CHAPTER I
Purpose and Need

The Missouri Department of Transportation and the Federal Highway Administration propose improving the Interstate 70 Corridor in Missouri, between the metropolitan areas of Kansas City and St. Louis, to meet the current and future needs of this highly important transportation facility. To facilitate this action, MoDOT has initiated this First Tier Environmental Impact Statement as the first step to fulfill this goal.

This chapter of the First Tier EIS provides an overview and description of the corridor, as well as identifies the transportation problems in the I-70 corridor, which would be addressed by the proposed project.

A. Project Overview

1. I-70 BACKGROUND

On June 29, 1956, President Dwight D. Eisenhower signed the Federal Aid Highway Act of 1956. The Interstate Highway System, also known as the Eisenhower System of Interstate and Defense Highways, is an interconnection of 45,500 miles of limited-access highways across the United States. One of the most significant of these highways is I-70, which in part provides east-west transcontinental interstate access. (A more detailed description of the history of the Interstate system and I-70 is presented in Chapter III, B. Natural Environment, 8. Historic and Archeological Resources.)

According to some reports[1], I-70 is the first Interstate highway in the United States. In August 1956, just a few weeks after President Eisenhower signed the legislation creating the Interstate Highway System, the Missouri State Highway Commission awarded the first contract on the construction of I-70. Construction of I-70 continued for another nine years and now spans a distance of more than 250 miles across the state.

Other than short reconstructed portions, the newest sections of I-70 are 36 years old. With proper maintenance provided by MoDOT, the facility has outlasted its original design life of 20 years and has carried traffic volumes of both cars and heavy trucks that have far exceeded the expectations of the original designers.

2. PROJECT HISTORY

In 1999, MoDOT conducted the *Route I-70 Feasibility Study* to document the existing condition and needs of I-70. The purpose of the Feasibility Study was to project the future needs of the facility, to analyze possible solutions, and to make recommendations on the most feasible course(s) of action to address these needs over the next several years. An objective of the

[1] Public Roads On-Line, “Three States Claim First Interstate Highway”, Summer, 1996

Feasibility Study was to investigate any deficiencies in the existing interstate that would influence future operations, maintenance or construction.

To accomplish that goal, the Feasibility Study completed a detailed analysis of the existing facility and parallel routes. Physical and operational features of the interstate route were reviewed along with the characteristics of its function. A number of possible strategies to resolve the issues associated with the current facility were defined and discussed. One involved adding capacity to the existing facility, while a second strategy involved building a new, parallel interstate facility. However, while these two strategies were identified as being feasible based on initial assessments, it was recommended that more detailed and comprehensive engineering and environmental investigations be conducted. As a result, MoDOT initiated this First Tier EIS for the I-70 Corridor.

The tiering approach complies with NEPA and is fully consistent with the requirements and spirit of the Council on Environmental Quality regulations implementing the procedural provisions of NEPA. The desired outcome of this first tier EIS is to have enough public, community and agency involvement and consensus that a decision can be made as to the direction MoDOT should take for making improvements to the I-70 Corridor. This First Tier EIS will declare a preferred strategy and will evaluate several conceptual corridors within that strategy. Preparing this First Tier EIS for the entire 199-mile corridor will allow MoDOT to address portions of the Corridor, based on independent utility and logical termini, for second tier documents. The second tier process will likely consist of several documents, concentrating initially on those portions of I-70 which have the highest priority.

A number of strategies were developed in consultation with various resource agencies. This First Tier EIS complies with the CEQ regulations that require an evaluation of a range of reasonable strategies that would potentially satisfy the purpose and need of the proposed project.

A number of decisions will be made in collaboration with the resource agencies in the development of this project. The major ones include; purpose and need of the project; strategies to be carried forward; the preferred strategy; Draft EIS; selected strategy and a Final EIS. Chapter III, Affected Environment and Chapter IV, Environmental Consequences, address and evaluate environmental issues and areas of concern identified through the scoping process and the collaborative decision-making process.

