPOSED WORK:** In situ testing will proceed at selected sites. In situ CBR tests will be performed in each boring at different depths. Samples of the soil subgrade will be obtained for detailed laboratory tests. Soil specimen from each will be sliced into small finite intervals and the moisture content of each interval will be noted and a moisture content–depth curve will be plotted. This curve will define the soft layer of material when it is present. One-dimensional consolidation tests will be performed on undisturbed specimens of the soil subgrades on specimens retrieved from different depths of the subgrade. The consolidation tests will be used to determine and compare the pre-consolidation pressures of the soft zone and the zone of soil located below the soft zones. If the soft zone of soil is present, then it could be expected that the pre-consolidation pressure of the soft zone would be less than the pre-consolidation pressure of soil located below the soft zone. When the stress in the soft zone increases due to an application of traffic wheel stresses, little settlement occurs in the soft zone and subgrade when the applied stresses are less than the pre-consolidation pressure of the soft zone of material.

<b>PROJECTED COST THROUGH FY 2003:</b>	\$22,500
<b>PROGRAMMED COST FY 2004:</b>	\$81,000
<b>TOTAL ESTIMATED COST:</b>	\$265,500



**REQUIREMENTS DOCUMENT FOR PAYOUT SCHEDULE  
KYSPR 04-271**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** The purpose of this project is to research the state project payout schedule on projects and make recommended changes to the process to make the process work in better coordination with projects as they are occurring and being paid for.

**BACKGROUND:** For many years the KYDOT has had a significant buffer between projects that were awarded as opposed to funds available for the projects. However, with recent budget changes, extra funds are not available to serve as a buffer between what is available and what is allocated for projects at any given time. Therefore, a system is needed wherein project payouts can be better anticipated and tracked such that the use of funds for highway projects are optimized.

**FY 2004 PROPOSED WORK:** Research into the background of project funding and tracking will occur in phase one of the three part project.

**PROGRAMMED COST FY 2004:** \$22,500

**TOTAL ESTIMATED COST:** \$45,000

**DEVELOPING A DATABASE OF MATERIALS, DESIGN, CONSTRUCTION,  
AND EXPERIMENTAL TECHNIQUES OF PAVEMENTS  
KYSR-04-272**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2006

**OBJECTIVES:** 1) Identify the available sources of materials, design, construction, and experimental features data within the Cabinet. 2) Identify additional data which may be collected, which would enhance the data which is currently available. 3) Develop guidelines to establish an integrated system which will permit the integration of the various data sources.

**BACKGROUND:** At present, the Transportation Cabinet maintains design, construction, materials, and performance data in different data management techniques for roadway segments across the state. At the present time, there is limited ability to correlate the performance of highway pavements with the type of construction, materials used, or experimental features utilized. This project will evaluate the feasibility of merging historical data which is currently available in various sources, in addition to developing a mechanism to capture these types of data on future highway construction and rehabilitation activities. The objectives of this study will lead to a better understanding of the performance of various techniques and materials which are used across the state. This information will permit the Cabinet to make better informed decisions with regard to the material specifications, design recommendations, and construction procedures. In addition, it will be essential to the planned implementation of the new pavement design guide being developed by NCHRP.

**FY 2004 PROPOSED WORK:** Work will begin to identify the available data sources within the Cabinet which may be utilized in establishing this database management system. A literature review of other state transportation agencies will also be conducted to determine how each may integrate this type of design, materials, and construction data.

<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COST:</b>	\$247,500

**EVALUATION AND IMPLEMENTATION ISSUES FOR THE  
2002 PAVEMENT DESIGN GUIDE  
KYSPR-04-273**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2007

**OBJECTIVES:** 1) Identify all the necessary input and analysis parameters required. 2) Develop appropriate calibration procedures for Kentucky conditions. 3) Develop an implementation plan to guide the Cabinet in establishing the necessary data collection requirements which may be necessary to support the use of the new procedure.

