

5.2 Modal Application of Performance-Based Planning and Programming (PBPP)



While highways will long remain the core of the KYTC scope of work, the KYTC is involved in bicycle and pedestrian facilities, aviation, public transit, and interfaces with rail and waterway transportation. These relationships will continue to evolve over the next twenty years as the interaction increases among all transportation modes to provide safe and reliable trips for people and freight.

The KYTC receives very limited funds for pedestrian, bicycle, aviation, and public transit programs and does not regularly receive federal or state funds for rail or water transportation

programs. Considering these funding limitations, specific needs for these non-highway modes have not been included in this document. However, references to those mode-specific plans have been provided so that we may provide a link to more complete data and identified needs for those programs.

To aid in the discussion, a list of acronyms are provided in **Chapter 7** and a glossary is available in **Chapter 8** to provide clarification regarding terminology commonly used within the industry of a specific mode of transportation.

5.2.1 Highways

5.2.1-1 Basic Maintenance Overview

- **Goal:** Provide for the safe and secure movement of people and freight.
- **Goal:** Provide for the improvement and maintenance of the existing transportation infrastructure.
- **Goal:** Provide a dependable transportation system that effectively and efficiently moves people and freight.
- **Goal:** Provide reliable connectivity and access - locally, regionally, and globally - for people and freight.
- **Goal:** The KYTC ensures that the process which develops and maintains a transportation system adequately considers dependable access to markets, jobs, and resources.

Asset management and preservation of existing infrastructure is critical to the KYTC effectively maintaining our highway system. Kentucky's road network is comprised of over 79,000 miles of public roads which is the primary element of the state's transportation system. The road network includes a wide variety of highway types, from multilane interstates to rural routes, each with unique challenges to be considered.

The KYTC is responsible for the maintenance of over a third of the mileage of that network. The responsibility for maintaining the assets includes the preservation (upkeep) of approximately 67,000 lane miles of pavement and striping, 14,000 bridges, 3,200 traffic signals, and 550,000 signs that are considered the existing infrastructure of the KYTC. The KYTC is responsible for keeping the network clear of snow and ice in the winter and mowing the rights of way in the spring and summer. While the KYTC inspects approximately 14,000 bridges, those designated as non-state-maintained bridges are maintained by the local governments.

As part of its maintenance responsibility, the KYTC collects and analyzes data on the condition of the pavement, bridges, striping, signals, and signs. Using the "plan-do-check-act" cycle as described previously in Chapter 4 of this Plan, the KYTC investigates what is the current status of these vital

components and implements targeted solutions to improve the operation of the transportation system.

5.2.1-2 Pavement

Smooth, comfortable and well maintained roadways are expected by residents and important to the safety and economy of the state. The KYTC maintains a system of roadways comprised of 27,500 centerline miles and approximately 67,000 lane miles, as previously noted. Maintaining and improving the condition of the roadway network is the primary objective of the KYTC Operations and Pavement Management Branch (OPM).

The OPM collects detailed information related to pavement roughness, cracking, rutting, and other distresses. On a project level, this data is used to determine treatments which would extend pavement life or address defects. At a higher level, this data can summarize the overall health of the pavement network. Commonly used measures of pavement health include roughness and condition.

"If we can maintain our roads, we will spend less money on repairing vehicles caused by the road conditions. Our roadways are important and each project should be looked at based on the importance and the amount of people that would be affected. Existing roadways should be reused and maintained."
Survey Participant,
Rowan County

5.2.1-2.1 Pavement Roughness

Pavement roughness is related to the degree of comfort or discomfort experienced while traveling. The most common measure of pavement roughness is the **International Roughness Index (IRI)**. Higher IRI values indicate rougher pavement. As illustrated in **Figure 5.2.1 A**, currently over 40% of Kentucky's pavements are considered rough. This has several negative impacts on motorists including: degraded driving experience, higher fuel consumption, increased vehicle damage, reduced safety, and pavement related delays.

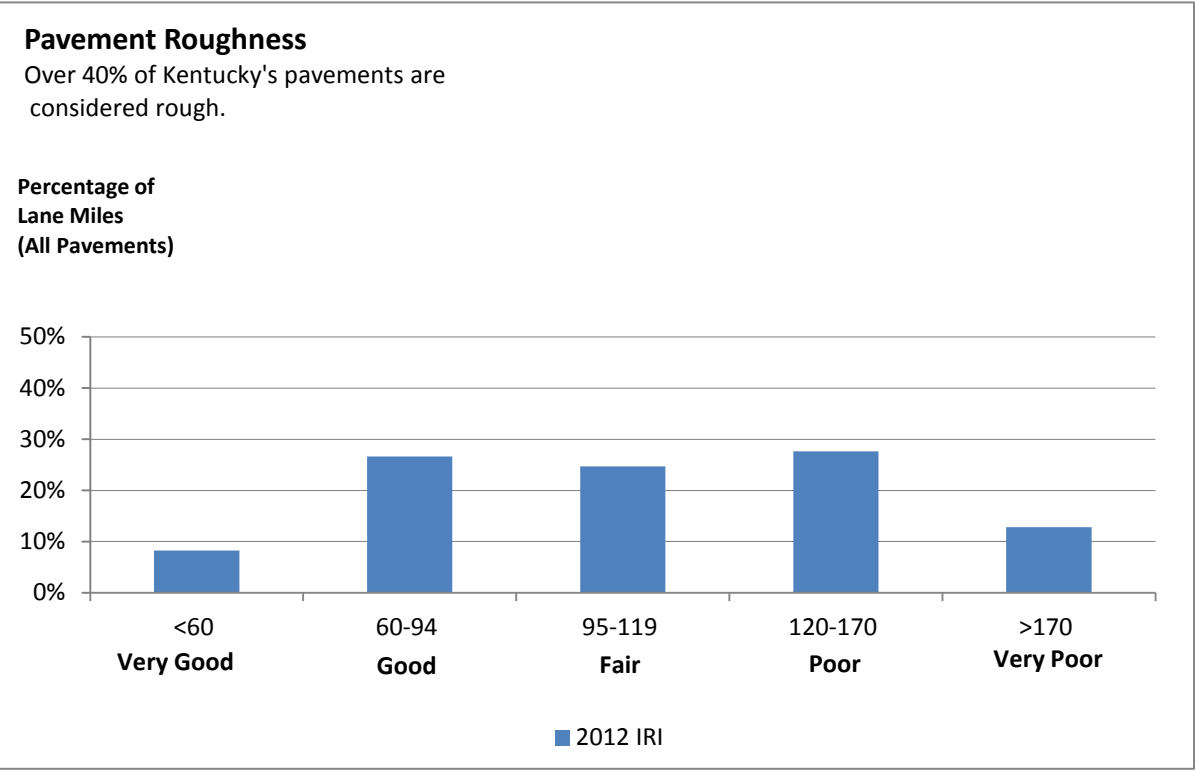


Figure 5.2.1 A – KYTC Pavement Roughness

5.2.1-2.2 Pavement Condition

On an average day, the total distance driven on Kentucky's entire state roadway network exceeds 100 million miles. Ideally, each of these miles would be driven on pavements in good condition. As a practical matter, however, priorities must be established which allow for the most efficient and flexible use of available resources. Since the ultimate purpose of Kentucky roadways is to serve the public, the KYTC places a higher emphasis on maintaining pavements with higher traffic volumes. To accomplish this, we use a sliding scale that holds high-traffic roadways to a higher standard of performance, rating the roadways as **good**, **fair** or **poor** depending upon the overall level of distress and the total traffic volume as presented in **Figure 5.2.1 B**.

"Although new roadways are important, I believe maintenance of current roadways is much more important."