3. MISSOURI LONG-RANGE TRANSPORTATION PLAN

MoDOT has recently completed a statewide, multimodal, Long-Range Transportation Plan to provide direction and focus to the current maintenance and future development of Missouri's transportation infrastructure. The long-range plan investigated both personal and freight transportation needs in the state. It included an examination of aviation, rail (freight and passenger), ports, pedestrian, bicycle, public transportation (urban, rural and intercity) and highway bridges. The resulting data and analysis from the study provided MoDOT with the information necessary to identify, define and prioritize future investments made in the state's transportation infrastructure.

(Expand on priorities, MOTIS, and others.)

The I-70 First Tier EIS project contributed to the development of the Long-Range Transportation Plan. Information provided to the Long-Range Transportation Plan included I-70 traffic, freight flow and pavement condition information. The I-70 First Tier EIS also identified the initial results of public input on the First Tier EIS process, the recommended preferred strategy resulting from the initial phase of the study and the priorities that have been defined for the maintenance and enhancement of the I-70 Corridor. This input has allowed MoDOT to include the needs and initial recommendations of the I-70 First Tier EIS in the Long-Range Transportation Plan and develop preliminary estimates for improvements in consideration with the transportation needs of the state as a whole.

B. Project Background Information

1. REGIONAL TRANSPORTATION SYSTEM

a. Roadway System

Interstate routes carry 38 percent of the total traffic volume in Missouri, while the actual interstate roadway mileage accounts for less than four percent of the state highway system. I-70 is a vital part of the interstate system. Within Missouri, I-70 connects the metropolitan areas of St. Louis, Columbia and Kansas City. In rural Missouri, I-70 carries more traffic daily than any other route.

Approximately 50 miles to the north, US 36 parallels I-70. US 36 in Missouri extends between Hannibal on the east and St. Joseph on the west. In Illinois, US 36 has become I-72, which continues to Champaign, Ill. Through Hannibal in Missouri, US 36 is marked as future I-72. To the south, US 50 also parallels I-70. US 50 is located 10 to 35 miles to the south and also connects the St. Louis and Kansas City metropolitan areas.

I-70 intersects a number of major interstate facilities in Missouri, though all are located in the metropolitan areas of Kansas City and St. Louis. These routes include I-29, I-35, I-435, I-470, all located in Kansas City, and I-270, I-170, I-64 and I-55 in St. Louis. Other major roadways accessed from I-70 include US 71 in Jackson County, US 65 in Saline County, US 63 in Boone County, US 54 in Callaway County, US 61 in St. Charles County, and US 67 in St. Louis County.

b. Rail System

The freight railroad system in Missouri consists of 4,396 mainline miles of track. Kansas City and St. Louis have the second and third largest rail hubs in the United States, respectively. Freight rail service is provided on a number of tracks between St. Louis and Kansas City.

AMTRAK operates rail passenger service between Kansas City and St. Louis. Two round trips are provided daily. AMTRAK stations are located at Kansas City, Independence, Lee’s Summit, Warrensburg, Sedalia, Jefferson City, Hermann, Washington, Kirkwood and St. Louis. MoDOT is also participating in the Midwest Regional Rail Initiative – an effort to develop a business plan for a Chicago-hubbed regional passenger rail system, in Illinois, Indiana, Michigan, Minnesota, Missouri, Nebraska, Ohio and Wisconsin. This system uses existing track shared with freight and commuter trains.