**BACKGROUND:** The National Cooperative Highway Research Program (NCHRP) is currently developing a new Pavement Design Guide based on mechanistic procedures. Kentucky is one of a very few states which has used mechanistic-empirical design procedures for many years. The Cabinet plans to implement this new design procedure over the next several years. A project is currently underway, "Development of Load Spectra for Use in Pavement Designs in the Implementation of the 2002 Design Guide" which deals with the development of the required traffic parameters of the new design procedure. It is anticipated the work begun on the load spectra project would be incorporated into this project to provide the Cabinet with all the inputs of the new design procedure. The new design procedure utilized various material models coupled with a mechanistic analysis procedure to predict pavement performance. This resulting performance is then used to determine if a pavement structure is suitable based on local condition and historical pavement performance. The new guide will require the user to calibrate the results to these local conditions and establish performance requirements for a hierarchy of pavement structures. The results of this project will permit the Cabinet to be a leader in the implementation of this procedure.

**FY 2004 PROPOSED WORK:** Work will begin to identify the necessary design procedure inputs which will be required. A general overview of the design process will be developed and distributed to various Cabinet divisions. Feedback received from each division will be used in the development of the implementation plan. Work will be initiated regarding the calibration of the design system results for Kentucky conditions.

<b>PROGRAMMED COST FY 2004:</b>	<b>\$67,500</b>
<b>TOTAL ESTIMATED COST:</b>	<b>\$405,000</b>

**BEST MANAGEMENT PRACTICES FOR EROSION CONTROL  
KYSPR-04-274**

New Study, Submission of Work Plan Pending  
Anticipated Complete Date: FY 2004

**OBJECTIVES:** The objectives for the study include:

1. Literature search to identify Best Management Practices (BMP's) related to erosion control primarily on highway construction projects.
2. Review current KyTC specifications, special notes, permits, and practices related to erosion control.
3. Survey KyTC Central Office and district officials about erosion control issues and enforcement of specified requirements.
4. Survey other state highway agencies to identify specifications/training/initiatives related to BMPs for erosion control.
5. Interview resource agencies to determine regulatory requirements/oversight of erosion control on construction projects.
6. Provide recommendations on new specifications, special notes, training and partnering requirements (resource agencies and contractors) to provide BMPs for erosion control on construction projects and to address erosion problems on existing KyTC facilities.

**BACKGROUND:** Erosion control, primarily on construction projects, has been identified as a concern issue by KyTC officials. Resource agencies are becoming more focused on non-point sources of pollution runoff such as erosion from highway construction projects. Regulatory oversight will increase in future with the possibility of fines and project delays or work stoppages. Significant information and training on BMPs for corrosion control is available from a variety of sources including other highway agencies. This information can be acquired and compiled into useful guides and specifications. Another promising method for addressing this issue is to form a partnership with contractors to implement BMPs. Additionally, some existing highway facilities such as bridges and embankments pose problems with erosion. BMPs can be identified to eliminate those or minimize runoff.

**FY 2004 PROPOSED WORK:** KTC researchers will conduct literature reviews, surveys, and interviews to determine current specifications and practices to identify erosion control issues/BMPs both for KyTC and for other highway agencies. KyTC will be provided with recommended BMPs and training alternatives to implement them. KyTC will also be provided with recommendations to institute a partnering program to work with contractors and resource agencies to ensure proper application of erosion control practices on KyTC projects. Common erosion problems on existing facilities will be identified with along with BMPs for limiting erosion and runoff.

**PROGRAMMED COST FOR FY 2004:** \$45,000

**TOTAL ESTIMATED COST:** \$45,000

**IMPLEMENTATION, MAINTENANCE, AND FULL DEVELOPMENT  
OF THE KENTUCKY GEOTECHNICAL DATABASE  
KYSR 04-275**

New Study; Submission of Work Plan Pending  
Anticipated Completion date: FY 2004