Survey Participant,
Ballard County

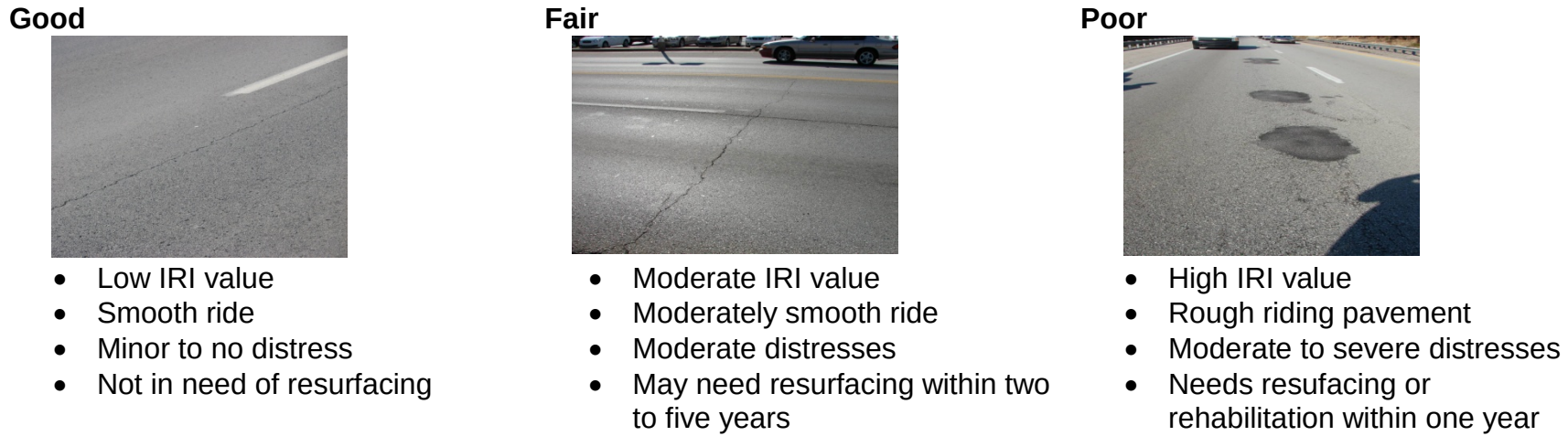


Figure 5.2.1 B– Range of Pavement Conditions

The KYTC has set a goal of increasing the percentage of good and fair pavements to a target of 92% by 2035. We are currently below that target with only 81% of pavements in the good and fair category as presented in **Figure 5.2.1 C**.

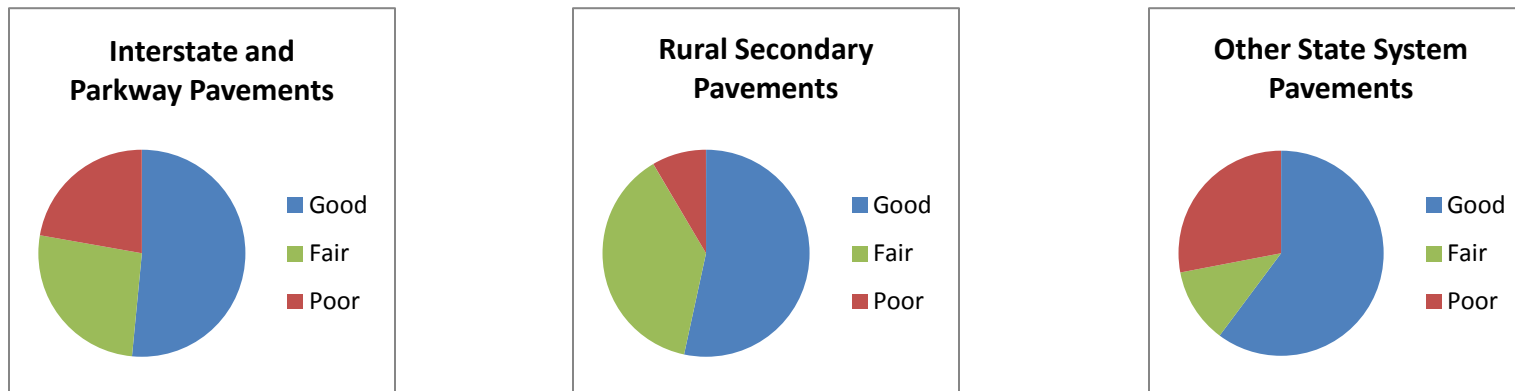


Figure 5.2.1 C– 2013 Pavement Conditions in KY by Roadway Functional Class

5.2.1-2.3 Pavement Performance

Faced with the scenarios in **Figure 5.2.1 D** and **Figure 5.2.1 E**, achieving better pavement performance requires a long-term commitment to a two-pronged pavement management approach. First, the KYTC must maintain pavements in good condition so that they last longer before rehabilitation is needed. Just as one would perform preventive maintenance on a car in order to extend its life, so must Kentucky embrace a strategy of preventive maintenance for roadway pavement which ensures the longest possible period of sustained performance. Second, the KYTC must reconstruct or rehabilitate pavement sections that have already deteriorated to a poor condition. Because these projects are much more expensive to complete, this effort should be coordinated with our long-term planning processes to incorporate other strategic goals such as increased capacity, improved traffic flow and enhanced safety, addressing as many of these goals as possible.

In some instances, however, it will be necessary to carry out rehabilitation or reconstruction solely for the purpose of improving the pavement condition.

FY 2012 Pavement Preservation Needs

• Interstates	\$312 million
• Parkways	\$131 million
• State Primary Rehab	\$81 million
• SP & SS Resurfacing	\$305 million
• RS Resurfacing	\$77 million
• Preventive Maintenance	\$12 million
Total	\$918 million

Current Interstate and Parkway Funding Levels

Interstate and Parkway pavement performance will not improve under current funding levels.

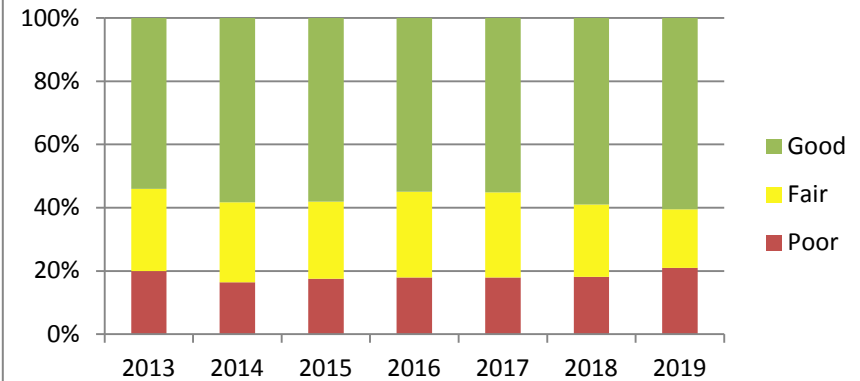


Figure 5.2.1 D – Future Pavement Performance Levels for Interstates & Parkways at Current Funding

Kentucky's Resurfacing Program

The needs of the resurfacing program continually outpace the actual spending.

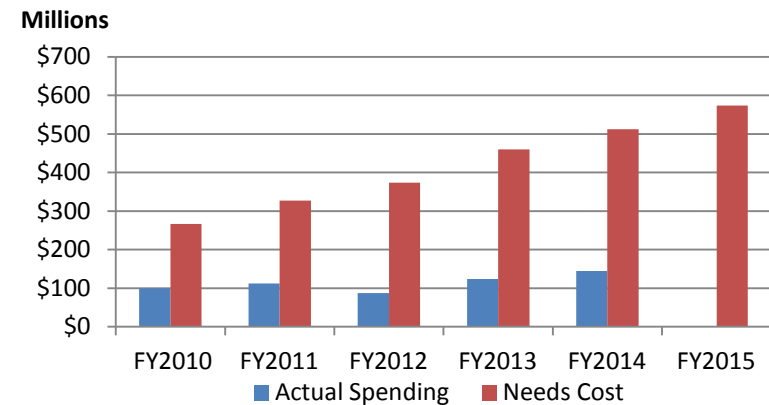


Figure 5.2.1 E – KYTC Resurfacing Program: Needs versus Spending

5.2.1-2.4 Pavement Preservation

One of the major challenges to an effective pavement preservation program is overcoming the desire to address pavement needs in a “worst-first” manner. While this strategy would seem to prioritize funding on those pavements most in need of attention, it would also result in more rapid deterioration of pavements currently in good to fair condition. In the end, the number of miles in poor condition would increase more rapidly than could be addressed with available funding, as has been the trend since 2009. This is due to the fact that it is much more expensive to repair pavements in poor condition than to prevent them from becoming poor in the first place.

This concept is illustrated in **Figure 5.2.1 F**. When pavements are relatively new and in good condition, preservation treatments can be performed to extend the pavement life. This can eliminate or significantly delay the need to perform a major rehabilitation or reconstruction in later years. The associated savings varies depending on the type of treatment, but historic data indicates that a savings of \$8 can be attained for every \$1 invested in preservation.



An effective pavement management program must ensure a balance between preservation, rehabilitation, and reactive maintenance. Sufficient funding is not available to focus solely on the reconstruction of pavements in poor condition; nor is it acceptable to simply perform reactive maintenance. The KYTC must utilize a variety of treatments to optimize system performance in a cost effective manner and extend the availability of the roads to the public.