Current Amtrak routes are shared with freight operations and therefore limited to 55 to 60 mph, due to track geometry and equipment. The next step would be to upgrade to 80 mph or FRA Class IV, this would take an investment in both track replacement and equipment. Improving speeds to 110mph will require a heavy capital investment. Speeds beyond 110 mph require that all crossings be grade-separated, costing as much as $2.5 million each.

c. Other Elements

Statewide travel of passengers and freight also occurs via bus, air and water modes of transportation. Intercity bus transportation is provided by Greyhound on I-70 and serves the major communities located along this route. Air travel is provided by a number of carriers between St. Louis and Kansas City. The total air transportation system in Missouri consists of the two major commercial airports in Kansas City and St. Louis and four regional commercial airports (Springfield, Columbia, Joplin and Cape Girardeau). The Missouri River is defined as a navigable waterway for its entire length through the state. The following ports are located on the Missouri River: St. Joseph Regional, Kansas City, Jackson County, Howard/Cooper County Regional and St. Charles County. Many of these ports serve intermodal functions providing an interface between barge, rail and truck transportation.

2. EXISTING I-70

Interstate 70 is one of the nation's longest interstate routes, running east west through the center of the United States. Interstate 70 begins in Baltimore, Md., and ends at Interstate 15 (I-15) in Utah, crossing through 10 states. Interstate 70 connects the cities of Baltimore, Pittsburgh, Columbus, Indianapolis. St Louis, Kansas City and Denver. In Missouri, I-70 bisects the state, connecting St. Louis on the east with Kansas City on the west.

Missouri's 251 miles of I-70 were completed in 1965. Between Route 7 in Jackson County and the Lake St. Louis exit in St. Charles County, I-70 is a four-lane divided freeway. The lanes are 12 feet wide, with 10-foot or 12-foot outside shoulders and four-foot or six-foot inside shoulders. Through most of Missouri, I-70 has a 40-foot grass median. The areas where the median width varies from 40 feet occur mainly where old US 40 was used for two lanes of the interstate. In these areas the median width is variable, but it is always wider than 40 feet. Through Columbia, Warrenton, Wright City, and Wentzville and across the Missouri River, the median is closed with a median barrier.

3. ANTICIPATED IMPROVEMENTS

A number of projects are either planned or are reasonably foreseeable that would have an impact on the I-70 Study Corridor. These projects are not limited to those that are included in the Missouri State Transportation Improvement Program, but rather reflect the reasonably anticipated long-range improvements to the various corridors outside of the I-70 Corridor. The roadways could be improved by 2030 (the First Tier EIS design year), although funding is not programmed at this time and the roadways are not identified as priorities on MoDOT's Mid-Range Plan. Inclusion in this list does not imply a commitment by MoDOT that construction of these improvements will occur prior to 2030. Rather, this list is based on needs identified and solutions proposed in either ongoing or completed studies for these projects. These assumed improvements establish a baseline condition for this First Tier EIS. The anticipated and assumed improvements include:

Major East-West Corridors:

- **US 36** - Widened and improved to a four-lane expressway for its entire length between I-29 and the Mississippi River. It has been proposed that US 36 be designated as I-72 but no action has been taken in this regard and no timetable established.

- **US 40** - Improved to an eight-lane or six-lane freeway from Downtown St. Louis to Route DD and then four lanes to connection with I-70.

- **US 50** - Widened and improved to a four-lane highway to provide a freeway or expressway facility from I-435 in Kansas City to I-44 located southwest of St. Louis.

Major North-South Corridors:

- **Route 13** - Four-lane highway from Springfield to Richmond.
- **US 65** – Four-lane highway from Arkansas to Trenton.
- **US 63** - Four-lane highway from West Plains to Kirksville.
- **US 54** – Four-lane highway from Camdenton to US 61.
- **Route 19** – Four-lane highway from US 54 to US 61.

4. PROPOSED ACTION

The corridor for the I-70 improvements has been generally defined as a 10-mile-wide band centered along the existing alignment of I-70 and extending from the I-470 interchange in Kansas City to the Lake St. Louis interchange, Exit 214. For most of this length, I-70 is a four-lane divided, fully access-controlled interstate facility. The project length is approximately 199 miles. The proposed action is to seek the most effective approach to improving I-70 in Missouri, including the development of alternative strategies, which when implemented will meet the future needs of this highly important corridor in Missouri. The I-70 study corridor is shown in Exhibit 1-1.