**OBJECTIVES:** Major aims are to implement the Kentucky Geotechnical Database, examine and analyze regional geotechnical data, and build geotechnical management techniques into the database system. A major task will consist of training personnel in the twelve highway districts of KyTC on the use of the rock slope and landslide management programs, and other programmed procedures, of the database. A key goal is to get personnel of the Kentucky Transportation Cabinet (KyTC) involved in using the database and to start storing cost data of landslide and rock slope repairs. To maximize benefits, it is essential that personnel in the districts start entering data so that maintenance data can be available for management analysis. This can help avoid the application of uneconomical repairs and save the Cabinet millions of dollars. Another task is to build a system to “capture”, in a real time mode, geotechnical data as it is generated by the Geotechnical Branch of the Kentucky Transportation Cabinet and a system that can be beneficial to the Branch in preparing their engineering reports. Create a web browser to facilitate access and use of the Kentucky Geotechnical Database. Another major task includes developing and programming a systematic method for storing (and retrieving) all the Geotechnical Branch’s reports in the database. Also, examine the feasibility of gearing the system for storing consultant’s reports, and build a system for entering, analyzing, and graphing field instrumentation data, such as data from slope inclinometers, piezometers, water wells, settlement platforms, or gages. Also, build a system for storing resilient modulus data that will be generated by the Geotechnical Branch and provide programmed procedures and mathematical models for analyzing these data. Build and add software to the “Applications” section of the database, and develop regional soils information, such as CBR maps and areas prone to landslides and rock falls. Perform preliminary analysis of geotechnical data of the Western portion of Kentucky, which is highly susceptible to large earthquakes, and attempt to identify soil formations along selected major highways that may liquefy. Liquefaction of highway foundations could be detrimental to highway structures.

**BACKGROUND:** The University of Kentucky Transportation Center has built a geotechnical database for the KyTC. The Center has performed major inventories of hazardous rock slopes and landslides on major highways in Kentucky. Attributes of about 2,100 potentially hazardous highway rock slopes and 1,300 landslides have been stored in the database. The hazardous conditions of the rock slopes have been rated numerically. Severity ratings of the landslides have been performed. These data, including latitudes and longitudes (obtained from Global Positioning (Satellite) System—GPS) and photographs of each rated rock slope and landslide are stored in the database. The database of information is stored on a server of the KyTC in Frankfort, Kentucky. To provide access, the twelve highway districts of KyTC, including several central offices, have been connected to the database. Management systems for entering and retrieving rock slope and landslide data have been constructed. Also, a third major component of the database for managing geotechnical engineering data has been constructed.

**FY 2004 PROPOSED WORK:** KTC personnel will visit each highway district to train selected individuals of KyTC. KTC personnel will continue to rate rock slopes and landslides identified by district personnel until KyTC personnel are trained. Work will also focus on building a web browser for viewing and retrieving data and a system for “capturing” geotechnical data as it is generated by KyTC.

<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$45,000

**USAGE OF GPS TECHNOLOGY FOR TRAFFIC CRASH LOCATION**  
**KYSPR-04-276**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The objective of this study will be to evaluate the accuracy of GPS coordinates placed on crash reports to determine if they represent a viable means of locating traffic crashes.

**BACKGROUND:** The crash report that was implemented in Kentucky starting in 2000 has data fields for the investigating officer to place the latitude and longitude of the traffic crash. All officers who investigate crashes have been provided GPS units and training for their use. However, preliminary analysis of the data show a substantial amount of inaccurate and inconsistent information relating to the GPS data. It is not apparent whether these inaccuracies have been caused by the investigating officer, data entry, the CRASH conversion program, or a combination of these efforts. The study will involve comparing the coordinates given on the police report with other information on the report that provides the crash location.

**FY 2004 PROPOSED WORK:** A data collection plan will be developed to determine the accuracy of crash location data being collected with the GPS units. Input data will be investigated and possible sources of error. Data entered by investigating officers will be analyzed to determine if there are patterns of error that can be identified. The CRASH conversion program will be evaluated for accuracy and possible sources of error. Other states using similar technologies will be surveyed to determine if similar problems and potential solutions exist. Expanded applications of GPS technology location information will also be investigated and documented. A report documenting results from the evaluation will be prepared.