Pavement

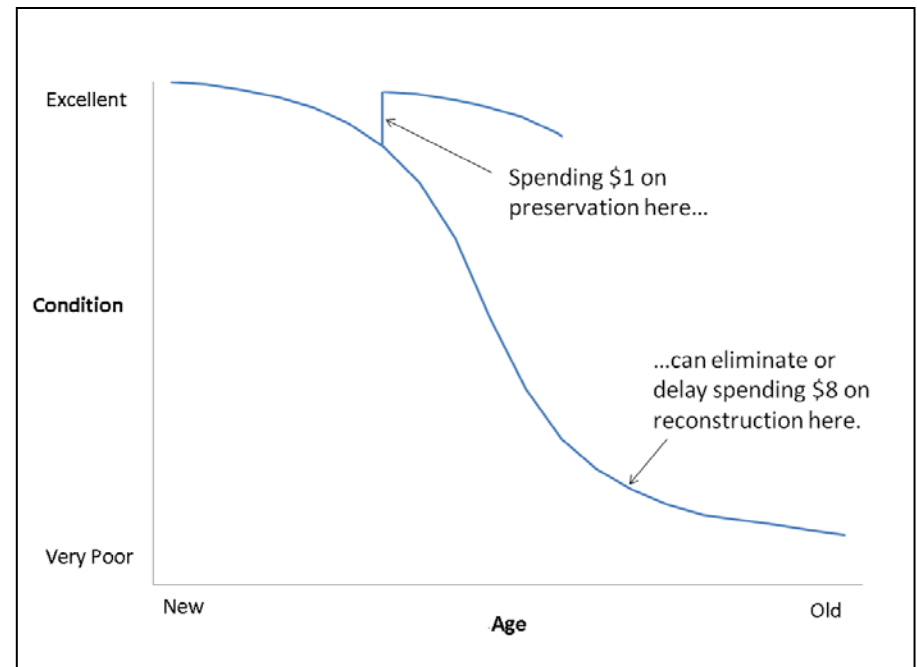


Figure 5.2.1 F: Pavement Condition over Time

5.2.1-3 Bridges

Taking care of Kentucky highways includes keeping approximately 14,000 bridges in a safe condition for the traveling public. The KYTC plays a vital role in this by maintaining an accurate inventory of all of Kentucky's state, local and privately maintained bridges. The KYTC is responsible for making sure that all bridges are inspected on a 2-year cycle.

Based on the findings of these inspections, the KYTC advises and makes recommendations to counties, cities and railroads about repairs needed to their bridges. Additionally, Contract Ready Proposals (CRPs) are developed for bridge maintenance and repairs on state-maintained bridges.

The KYTC is also responsible for determining the safe load-carrying capacity of all public bridges and the posting of notification signage when it is determined that a bridge cannot safely carry the legal roadway weights. Proper sign posting procedures are necessary to remain in federal compliance and retain Kentucky's eligibility for federal bridge funds. To date, only about 65% of Kentucky's bridges have been load-rated.

"I believe that more money has to be spent on performing various maintenance activities, especially preventative maintenance, on the bridges in Kentucky." If the bridges were not there, what good would a "perfect" stretch of asphalt be?"

Survey Participant,
Madison County

Currently, about 17% of counties and 32% of cities which maintain bridges are not in compliance with load posting requirements. A concerted effort to load rate all bridges in Kentucky is underway to get all counties and cities into compliance and

therefore eligible for federal bridge funds.

5.2.1-3.1 Bridge Condition

In assessing overall bridge condition, the KYTC assigns a rating based on the lowest rating of the three major bridge components – the deck, superstructure, and substructure. A bridge with one or more of these major components in poor condition is rated as poor. For a bridge to be rated in good condition overall requires that all three components be rated in good condition.

"We live in West Kentucky, in a sense completely surrounded by rivers and water. Our infrastructure, livelihood and survival depend on crossing these rivers on aging, antiquated bridges. In the event of a major earthquake, we could literally be cut off for months. Bridge maintenance and expansion should be a major consideration moving forward."
Survey Participant,
McCracken County

As of 2013, there were 6.7% bridges rated in poor condition in Kentucky. Each day approximately 3.3 million vehicles travel across bridges rated in poor condition.

5.2.1-3.2 Improving Bridge Performance

The KYTC spends about \$30 million annually on bridge repairs and maintenance. Most of these funds come from the KYTC Bridge Maintenance account with the rest coming from Rural Secondary Funds and Federal Interstate Maintenance Funds. Approximately \$80,000 per county per year is made available to counties across the state for county maintained bridges.

Within the KYTC budget, approximately \$70 million per year in the Six-Year Highway Plan is devoted to the replacement of existing bridges through the Bridge Replacement and Rehabilitation (BRO, BRZ, and BRX) programs. (See Chapter 8 – Glossary for program descriptions). The KYTC also manages the construction of major new and replacement bridges throughout the state. In Western Kentucky, the KYTC is in the process of constructing two major four-lane bridges on US 68 that will replace the existing two-lane bridges over Lake Barkley and Kentucky Lake. In 2013, the bridge over the Ohio River connecting Wickliffe, Kentucky to Cairo, Illinois underwent a major rehabilitation that will extend its life expectancy for at least ten more years. The Milton-Madison Bridge over the Ohio River and the US 60 Bridge over the Tennessee River at Ledbetter, Kentucky were also replaced by 2014. In partnership with the state of Indiana, a new bridge is being constructed in downtown Louisville to carry I-65 traffic to southern Indiana and another to connect I-265 (Gene Snyder Expressway) in eastern Jefferson County with southern Indiana.

The KYTC has recently increased its preventive maintenance efforts on state-maintained bridges by issuing CRPs for bridge washing. These projects involve cleaning the steel girders, drains, deck gutter lines, abutment caps, pier caps and bearing devices and applying concrete sealants and water-resistant grease to all components as necessary. This preventive maintenance prolongs the life expectancy of the bridge by several years by reducing corrosion and wear to the structure through exposure to salt, dirt and other contaminants. Most of these contracts are funded through Bridge Maintenance funds (FE02), which have not been increased for more than eight years.

Over the next 25 years, the KYTC will support continuing trends toward a decrease in the number of Poor bridges and an increase in those rated Good by being more proactive and devoting more resources to preventive maintenance. This will require an increase in bridge maintenance funds as well as more time and manpower devoted to routine bridge maintenance activities.

5.2.1-3.2 Culverts

Similar to bridges, culverts with a length of 20 feet or more are also inspected on a 24 month schedule by the KYTC. As of 2013, Kentucky had approximately 2,900 culverts on state and local roads that met the minimum standard for length requiring inspection. Through the biannual inspection process, culverts in Kentucky are also rated for overall condition. In 2013, 83 culverts (2.8%) were rated in Poor condition, 1540 (53.1%) in Fair condition, and 1280 (44.1%) in Good condition. **Figure 5.2.1 G** provides a graphical representation of the condition for both the bridges and the culverts in Kentucky in 2013.

“I think funding for maintenance of existing roadways and bridges should always have a higher priority than building new roads and bridges. It is also a problem when vehicles must sit at a red light for a full minute, or more, when no traffic is coming in the other direction. This increases the use of fuel, which in turn, increases the cost to the consumer of that fuel and increases pollution.”

Survey Participant,
Franklin County

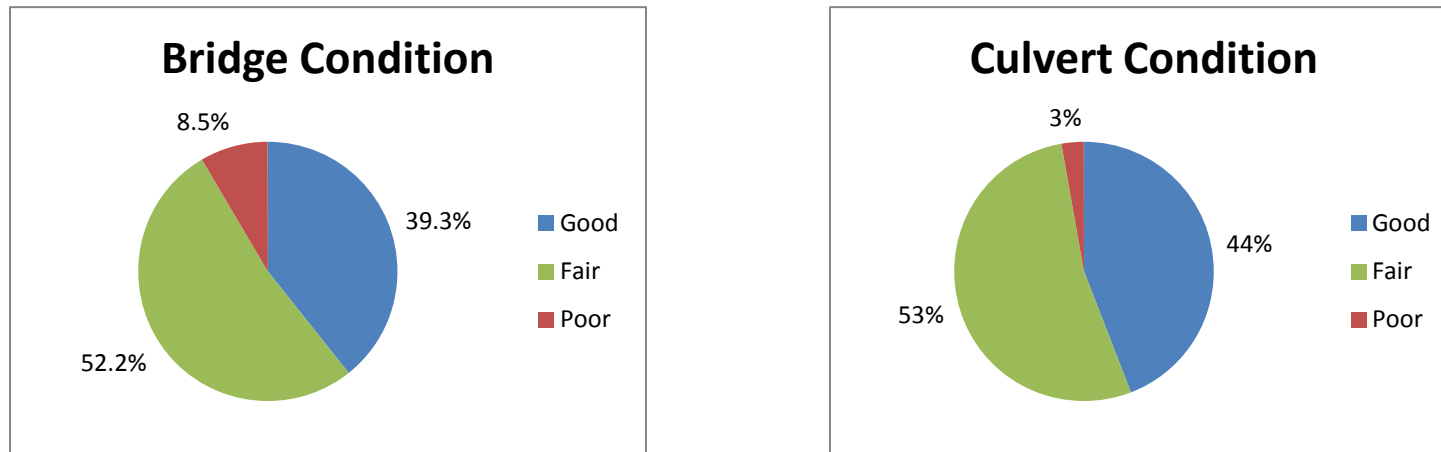


Figure 5.2.1 G - 2013 Bridge and Culvert Conditions in Kentucky

5.2.1-4 Signs, Signals, and Striping

Kentucky has adopted the *Manual on Uniform Traffic Control Devices* (MUTCD) as the standard for traffic control devices -- signs, signals and pavement markings -- along public highways. The purpose of the MUTCD is to provide uniformity to the meaning and application of traffic control devices across the nation.