C. Purpose and Need

The goal of I-70 improvements between Kansas City and St. Louis is to provide a safe, efficient, environmentally sound and cost-effective transportation facility that responds to the needs of the Study Corridor in addition to the expectations of a nationally important interstate. The specific purpose and need for this project can be summarized as follows:

- **Roadway Capacity** – Increase roadway system capacity in accordance with the projected travel demands to improve the general operating conditions of I-70.
- **Traffic Safety** – Reduce the number and severity of traffic-related accidents occurring along I-70 between Kansas City and St. Louis.
- **Roadway Design Features** – Upgrade current roadway design features along I-70, including interchanges, roadway alignment and roadway cross sections.
- **System Preservation** – Preserve the existing I-70 facility through continued and ongoing maintenance activities.
- **Goods Movement** – Improve the efficiency of freight movement using I-70.
- **Access to Recreational Facilities** – Facilitate the usage by motorists of nearby regional recreational facilities through improved accessibility.

Each of these specific needs is discussed in the following sections. The ordering of these specific needs is not intended to imply any relative prioritization or order of importance. Furthermore, the numbering of the individual needs of the I-70 Study Corridor is not intended to replace the findings of the Missouri Long-Range Transportation Plan regarding the prioritization of MoDOT's statewide needs.

1. ROADWAY CAPACITY

a. Traffic Trends on I-70

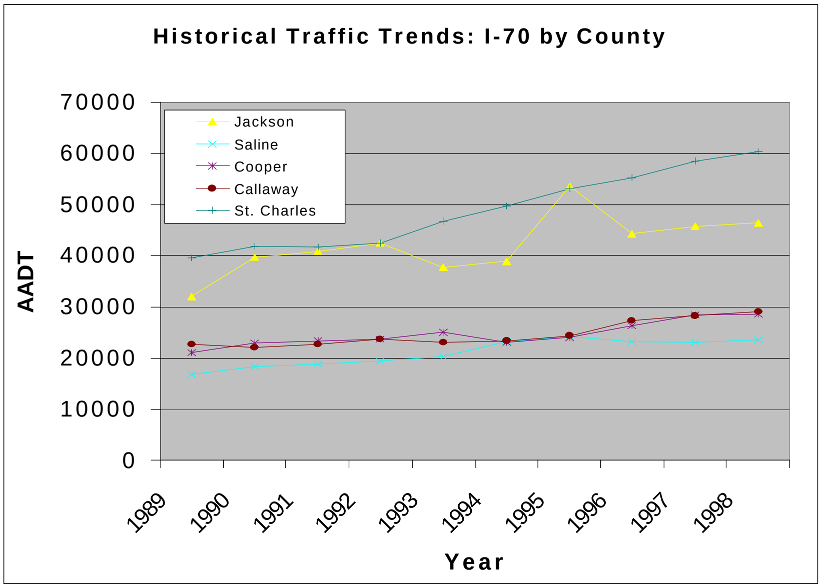
Traffic on I-70 has been continually increasing with time. An examination of average annual daily traffic, from an historical perspective indicates there have been fluctuations in traffic volumes from year to year at most locations. These differences could be due to construction or opening of new roadways or other unknown conditions that cause a diversion of traffic to or away from I-70. Table I-1 represents a 10-year history for five counties in which MoDOT maintains annual traffic counts on I-70 between Exit 15 (I-470) and Exit 214 (Lake St. Louis), the study limits. These trends are presented graphically in Figure I-1. The counter locations are:

County	Counter Location
Jackson	I-70 at Route 7
Saline	I-70 at Route 127
Cooper	I-70 at Route 87
Callaway	I-70 at US 54
St. Charles	I-70 at US 40/61

Table I-1: I-70 Historical Average Annual Daily Traffic (AADT)