<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COST:</b>	\$67,500

**EVALUATION OF AUTO INCIDENT RECORDING SYSTEM**  
**KYSPR-04-277**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** The objectives of this study will be to evaluate the effectiveness and the benefits of the AIRS implementation and to develop recommendations regarding continued use of the system at the present location and/or at other locations.

**BACKGROUND:** The Auto Incident Recording System (AIRS) was installed at the intersection of Brooke Street and Jefferson Street in Louisville, with the objective of improving safety at that intersection. The system continually records digital video of the intersection and monitors the vicinity for the sound of vehicle crashes or near misses. When an incident is detected, a 10-second segment of video (beginning five seconds before the incident) is stored on a VHS videotape. Traffic engineers can then study the incidents on the videotape and identify the types of behavior (and contributing factors) that are causing incidents. Corrective measures can then be developed to reduce the number of incidents.

**FY 2004 PROPOSED WORK:** A data collection plan will be developed to routinely extract information from the digital video system presently installed in Louisville. For actual crashes, the crash report will be obtained from the Louisville Police Department and will be used in combination with the digital video to analyze types and patterns of crash occurrence. Additional analyses will be performed to determine if patterns and predictors of other crashes can be associated with the information recorded by the system. A preliminary report will be prepared to document the system operation and effectiveness.

<b>PROGRAMMED COST FY 2004:</b>	\$45,000
<b>TOTAL ESTIMATED COST:</b>	\$45,000

**HIGHWAY COST ALLOCATION ANALYSIS  
KYSR-04-278**

New Study, Submission of a Work Plan Pending  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To determine the levels of revenue contribution and cost responsibility of highway users operating on Kentucky's state-maintained highway system.

**BACKGROUND:** Traditionally government bears the primary responsibility for providing and maintaining public roads and streets. Although the private sector has been called upon to shoulder more of the load, highways continue to be financed largely from tax revenues and user tolls. Primary goals for those charged with drafting highway tax legislation include an equitable assignment of responsibility to various groups of taxpayers and an efficient system for tax administration. Highway cost allocation studies have traditionally sought to assure that the goal of equity is met. Highway cost allocation research, as a means for evaluating the equity of highway user taxation, was first reported in Kentucky in 1956. Highway cost allocation studies have been conducted for Kentucky beginning in 1982. Changes in the types of data used and the methodologies employed resulted over the period of years, and the processes have been progressively streamlined and automated to permit more efficient analyses to be performed. Prior studies have been limited to the state-maintained highway system, which comprises approximately 27,000 miles of the 73,000 miles of roads and streets in Kentucky.

**FY 2004 PROPOSED WORK:** Databases used in previous years will be updated to reflect fiscal year 2003 revenue and cost data and calendar year 2002 travel activity. Alternatives recommended from a recent review of the analysis procedures will be evaluated, and when considered appropriate and beneficial, incorporated into the updated report. Cost data based on the MARS accounting and reporting system and revenue and cost data from the Transportation Cabinet's "Financial Report to Management" will be updated. Taxation changes and legislative initiatives, if proposed or suggested, will be evaluated. A report documenting the results of the study will be completed in draft form and presented to an Advisory Committee prior to printing and final distribution of the report.

<b>PROGRAMMED COST FY 2004:</b>	\$58,500
<b>TOTAL ESTIMATED COST:</b>	\$58,500



**DEVELOP AN ARCHIVED DATA MANAGEMENT SYSTEM PROTOTYPE**  
**KYSPR-04-279**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2004

**OBJECTIVES:** To identify the data needs of stakeholders throughout Kentucky, develop an Archived Data Management System (ADMS) that supports online query, estimate the required maintenance effort of the proposed ADMS, examine the quality of the data, and develop error detection algorithms.

**BACKGROUND:** Deployment of Intelligent Transportation Systems (ITS) has been increasing throughout the country, generating massive amounts of data. These data are primarily used in short-term or real-time operations management of transportation systems. For various reasons, the data are not being appropriately archived, and, in many cases, not archived at all. However, the ITS data have great potential value in transportation planning.