5.2.1-4.1 Signs

Proper signage is an integral part of Kentucky's transportation system, with a primary purpose of guiding motorists to the desired destinations safely and effectively. The KYTC maintains an estimated 550,000 signs across the state to alert drivers to our state traffic laws, warn them of unexpected situations, and provide guidance and direction.

The Federal Highway Administration (FHWA) requires states to implement a system to ensure that regulatory and warning signs are legible at night. The KYTC has begun a process that will create an inventory, which includes signage and location, and has initiated the development of a deterioration model for signs based on sheeting type, color, orientation and age. Using these tools, the KYTC will be able to determine when signs must be replaced in order to maintain an acceptable level of retro-reflectivity.

"The proper maintenance of existing roads and infrastructure is paramount. Proper striping, surfaces, marking and signage should be maintained first. Improve roadway surface markings through greater use of reflectors and improved paints."

Survey Participant,
Fayette County

5.2.1-4.2 Signals

Traffic signals are a key component of the KYTC's efforts to manage congestion along our highway system. Over 3,200 traffic signals are currently installed along the state highway system. Approximately 70% of these devices are maintained by the KYTC with the remaining 30% maintained and operated by larger local governments (such as Metro Louisville and Lexington-Fayette Urban County Government (LFUCG)). At a replacement cost of approximately \$75,000 per device, these installations represent an investment value of approximately \$245,000,000.

In order to maximize the efficiency of traffic flow along certain corridors, many of our traffic signals have been incorporated into coordinated signal systems. Simply, a coordinated signal system is a group of nearby traffic signals that communicate with each other to provide favorable signal timings to motorists with the primary goal of moving traffic efficiently through a corridor or within a defined area. To this end, the KYTC currently maintains approximately 175 coordinated signal systems statewide.

The KYTC's current performance goal is to update coordinated signal system timing a minimum of once every three years to maximize efficiency of traffic operations through these critical areas. In addition, the KYTC can remotely communicate with 60% of the traffic signals statewide which allows the KYTC to address timing and other operational issues from our offices. Such communication and monitoring systems will become a more critical component in the operation and maintenance of traffic signals in the future as these systems reduce the amount of field work necessary for traffic signal system timing maintenance and decrease the amount of time that traffic signals are not operating as designed.

5.2.1-4.3 Pavement Markings

Like other traffic control devices, pavement markings provide guidance and information to the road user. In some cases, markings are used to supplement other traffic control devices and in other cases, by themselves to convey regulatory, guidance or warning messages. Under most conditions, markings provide important information while requiring minimal diversion of attention from the roadway. The most common pavement markings include lane and stop lines, crosswalk markings, crosshatching and arrow/word markings.

"Top priorities that I see are repairing/maintaining existing roads (fix potholes, etc. that could be dangerous) and maintain lighting/stripping for better vision at night."
Survey Participant,
Simpson County

Reflective beads are imbedded into pavement markings to make them more visible at night. The amount of light reflected back from vehicle headlights to the source is known as retro-reflectivity, one of the key characteristics associated with pavement marking performance. Currently, the KYTC ensures quality pavement markings through performance specifications which require minimum retro-reflectivity within an initial proving period. Beyond that period, markings are replaced as needed based on the recommendations of local engineers in the field. Factors that can negatively impact the long-term durability and performance of markings include material characteristics, traffic volumes, weather, snowplow activity and location. The KYTC continues to partner with the Kentucky Transportation Center (KTC) to evaluate pavement marking issues across the Commonwealth.

In recent years, the KYTC has predominantly used paint for long-line striping due to its low initial cost. In the future, however, more durable products may be used if the higher initial costs can be justified. By 2035, the KYTC will have more advanced pavement marking management systems that will help determine the appropriate marking material for specific sections of roadway based on projected costs, ensure performance and retro-reflectivity determine an appropriate replacement cycle based on past performance. These advanced systems will help ensure that the KYTC makes the best use of funds for pavement marking installation and maintenance.

5.2.1-4.4 Roadside Maintenance

In addition to signs, signals and pavement markings, the KYTC maintains the smaller elements of the roadside appurtenances through its Roadsides and Permitting functions.

Roadside maintenance broadly encompasses everything from the edge of pavement to the edge of right-of-way including vegetation, pipe inlets and outlets, rock cuts, fences, guardrail, weigh stations and rest areas. Maintaining each of these elements plays a role in the stability and preservation of Kentucky's highway network. In addition to their connection to overall system performance, FHWA requirements mandate

some of the operational aspects of our rest areas, weigh stations and roadside features.

As is the case with signs, the KYTC will have implemented a system by 2035 that identifies the location, condition and potential remaining service life of other assets that include pipes, guardrails and many

"Treat roads as something for everyone to access, as major, contributing elements to our cities and towns."

Survey Participant,
Jefferson County

other roadside features. This system will be used to establish funding needs and make more informed project decisions.

Another vital part of proper network maintenance is the regulation of what touches it, whether it is a residential driveway, a pipeline underneath or a utility line overhead — all of which fall under the Permitting function. The standards to which these are built can adversely affect the physical and/or operational condition of our network.

5.2.1-5 Enhancing Mobility

Kentucky's highway system is comprised of over 79,000 miles of public roads and streets, including nine interstate highways and nine state parkways. The KYTC maintains 27,500 miles or 67,000 lane miles of Kentucky's highway system, with the remaining 65 percent maintained by cities and counties. To keep Kentucky moving, the KYTC must address the issues of safety, congestion and freight movement.

"Kentucky roadways need to be improved and better maintained to promote public safety. Many roads in Kentucky were designed and built many years ago. Today there is more traffic traveling Kentucky roads and the roads are not suited or designed to accommodate the growing times of today."

Survey Participant,
Allen County

5.2.1-6 Safety

GOAL: Provide for the safe and secure movement of people and freight.

The Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), enacted by the federal government in 2006, established a requirement that each state develop a Strategic Highway Safety Plan (SHSP). The SHSP is a data-driven comprehensive plan, updated every four to five years, that integrates the four E's of transportation safety: enforcement, engineering, education, and emergency response.

Kentucky's Plan establishes statewide goals, objectives and key emphasis areas, developed in consultation with federal, state, local and private sector stakeholders, and outlines measurable strategic opportunities to reduce fatalities and serious injuries on state roadways. Kentucky's original 2006 SHSP dealt with safety issues including aggressive and impaired driving, commercial vehicle safety, Drive Smart safety corridors, incident management, roadway departure, occupant protection, young drivers, traffic records and legislative issues. The most recent federal highway authorization bill, Moving Ahead for Progress in the 21st Century (MAP-21), sets additional requirements that measure the Plan's performance and report on progress toward achieving its goals.

Kentucky roadway departure crashes accounted for over 70% of the roadway fatalities from 2006 to 2012, compared to national rates of just over 50%, leading to Kentucky's designation by the FHWA as a Roadway Departure focus state. During this same period, intersection-related crashes accounted for another 14% of roadway fatalities -- an average

of 112 per year -- and 25% of injury crashes. As a result of this data, roadway departure and intersection crashes are primary focus emphasis areas of the HSIP. HSIP funding closely reflects the significance of this data, with 66% of annual funding in Kentucky targeted to address roadway departure issues and 17% towards intersection safety improvements.

5.2.1-6.1 Enforcement

In 2005 statewide roadway fatalities stood at 985 and trends indicated an increase to as many as 1,200 by 2011. One of the KYTC's first efforts in support of the new 2006 SHSP was an endorsement of seat belt legislation that almost immediately reversed this trend line. The legislation assigned "primary" status to Kentucky's existing seat belt law, allowing law enforcement to cite drivers for a restraint violation even when no other violation existed. The law improved seat belt usage from 65% to 85% in the years since its passage, saving an estimated 2,000 lives and is represented graphically in **Figure 5.2.1 H**.