	Traffic Volume (AADT) by Year									
County	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Jackson	104,500	96,100	96,600	100,100	108,700	111,700	106,200	116,300	118,700	121,800
Saline	17,900	18,700	19,100	20,000	20,600	21,000	22,200	22,600	23,100	23,400
Cooper	21,000	22,900	23,400	23,800	24,100	23,000	24,100	26,400	28,400	28,600
Callaway	22,700	22,100	22,700	23,600	23,000	23,400	21,400	27,300	28,300	29,000
St. Charles	39,500	41,900	41,600	42,500	46,700	49,700	53,100	55,200	58,500	60,300

Figure I-1: I-70 Historical Traffic Trends (at Counter Locations)



Using I-70 traffic data published on MoDOT's statewide traffic count maps, annual traffic growth trends along the entire Study Corridor were investigated. The urbanized areas near Kansas City and St. Louis exhibit a greater average annual percent growth than do the rural sections of I-70. In Jackson County, traffic counts for the 12-year period from 1987 to 1998 indicate that the average annual percent growth has been 6.5 percent per year. At the easterly limit of the Study Corridor, the growth in AADT averaged 5.9 percent per year for the same 12-year period. Comparatively, available AADT's along the rural areas through which I-70 passes generally indicate a variety of average annual growth rates. In the area of the Boone County-Callaway County line, AADT's exhibit a significantly lower rate of average annual growth at 1.0 percent per year.

b. Travel Markets

To better understand the travel characteristics of the Study Corridor and the cause of transportation-related problems along I-70, a review of the Corridor's travel markets was performed. Travel markets are defined as the generalized travel patterns, in terms of trip attractions and productions, for aggregated traffic analysis zones. Utilizing the trip origination and destination data from the Statewide Travel Demand Forecasting Model for the 1997 and 2030 scenarios, travel to and from the Corridor's analysis zones was aggregated into four major subareas. These four subareas were defined to determine, in general, how the majority of travel to and from the Study Corridor is oriented. These four subareas are comprised of Kansas City, Columbia, Jefferson City and St. Louis. By knowing the general travel patterns of the Study Corridor and the forecasted growth markets, determinations can then be made regarding the cause of transportation problems, and the viability of improvement concepts to serve the current and emerging markets.

The following summary provides the results of the market analysis. As shown, travel to, from and within the Study Corridor between the major trip generation areas is expected to grow measurably in the future. Travel between Kansas City and St. Louis is the predominate travel market between the four subareas. Daily travel between Kansas City and St. Louis, not including air travel, is expected to increase at an average annual rate of 2.8% per year.

	Daily Trips	
	1997	2030
• Kansas City and St. Louis	5,850	11,600
• Kansas City and Columbia	1,700	5,150
• Kansas City and Jefferson City	650	1,500
• Columbia and St. Louis	3,000	6,150
• Columbia and Jefferson City	5,600	7,550
• Jefferson City and St. Louis	1,200	2,050

Travel Between these areas and areas external to the state are summarized as follows:

	Daily Trips	
	1997	2030
• Kansas City	111,900	251,500
• Columbia	400	1,000
• Jefferson City	200	350
• St. Louis	169,900	374,900

In the base year (1997), approximately 8,300 daily trips travel through the state on I-70. Forecasts indicate that by 2030, the external to external travel along I-70 will be approximately 15,000 trips per day.

c. Missouri Statewide Travel Demand Model

MoDOT's statewide travel demand model is the source of traffic data for most of the analysis conducted for the I-70 Corridor Improvement Study. To enable the reader to understand the basis for travel forecasts and testing of alternative strategies, a summary of the model process, its inputs and outputs, and the associated operations analysis.