Two significant deployments of regional traffic management systems (ARTIMIS and TRIMARC) have taken place in Kentucky, and these systems collect substantial amounts of traffic data. The goal of this research is to develop an integrated Archived Data Management System for the Kentucky Transportation Cabinet based on data collected by ARTIMIS and TRIMARC.

**FY 2004 PROPOSED WORK:** The data needs of stakeholders will be identified, and functional requirements for the ADMS will be developed. Project staff will develop a scope of work and evaluation criteria for selecting a subcontractor (if necessary) to assist in the study. Suitable hardware and software platforms will be identified for the proposed ADMS. Resources required to support and maintain the system will be identified. The data sources, database structure and layout, and the data storage requirements will be specified. An algorithm will be developed for the proposed ADMS to process the raw data collected by ARTIMIS and TRIMARC and compile them into a GIS database. This algorithm will then be implemented in a stand alone software tool. The quality of data collected by ARTIMIS and TRIMARC will be evaluated in comparison with data from other sources, and a set of data quality rules will be developed for dealing with missing or erroneous data.

<b>PROGRAMMED COST FY 2004:</b>	\$90,000
<b>TOTAL ESTIMATED COST:</b>	\$90,000

**EVALUATE METHODS TO LIMIT THE TIME TAKEN  
TO INVESTIGATE CRASH SITES  
KYSR-04-280**

New Study: Submission of Work Plan Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** To identify opportunities to reduce the time required to investigate and clear crash scenes. These opportunities will be evaluated in terms of their feasibility, cost, and benefits, and recommendations will be developed.

**BACKGROUND:** In addition to the direct costs of highway crashes (death, injury, and property damage), there are substantial indirect costs as well. One substantial source of indirect costs is the congestion and delay that results from lane blockages or road closures while the crash is being investigated and cleaned up. In many cases, vehicles could be moved and roadways reopened very quickly, but this does not occur because of the need to investigate the crash scene. Thus, the process of crash investigation can substantially increase the congestion and delay costs associated with the crash. It is possible, in many cases, that the incremental cost of the investigation greatly exceeds any value that it may produce.

**FY 2004 PROPOSED WORK:** A project work plan will be developed and submitted by the project staff. A Study Advisory Committee (SAC) will be formed. The SAC will review and approve the work plan. Current policies and procedures related to crash scene investigation in Kentucky will be identified, described, and evaluated. A literature review and survey of other states will be conducted to identify "best practices" related to crash scene investigation. A cost-benefit analysis will be conducted to assess the cost-effectiveness of investigating crash scenes.

<b>PROGRAMMED COST FY 2004:</b>	\$67,500
<b>TOTAL ESTIMATED COST:</b>	\$112,500

**TESTING AND CALIBRATION OF THE BRIDGE MANAGEMENT SYSTEM  
KYSR 04-281**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** (1) Evaluate the Cabinet's current Bridge Management System (BMS); (2) Calibrate the various parameters used in the decision making process; and (3) Prepare a training manual and hold training sessions.

**BACKGROUND:** Bridge Management Systems are essential in prioritizing bridges for maintenance, repair, etc. A system recently acquired by the Kentucky Transportation Cabinet is in need of being adapted to the Cabinet's needs.

**EXPECTED BENEFITS:** The implementation of the new management system will greatly enhance the capabilities of the Transportation Cabinet in prioritizing bridges for maintenance and repair.

**FY 2004 PROPOSED WORK:** Initiate and complete 35% of the evaluation and calibration of the bridge management system.

**PROGRAMMED COST FY 2004:** \$45,000

**TOTAL ESTIMATED COST:** \$90,000

**IMPACT OF OUTSOURCING KYTC PROJECT SERVICES**  
**KYSPR 04-282**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** The purpose of this project is to evaluate the effectiveness, benefits and concerns of the possible outsourcing of primary project delivery functions by DOTs. An extensive review will be conducted of the current practices by other DOTs for outsourcing primary project delivery functions. Following in-depth feasibility analyses of such practices by the Cabinet, guidelines will be developed for the possible outsourcing of KyTC project services.