"Safety should be #1 priority. Fixing hazardous stretches of road whether they be blind curves or narrow heavily traveled roadways should be done statewide. Potholes should be attended to ASAP to avoid blowouts/bent wheels and to prevent some motorist from being stranded."

Survey Participant,
Rowan County

The Kentucky Office of Highway Safety (KOHS), a division of the KYTC, has recommended program funding of nearly \$3 million in federal FY 2014 to state and local agencies to be designated for increased enforcement throughout the Commonwealth. This included \$1,219,850 for impaired driving, \$354,800 for occupant protection and \$1,387,320 for speed control.

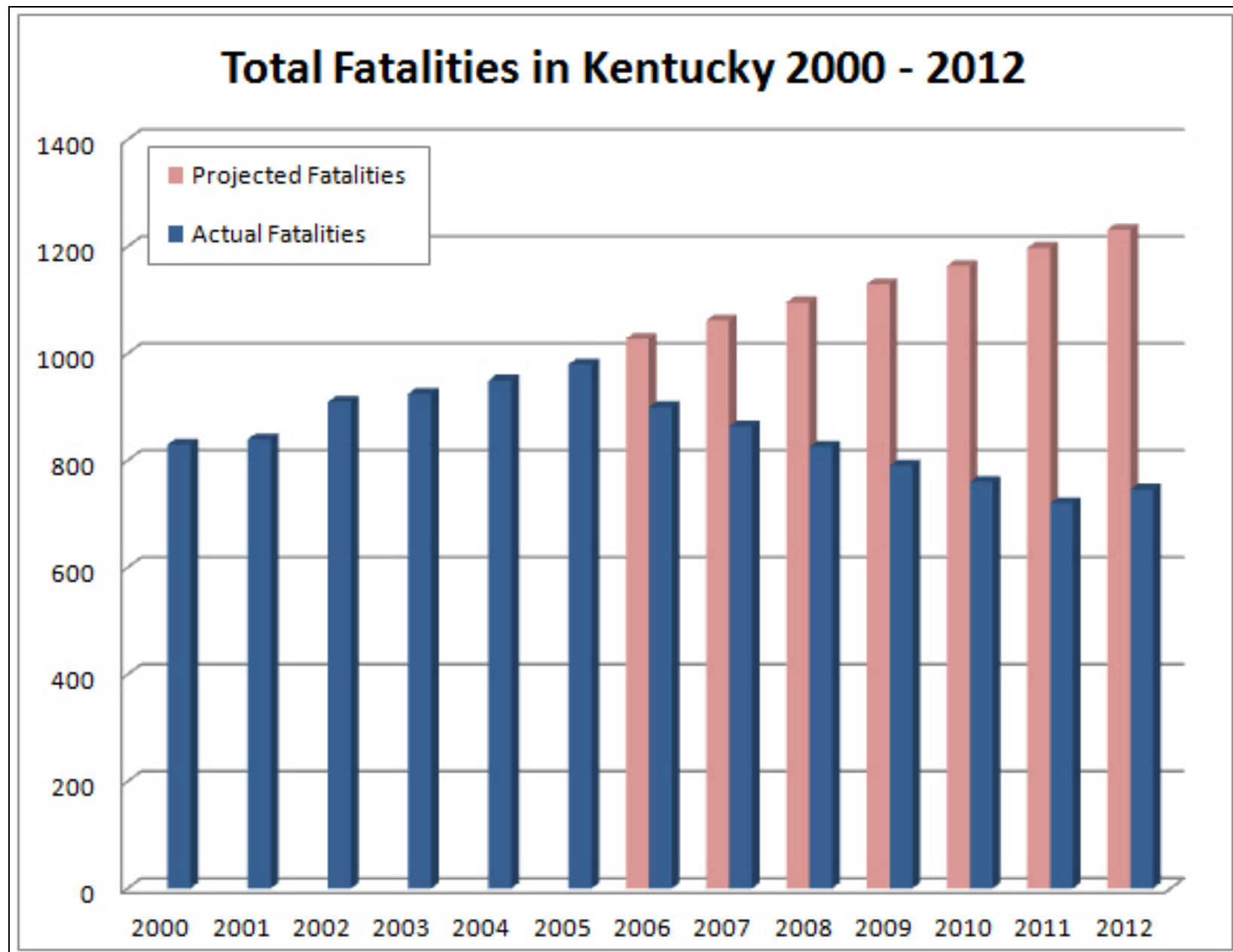


Figure 5.2.1 H - Total Highway Fatalities in Kentucky (2000-2012)

5.2.1-6.2 Engineering

The Highway Safety Improvement Program (HSIP) was established by SAFETEA-LU as a FHWA core program and included a significant increase in funding for infrastructure-related safety improvement projects. The HSIP requires a data-driven, strategic approach to improving safety on all public roads, focusing on performance consistent with the Strategic Highway Safety Plan (SHSP). Using information such as crash and roadway data, the HSIP prioritizes highway improvement projects that address specific crash types and patterns. HSIP uses targeted countermeasures that predict a significant return on funds invested in terms of crash reduction. Under MAP-21, HSIP funding to Kentucky has nearly doubled to a current level of nearly \$39 million per year, further reinforcing the importance of a data-driven spending program.

In 2009, the Towards Zero Deaths (TZD) initiative was developed by the American Association of State Highway and Transportation Officials (AASHTO), endorsed by the Governor's Highway Safety Association (GHSA), the Federal Highway Administration (FHWA), and adopted by several states, including Kentucky. The overall strategy of TZD is based on two elements: cultural change and building the foundation of safety. AASHTO has taken a lead role in the development of TZD, setting an overall goal of decreasing fatalities by 50% by 2030 – an attainable goal which will be adopted by the KYTC into its next SHSP.

The ultimate measure of the success of the HSIP and TZD initiatives will be a significant statewide decline in the number of fatalities, serious injuries and collisions. **Figure 5.2.1 I** graphically illustrates the history of collisions in Kentucky from 2000 through 2012.

5.2.1-6.3 Education

The Kentucky Office of Highway Safety provides programs throughout the Commonwealth, including videos, presentations and simulators, which educate Kentucky drivers about distracted, aggressive and impaired driving, seat belt safety, young and mature drivers, child passenger safety and more. Approximately \$1 million dollars is dedicated annually toward these efforts.

5.2.1-6.4 Emergency Response

Approximately \$4 million is annually dedicated by the KYTC to highway incident management and the Safety Assistance for Freeway Emergencies (SAFE) Patrol. The Division of Incident Management provides travel information to Kentucky's 511 traveler information system and alerts other agencies and cabinet officials when highway incidents occur. SAFE Patrol operators provide gas and oil, inflate or change flat tires, provide a "jump" for dead batteries and other minor automotive repairs to motorists on Kentucky roadways. They also assist law enforcement by directing traffic, removing roadway debris, monitor suspicious activity and tag abandoned vehicles.