Travel demand forecasting is a four-step process that addresses questions such as:

- Who is traveling? (Trip Generation)
- Where are they going? (Trip Distribution)
- What means of transportation will they use? (Mode Split)
- What route will they take to get where they want to go? (Trip Assignment)

Prior to executing these steps, the user identifies the geography that will describe the model area. The geography is generically referred to as traffic analysis zones (TAZs). For the Missouri model, TAZs are derived from census geography and are either county, tract, or block group based, depending upon the application for which the model will be used. For the I-70 study, the TAZs in the corridor are block groups, the areas adjacent to the corridor TAZs expand to tracts, and the TAZs for the remainder of the state are counties. For each of these TAZs, demographic and employment data must be estimated and allocated for the model base year and forecast for future years.

The next feature of the model, before initiating the four-step process, is to create a simulated roadway network. Missouri's highway network is a product of the state's GIS system. Roadway characteristics such as lanes, functional classification, capacity, speed, and area type (urban, suburban, and rural) are coded into a node/link representation and a synthesized network is created.

Household characteristics and travel data are used to build trip generation relationships. In brief, households with certain combinations of household size and number of vehicles available generate different amounts of trips daily. The numbers of daily trips are estimated, by trip purpose, for a daily (24-hour) period.

The trips are then distributed in the trip distribution step according to the number of trips produced by each TAZ and the number attracted to each TAZ. This step results in a from/to matrix of trip interchanges between TAZs.

Because not all trips are made by private auto, in the mode split step the amount traveling by available modes is determined. Certain percentages, depending upon availability of transit and non-motorized means of travel, are applied to the trip matrix to reduce it to person-trips made by auto. The person trips are converted to auto trips through the application of auto-occupancy factors.

Finally, the adjusted trip matrix (origin-destination pairs) is assigned to the network in the trip assignment step. The process begins with loading the trips between pairs of TAZs onto each link of the minimum time path between the TAZ pairs. The trip assignment logarithm compares loaded volume to the capacity for each link and adjusts speeds to account for congestion, which essentially assigns trips to paths other than the shortest time.

The key feature of the four-step process is that it is sensitive to changes in land use and transportation systems.

d. Population and Employment Forecasts

The trip generation step, in the process described in the preceding section, requires population and employment data for future time periods. The population data comes from two primary sources: the Missouri Office of Administration, and the Division of Budget and Planning and CensusCounts 98 (a provider of census data and estimates). The MOA provides the most current population projections by county and CensusCounts 98 provides the best population employment estimate by block group.

The MOA provides five-year incremental population projections by county up to 2025. The most recent projections were used in this project with the understanding that while the projections have not been officially adopted, they are considered by MDA to be the best representation of future population change.

Starting with 1990 census counts, a cohort-component demographic model was used to project population cohorts at five-year intervals to the year 2025. The cohorts are males and females in five-year age groups for every county. Individual rates for three components of population change - fertility, mortality, and migration - are used to project each age-sex cohort forward. The projections are based on modified 1990 census counts from the U.S. Bureau of the Census.