**BACKGROUND:** There are many functions carried out by a DOT and many relate to its major responsibility for transportation project delivery. The primary function is that of senior management, which is often called **Program Management**. The more traditional functions are: **Planning, Design, Pre-construction, Construction, Operations and Maintenance**. All of these functions require manpower, resources, and senior management attention in project delivery. For years DOTs have conducted most of their functions with their own resources. There has always been some outsourcing of work, especially for construction services and to a lesser extent, design services. The increasing demands on DOTs today, and changing resources, are causing investigation of alternative methods of accomplishing their essential functions. A major option is to contract out more of its work to external parties, commonly called outsourcing.

**FY 2004 PROPOSED WORK:** A review will be conducted of the current practices by other DOTs for outsourcing primary project delivery functions. Evaluations will be made of the impacts of these outsourcing activities.

<b>PROGRAMMED COST FY 2004:</b>	\$ 54,000
<b>TOTAL ESTIMATED COST:</b>	\$108,000

**INNOVATIVE RAPID CONSTRUCTION METHODS**  
**KYSPR 04-283**

New Study, Submission of Work Plan Pending  
Anticipated Completion Date: FY 2005

**OBJECTIVES:** The purpose of this project is to identify innovative construction methods and processes to enhance the speed of construction on KyTC construction projects. Investigations will be made of the tradeoffs between speed, quality, impacts on highway users, and the cost of construction when using specific innovative methods and/or processes. Finally, guidelines will be developed for utilizing specific innovative, rapid construction methods for KyTC projects.

**BACKGROUND:** A vast majority of KyTC construction projects are now reconstruction and rehab projects. Meanwhile, the volume of traffic on KyTC roads is increasing, environmental regulations are becoming stricter, and the cost of conventional road and bridge construction methods is on the rise. Conventional construction/reconstruction methods will be seriously strained to meet the demands of future KyTC needs, especially the current philosophy of "Get In, Get Out, and Stay Out." The use of innovative construction/reconstruction will help alleviate these concerns.

**FY 2004 PROPOSED WORK:** A review will be conducted of potential innovative methods of construction to enhance the speed of construction on KyTC construction projects. An evaluation will also be performed on all methods and processes studied to judge their impact on all performance aspects of the projects and the participants involved.

<b>PROGRAMMED COST FY 2004:</b>	\$ 36,000
<b>TOTAL ESTIMATED COST:</b>	\$90,000

## APPENDIX C

### Certification for Federal-Aid Contracts

The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such subrecipients shall certify and disclose accordingly.

# **RESEARCH AND DEVELOPMENT**

**PART III B**

**KENTUCKY PLANNING AND RESEARCH PROJECT  
WORK PROGRAM - PART IIIB  
FISCAL YEAR 2004**

<b>LINE ITEM NO.</b>	<b>STATE STUDY NO.</b>	<b>STUDY TITLE</b>	<b>PRINCIPAL INVESTIGATOR</b>	<b>ESTIMATED COST FY 2004</b>
1	04-50	General Administration	Toussaint	\$ 50,000
2	04-51	Equipment Acquisition and Maintenance	Toussaint	90,000
3	04-52	Student Assistance	Toussaint	60,000
			<b>TOTAL</b>	<b>\$200,000</b>



**GENERAL ADMINISTRATION**  
**KYP 04-50**

The general administrative costs associated with payroll distribution, personnel actions, accounts, receptionist, office equipment, and preparation of line items, proposals, and detailed work plans, consultant fees and associated Center administrative expenses including food and refreshments for necessary meetings are combined in this section inasmuch as a pro rata apportionment of time and other accountable costs among the several studies would be impractical from the standpoint of accounting.

**PROGRAMMED COST FY 2004:**

**\$50,000**

**EQUIPMENT ACQUISITION AND MAINTENANCE**  
**KYP 04-51**

Acquisition and maintenance of laboratory and field test equipment are combined in this section inasmuch as a pro rata apportionment of these accountable costs among several studies would be impractical from the standpoint of accounting.