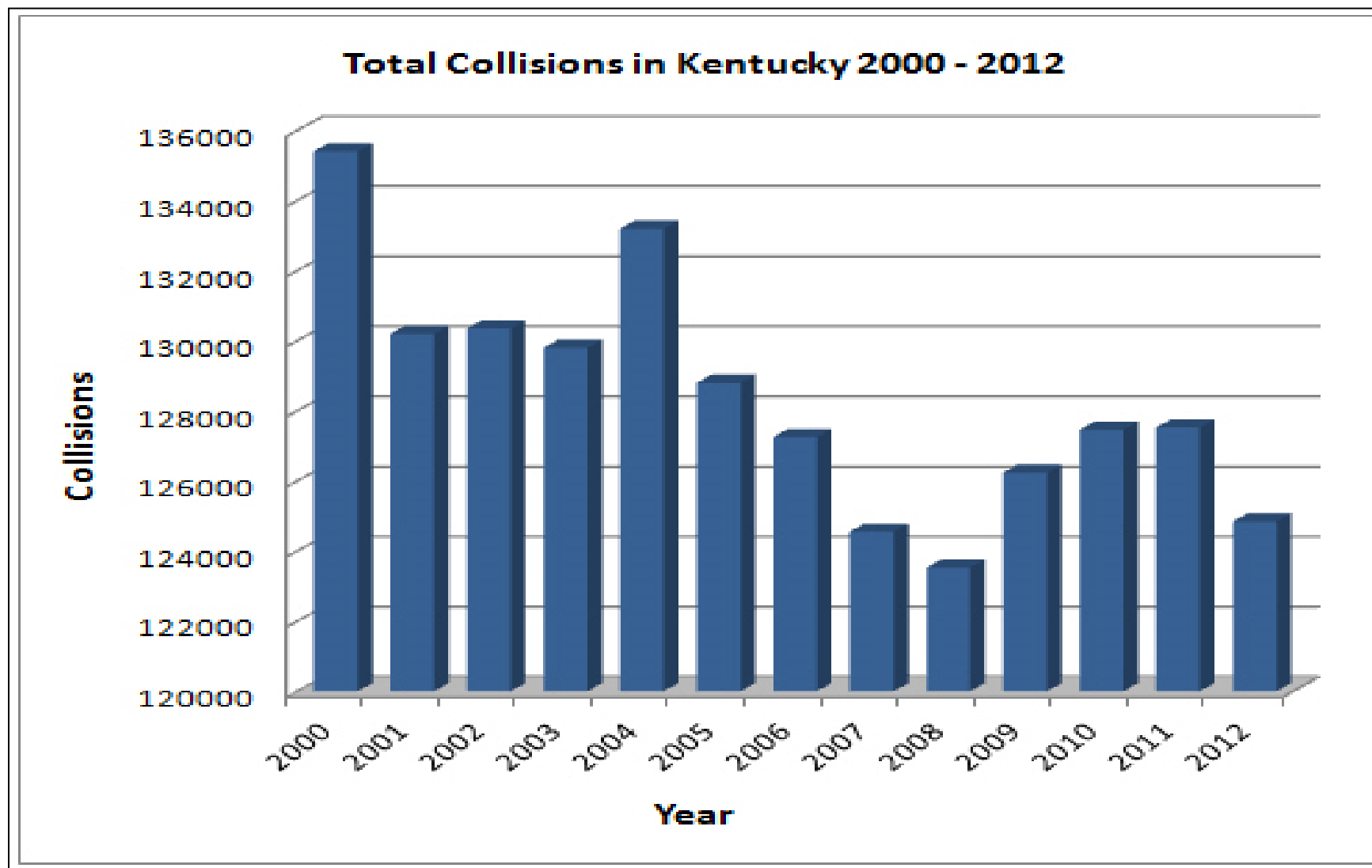


Figure 5.2.1 I - Total Highway Collisions in Kentucky (2000-2012)

5.2.1-6.5 Security

Improving safety and security remains the public's highest concern for Kentucky's transportation system. Coordination among all agencies is necessary to address the many factors related to improving safety and security. Some of those factors include: increasing the use of safety equipment, improving driver skills and driver awareness, improving road and pavement conditions, decreasing congestion through innovative traffic control methods, monitoring and addressing roadway conditions under inclement weather conditions, deployment of Intelligent Transportation Systems (ITS) to facilitate traffic flow, and increasing communication to the public. All of these factors also serve to increase the security of our transportation systems.

The KYTC is responsible for the aggressive management of transportation assets and the transportation infrastructure during a threat of, or immediately following, an emergency or disaster incident which is critical to the safety of all state residents and transients. This function includes providing for coordinated plans, policies, and actions of state and local

governments to ensure the access and safety of the public traveling on the transportation system during all hazards. Once the threat or hazard no longer exists, the KYTC is also responsible for prompt inspections of the transportation infrastructure and for facilitation of orderly re-entry into the area after an evacuation. Other missions may not involve evacuations, but are equally important. These may include responding to weather conditions, or re-routing traffic to protect travelers from hazardous material. Hazards requiring action by the KYTC include:

- Tornados
- Winter Storms
- Wildfires
- Flooding
- Dam Failure
- Hazardous Materials
- Earthquakes
- Weapons of Mass Destruction
- National Security Emergencies

5.2.1-7 Congestion

- **GOAL:** Provide a reliable transportation system that effectively and efficiently moves people and freight.
- **GOAL:** Provide reliable connectivity and access - locally, regionally, and globally - for people and freight.
- **GOAL:** Provide for the safe and secure movement of people and freight.

A major challenge facing the KYTC is lessening congestion and its effects on keeping Kentucky moving. Congestion can be an issue anywhere, whether it is a recurring event such as daily commuter traffic tie-ups or non-recurring due to crashes or weather conditions. It can create travel delays, negatively impact the economy and air quality and increase the potential for crashes. While it is unlikely that congestion can ever be eliminated, the KYTC continues to address the issue at every opportunity and seek innovative and cost-effective mitigation solutions wherever possible.

Traditional mitigation measures such as building new roads or adding traffic lanes may no longer provide the greatest value for the Commonwealth's transportation funds. Instead, the KYTC will better serve transportation system users by pursuing alternatives that expand capacity along currently established corridors and non-traditional options that result in fewer vehicles on the road network that will likely include technological advancements in both vehicle operation and transportation systems. The ultimate solution is a system where the road network, vehicles and users can effectively communicate with each other to improve efficiency.

Traffic signals are a key component of the KYTC efforts to manage congestion. To many, traffic signals are an ultimate remedy for traffic problems at intersections. However, unwarranted installations can actually adversely impact both the safety and efficiency of vehicular, bicycle and pedestrian traffic. As a result, the KYTC normally considers the

installation of traffic signal devices primarily when circumstances indicate that it may be difficult for road users to safely determine their own right-of-way. Even so, Kentucky's state highway system includes over 3,200 traffic signals. Approximately 70% of these devices are maintained by the KYTC, with the remaining 30% falling under the authority of Kentucky's larger cities like Louisville and Lexington.

In order to maximize the efficiency of traffic flow along certain corridors, many signals have been incorporated into coordinated systems. These systems enable traffic signals in close proximity to communicate with each other to provide favorable signal timings that move traffic efficiently through a corridor or within a defined area. About 175 coordinated signal systems are currently maintained by the KYTC statewide.

The KYTC performance goal is to update signal system timing at least once every three years to maximize efficiency through these critical areas. The KYTC also communicates with 60% of the traffic signals statewide, enabling remote monitoring of discrepancies in timing and other operational issues, reducing the amount of field work necessary and dramatically decreasing the amount of time that traffic signals are not operating as designed.

The use of Intelligent Transportation Systems (ITS) and coordinated weather response are other strategies for dealing with congestion along the highway network. ITS is a broad

term referring to many of the electronic devices along our highways. These interconnected devices provide real-time traffic flow information to the KYTC, which is in turn relayed to the traveling public via electronic signs along the roadway, the 511 telephone system, the KYTC website and various media outlets. By 2035, however, direct communication between the sensors and vehicles is expected to be commonplace.

The National ITS Architecture was used as a guide to update Kentucky's Statewide ITS Architecture. National ITS Architecture defines the components of the surface transportation system, how they interact and work together, and what information they exchange to provide ITS services. It includes much of the upfront analysis and planning information necessary to deploy ITS including project definition and requirements, information exchange requirements, system evaluation criteria, cost development information, communications analysis and the benefits of deployment of specific ITS applications. National ITS Architecture recommendations and projects were mapped against the goals in Kentucky's ITS Strategic Plan to determine which were most directly associated with

"The double crossover interchange...implemented at the Harrodsburg/New Circle intersection greatly reduces congestion and makes the area safer...Inventive solutions such as this should be researched and implemented across the state."

Survey Participant,
Jessamine County

accomplishing those goals, and specific project recommendations were developed. An update of Kentucky's Statewide ITS Architecture was completed in 2014.

Among the most visible of the KYTC ITS programs and projects are several operational freeway traffic management centers. These centers use digital message signs, cameras,

511, the Highway Advisory Radio System (HARS), pavement sensors, weather stations, and the Safety Assistance for Freeway Emergencies (SAFE) Patrol to improve traffic conditions and safety along Kentucky highways.

Coordinated weather responses bring the KYTC crews on duty during the most severe weather to ensure that the traveling public remains safe and emergency crews can operate effectively. During the winter months, the KYTC crews are supplemented by contractor forces to ensure that roads are addressed in a timely fashion. The state-maintained system is prioritized so that highly-traveled and emergency routes are kept as clear as possible while lower priority roads are treated as staffing allows. The KYTC spends approximately \$30 million annually on salt and other chemicals, contractors, equipment and employee overtime pay to keep Kentucky's road network operational during winter storms.

The KYTC web-based "Congestion Toolbox" identifies additional strategies and technologies to address moving traffic more efficiently (<http://transportation.ky.gov/Congestion-Toolbox/Pages/default.aspx>). In addition to more traditional solutions, the toolbox includes innovative ideas like the double crossover diamond interchange, in which both directions of traffic on an interchange crossroad move to the opposite side of the roadway, facilitating left-turn movements onto the freeway. The newly constructed interchange at Harrodsburg Road with New Circle Road in Lexington is an example of this innovative alignment. Single point urban interchanges, where all turns are made from a single traffic signal centered in the overpass, have been installed at several interchanges across the state. Reconstruction of intersections into roundabouts is yet another option, in which a circular intersection is created around a central island, slowing traffic and moving it in a single direction to multiple intersections.