**PROGRAMMED COST FY 2004:** **\$90,000**

**STUDENT ASSISTANCE  
KYP 04-52**

**OBJECTIVE:** To provide a work experience in the transportation area for university students.

**BACKGROUND:** The Kentucky Transportation Cabinet endeavors to recruit young engineers through various means such as the Cabinet's Scholarship Program. Some of those students and others have worked part time within the Kentucky Transportation Center facilities. Those students receive financial compensation, but more importantly, gain valuable experience. Cabinet officials are of the opinion that the Center is an excellent recruitment area for potentially promising engineers and have included a line item for support of part-time students. Financial assistance for student employees shall be for student salaries only and shall not include indirect costs.

**PROGRAMMED COST FY 2004:**

\$60,000

# **RESEARCH AND DEVELOPMENT**

**(Tentative Future Projects)**

5/06/03-Research FY 2004						
Green Reflects on going projects (or carry over \$)						
Blue reflects proposed projects for FY04						
c/o = carried over from FY2003						
Project #	SECTION		FY2004	FY2005	FY2006	FY2007
<b>POLICY/PLNG</b>						
03-263	Highway users survey	c/o	\$54,000			
03-264	State TVS count est.process[3]		\$20,000			
04-271	Requirements document for payout schedules	#2	\$25,000	\$25,000		
	Showcase of innovative KY techniques-envir., pub involv.	#3		\$75,000		
	Highway data assessment	#3		\$75,000	\$75,000	
	How to blend in public desires w/ trans. expenditures	#4			\$75,000	
	<b>SUB-TOTAL</b>		<b>\$99,000</b>	<b>\$175,000</b>	<b>\$150,000</b>	<b>\$0</b>
<b>PVMT/MATL</b>						
02-243	Eval. of Incentive/Disincentive Proc.(1)		\$75,000			
02-244	Eval. of NDT and Geo physical techniques(6)	c/o	\$120,000			
02-245	Eval. of Agg. Segregation on Pvmt. Perf. (3)		\$50,000			
03-265	Eval. of PMS and Maint. Rating System(2)[2]		\$90,000	\$90,000		
03-266	Use of PVMT profiling equip for as built hwys[3]	c/o	\$140,000	\$100,000		
03-267	Devel of Pvmt distress manual[4]		\$50,000			
04-272	Devel a database of materials, design, const, etc	#1	\$75,000	\$100,000	\$100,000	
04-273	Eval & Implementaton of 2002 Pvmt Des Guide	#2	\$75,000	\$150,000	\$150,000	\$75,000
	Pvmt moisture problem/Asph.pvmt permeability/drainage	#3		\$75,000	\$150,000	\$125,000
	Investigation of validity of asph.binder content	#4		\$125,000	\$125,000	
	<b>SUB-TOTAL</b>		<b>\$675,000</b>	<b>\$640,000</b>	<b>\$525,000</b>	<b>\$200,000</b>
<b>ENVIRONMENT</b>						
00-210	Environmental commitments	c/o	\$27,400			
01-225	Case study of 4f litigation	c/o	\$14,100			
03-268	Safety/Health Concerns for KyTC personnel(2)[1]		\$60,000			
04-274	Erosion control-BMP	#1	\$50,000	\$0		
	Envir stewardship training	#4		\$50,000		
	Integrated roadside vegetation management	NSPR				
	<b>SUB-TOTAL</b>		<b>\$151,500</b>	<b>\$50,000</b>	<b>\$0</b>	<b>\$0</b>
<b>GEOTECH</b>						
01-228	Reduction of Stresses on Buried Rigid Struct.	c/o	\$97,000	\$35,000		
01-229	Resilient Modulus for Compacted Crushed Agg.		\$75,000	\$75,000		
02-238	Anal. of Base Matl reinforcement w/geofabric(1)		\$65,000			
02-239	Corrosion Eval of MSE walls(2)		\$50,000			
03-270	Engr prop of soft soil layer at subgrd[1]		\$90,000	\$90,000	\$90,000	
04-275	Geo-tech database-development only	#1	\$50,000			
	Examination of soil moisture & dry density for Res Mod	#2		\$100,000	\$100,000	
	Use of dynamic compaction	#4			\$100,000	\$50,000
	<b>SUB-TOTAL</b>		<b>\$427,000</b>	<b>\$300,000</b>	<b>\$290,000</b>	<b>\$50,000</b>

Project #	SECTION		FY2004	FY2005	FY2006	FY2007
<b>TRAFFIC/SAFETY</b>						
02-251	Development of Access Mgt Stds & Process(7)		\$75,000			
03-257	Effect of pvmt surf on safety[1]	c/o	\$107,500			
03-258	Traffic crashes at intersections[2,4]		\$125,000			
03-259	Effect of warning signs on oper speeds[3]	c/o	\$80,000			
04-276	Usage of GPS technology for accident location	#1	\$75,000			
04-277	Evaluation of Auto Incident Recording Syst (AIRS)	#1	\$50,000			
04-278	Cost allocation study		\$65,000			
	Eval of work zone speed reduction measures	#2		\$75,000		
	Anal of condition and mgt of KYTC traffic signal systems	#3		\$100,000	\$100,000	
	Inconsistencies of design speed, oper speed, posted spd	#3		\$75,000	\$75,000	
	Feasibility study of removing flagger from workzones	#4		\$75,000		
	<b>SUB-TOTAL</b>		<b>\$577,500</b>	<b>\$325,000</b>	<b>\$175,000</b>	<b>\$0</b>
<b>ITS</b>						
02-242	Procurement Process analysis/recomm.(3)	c/o	\$20,000			
04-279	Automated Data Management System	OG	\$100,000			
04-280	Evaluate methods to limit time at crash sites	#2	\$75,000	\$50,000		
	Implementation/eval of auto infrared tech for CV brake insp	#4		\$60,000	\$60,000	
	<b>SUB-TOTAL</b>		<b>\$195,000</b>	<b>\$110,000</b>	<b>\$60,000</b>	<b>\$0</b>
<b>STRUCTURES</b>						
00-206	Eval. of I-24 Corr. for Mod. Seis. Events KY-00-206		\$40,000	\$35,000		
01-234	Earthquake Resp Trng./Assess. of Needs W.KY		\$55,000			
02-246	Eval of Western KY Parkway for seismic impact(1)		\$45,000	\$200,000	\$60,000	
03-260	Implement remote sensing technology[1]	c/o	\$55,000			
03-261	Barge Impact Anal (follow-up)(2)[3]		\$50,000	\$60,000		
04-281	Testing/Calibration of Bridge Mgt System	#1	\$50,000	\$50,000		
	Heavy bridge deck overlays	#2		\$75,000	\$75,000	
	Concrete bridge deck patching	#3			\$100,000	
	<b>SUB-TOTAL</b>		<b>\$295,000</b>	<b>\$420,000</b>	<b>\$235,000</b>	<b>\$0</b>
<b>CONSTRUCTION</b>						
04-282	Impact of Outsourcing on KyTC services	#2	\$60,000	\$60,000		
04-283	Innovative rapid const/reconst methods	#4	\$40,000	\$60,000		
	Contractor involvement in traffic control plans				\$75,000	
	<b>SUB-TOTAL</b>		<b>\$100,000</b>	<b>\$120,000</b>	<b>\$75,000</b>	<b>\$0</b>
	<b>GRAND TOTAL-SPR PROJECTS</b>		<b>\$2,520,000</b>	<b>\$2,140,000</b>	<b>\$1,510,000</b>	<b>\$250,000</b>
	<b>TOTAL NEW PROJECTS-2004</b>	<b>13</b>	<b>\$790,000</b>			
	<b>ON-GOING PROJECTS -PRIOR YEARS</b>	<b>26</b>	<b>\$1,730,000</b>			
	<b>TOTAL SPR</b>		<b>\$2,520,000</b>			