A congestion mitigation strategy often overlooked is simply reducing the number of vehicles on the road. For example, water transport of freight is the most fuel-efficient method of transportation, and a single 15-barge tow can carry as much as nearly 900 trucks, while a standard unit railroad train can transport as much freight as almost 400 trucks.

The number of personal vehicles may also be reduced by encouraging businesses to permit flexible or non-standard work schedules, which would not necessarily reduce the number of vehicles but would distribute traffic flow on the system over a wider period of time. Encouraging an increase in telecommuting and improving pedestrian and cycling facilities would also help reduce the total number of system users.

5.2.1-8 Freight Movement

- **GOAL:** Ensure that the process which develops and maintains the transportation system considers the dependable access to markets, jobs, and resources.
- **GOAL:** Provide reliable connectivity and access - locally, regionally, and globally - for people and freight.
- **GOAL:** Provide for the safe and secure movement of people and freight.

Kentucky is ideally located near the center of the country and along major national freight corridors for carrying goods and commodities by highway, rail, river and air. These major corridors provide reliable local, regional and global access for people and freight crucial to the current and future economy of the state. Freight movements benefit not only the businesses being served but also the transportation, warehousing and logistics industries providing the service as well as the local economies of the areas in which they are located. As a crucial element of economic development,

availability of an effective freight network provides a direct benefit to the Commonwealth, its residents and businesses.

Most of Kentucky's freight activity takes place on a regional basis, originating both within and from surrounding states, and requires regional and multi-state cooperation to produce the most efficient and effective transportation system possible. For example, the air cargo facility for Cincinnati, Ohio is physically located at the Cincinnati/Northern KY airport in Hebron, Kentucky. As a result, planning in the area must include both states as well as the Ohio Kentucky Indiana Regional Council of Governments (OKI). Additional partners with the KYTC in freight planning activities include local Metropolitan Planning Organizations (MPOs), regional Area Development Districts (ADDs), and freight planners from surrounding states.

Trucks move about 70% of freight (aka goods) flow, by value, through Kentucky. Because they carry the largest share of freight, the trucks are very visible and the public often expresses a desire for freight to be shifted to the other modes whenever possible. **Figure 5.2.1 J** provides a graphical representation for the movement of freight via tonnage through various modes throughout the nation for 2011, while **Figure 5.2.1 K** illustrates the movement of freight nationwide along the National Highway Network (NHN) by truck. Since trucking provides such a large economic benefit to the economy, it is not reasonable to completely remove them from highways. We must always keep in mind that regardless of the trip our goods take, they all start with a truck and end with a truck.

"The Commonwealth should look toward the future for development of transportation facilities and services. I feel that river and rail freight/cargo transportation systems will be of increasing importance due to the economics of these types of transportation."

Survey Participant,
Floyd County

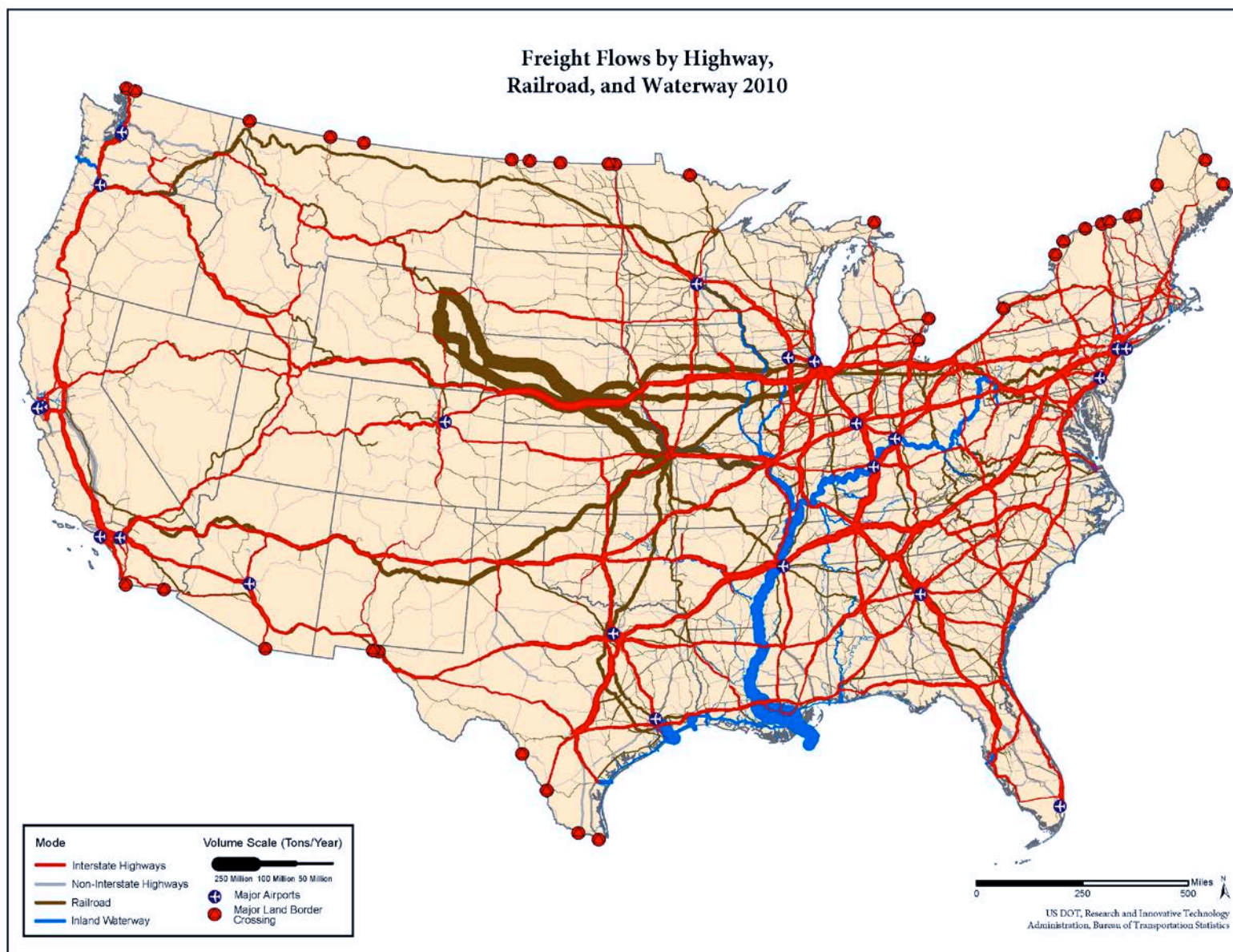
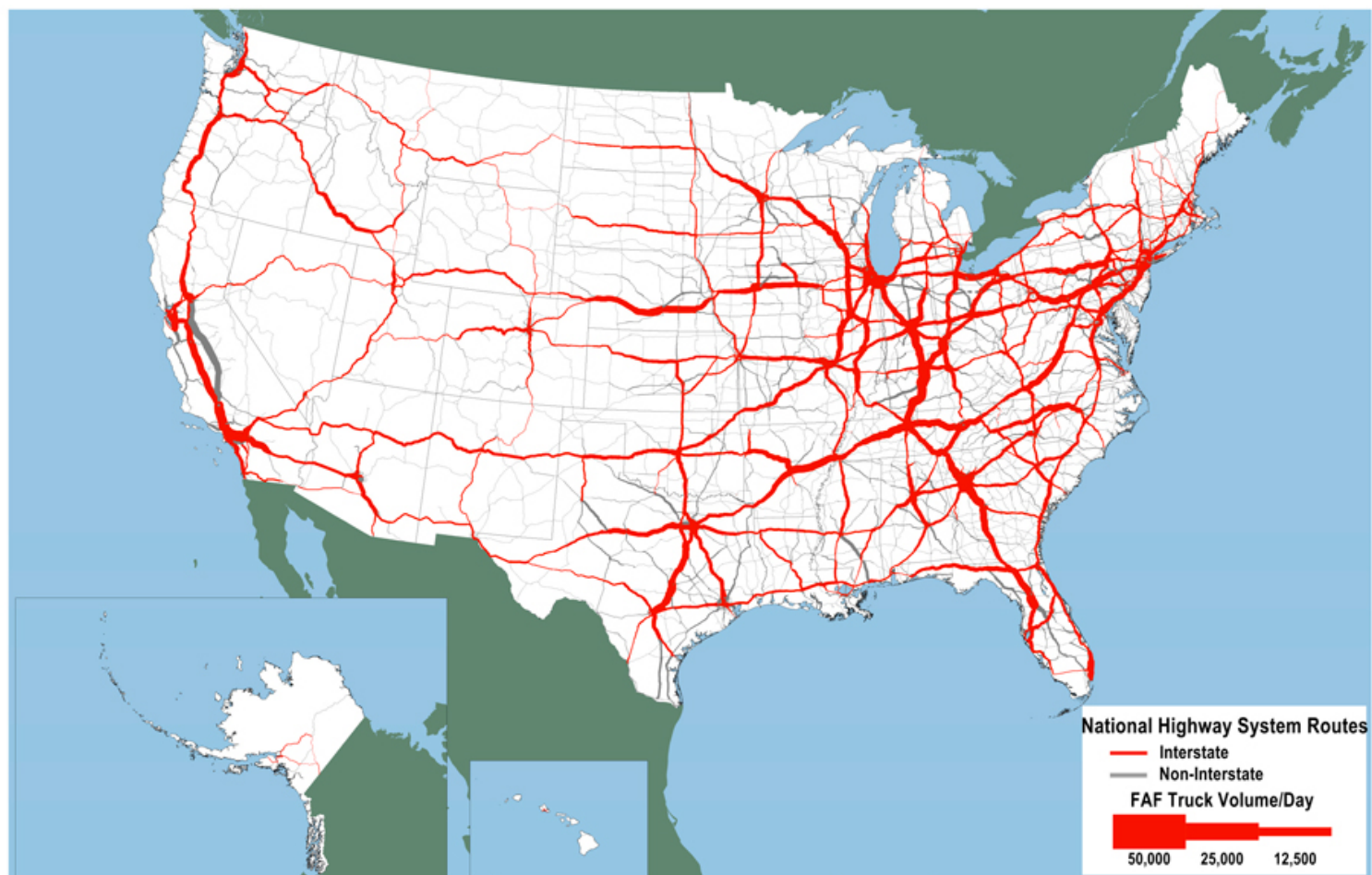


Figure 5.2.1 J – 2010 National Freight Movement by tonnage on Highways, Railways and Inland Waterways

Average Daily Long-Haul Freight Truck Traffic on the National Highway System: 2007



Note: Long-haul freight trucks typically serve locations at least 50 miles apart, excluding trucks that are used in movements by multiple modes and mail.
 Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 3.4, 2012.

Figure 5.2.1 K – Long Haul Freight Movement on National Highway Network by Truck in 2007

Figure 5.2.1 L shows the movement of goods by truck with Kentucky composing at least a portion of the freight route as part of the National Freight Analysis Framework (FAF). The KYTC does continue to strive, however, to encourage use of all modes of transportation in the transfer of our goods.

Rail cars carry about 8% of Kentucky freight value but 26% of freight tonnage over some 2,500 miles of track across the state. While much of that freight is coal, products shipped by rail in Kentucky also include new automobiles, aluminum, grain, chemicals and peanut products. Kentucky's waterways are also a great transportation resource. More than 25% of the nation's waterborne commerce is shipped on the Ohio River, which flows along the state's northern boundary. The Mississippi River on Kentucky's western border connects the state to deep-water ocean ports. Kentucky's seven riverports provide services for transfers of commodities between barges and trucks or rail cars for more local transportation. Kentucky ranks third in the nation in total air cargo shipments as a result of the freight sorting and distribution centers at the Louisville and Cincinnati/Northern KY airports.

Kentucky's Constitution requires Highway Funds to be spent only on roadways. With this in mind, the selection of specific freight transportation modes to be used by the private sector for improvements is an economically driven private sector decision. This decision to utilize a particular mode of transportation is made collaboratively by shipping

corporations and their customers. The KYTC can, however, play a part in improving access to freight facilities through its process of identifying roadway improvements.

As part of its MAP-21 reauthorization, Congress recognized the importance of a strong freight network to ensure competitiveness in the global economy. Freight goals include reducing congestion, increasing productivity and economic efficiency and improving safety, security and resilience. MAP-21 provides incentives to prioritize freight movement highway projects by increasing the federal share of funding for freight-related projects and only funding those projects identified in state freight plans. The Kentucky Statewide Intermodal Freight Plan, created in 2006 and updated in 2007, focuses on addressing highway congestion and bottlenecks while promoting other transportation modes to divert freight traffic from highways. The Plan can be accessed at <http://transportation.ky.gov/planning/documents/Freight%20Plan%20Extended%208%202007.pdf>. An update to the Plan is currently underway, with anticipated completion in the fall of 2015 that will include goals for maintaining and promoting intermodal programs throughout the state.

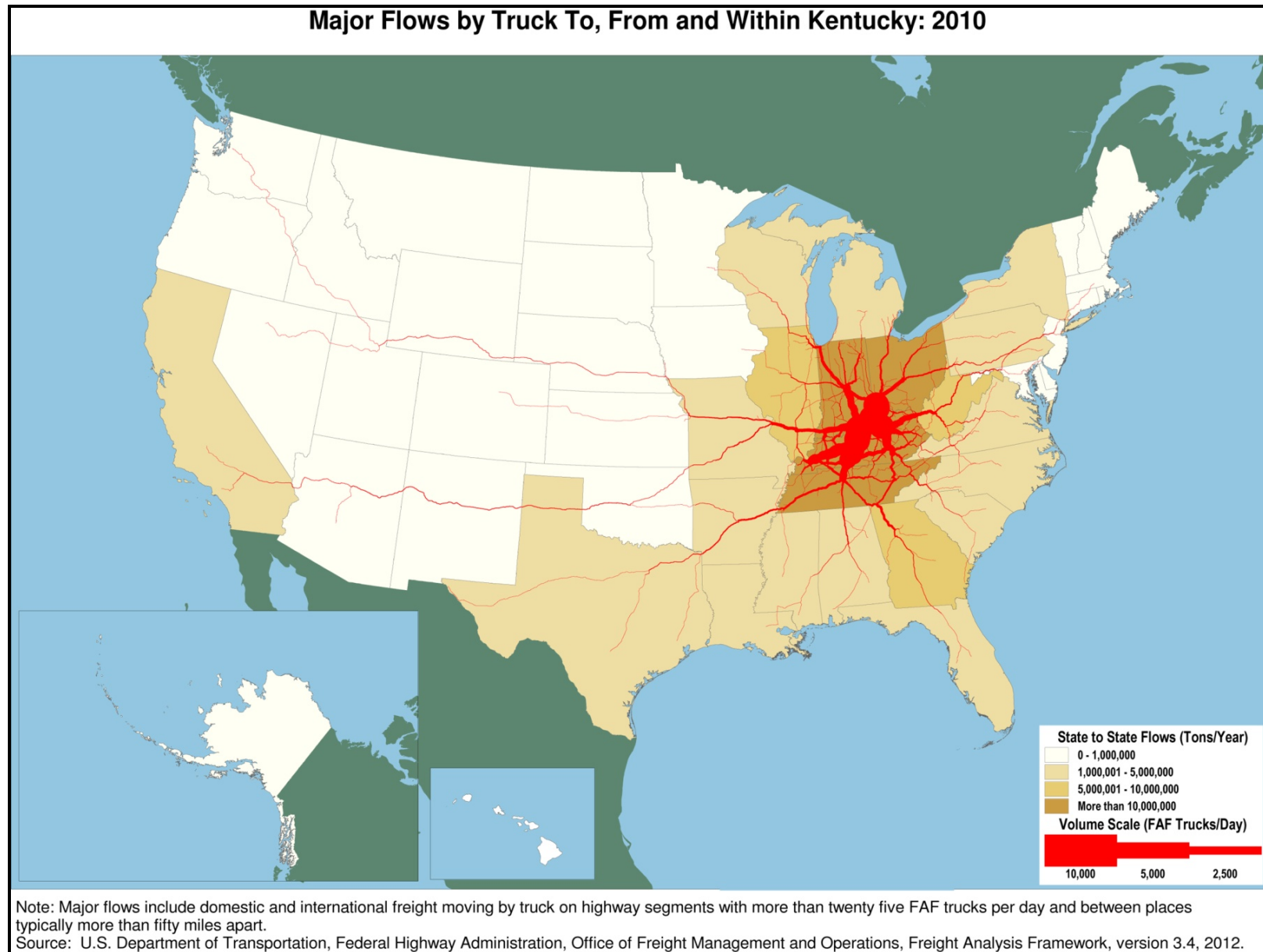


Figure 5.2.1 L – National Freight (Goods) Routing to, from and through Kentucky via Truck