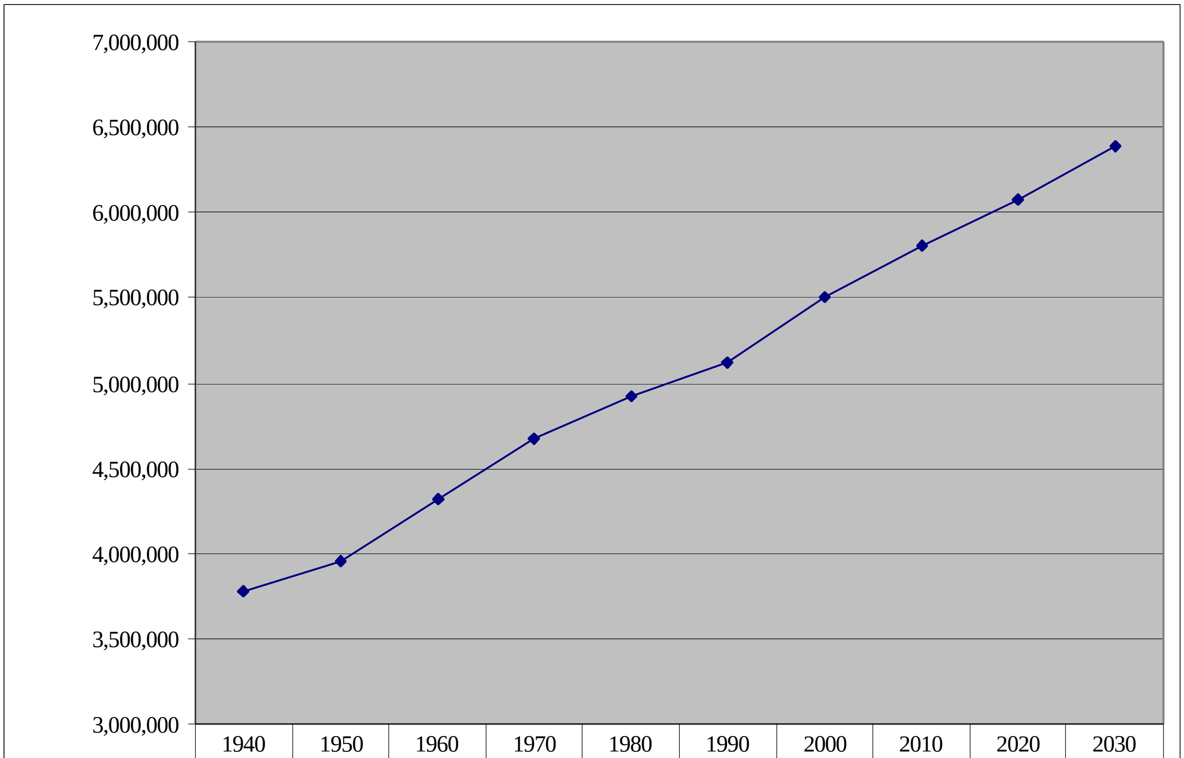
According to MOA, the basic overall growth between 1990 and 2020 may resemble growth in the 1920s, 1930s and 1940s when the population grew by 500,000 while growth in the 1960s, 1970s and 1980s, grew by 800,000 people. The highest level of growth assumption used by MOA was that the total state population would reach six million by 2020. Also, according to MOA, Missouri’s rate of population growth has dropped each decade since 1950. Missouri grew by 9.2 percent in the 1950s, 8.3 percent in the 1960s, 5.1 percent in the 1970s and 4.1 percent in the 1980s.

For this project, the 1997 population control totals by county were found by interpolating between the 1995 and 2000 estimates from the MOA. The 2025 and 2030 population control totals were found by forecasting 1990, 1995, 2000, 2005, 2015, 2020 five years further.

To determine the population (as well as households and housing units) estimates for 1997 by block group, the following procedure was used. First, the county totals were calculated from the CensusCounts 98 data source. Next, the percent change of these totals from the county totals estimated from the MOA was then calculated. These percentages (one for each county) were then applied to the block group-level estimates from the CensusCounts 98 data source to arrive at the block group-level population data used for this project. For example, the 1997 population difference between CensusCounts 98 and the MOA for Adair County was 98.46 percent; this factor was then applied to every block group within Adair County. This was repeated for every county.

Future-year population projections were estimated by calculating the percent changes by county between the 1997 estimates provided by Census Counts 98 and each subsequent five-year projection from the MOA. These data were then disaggregated to the block group level using the procedure described in the preceding paragraph. Figure I-2 graphically displays statewide population trends and projections.

Figure I-2: Missouri Population Trends and Forecasts



	1940	1950	1960	1970	1980	1990	2000	2010	2020	2030
Population	3,783,689	3,954,040	4,318,780	4,676,265	4,923,470	5,117,073	5,505,509	5,808,393	6,076,924	6,385,625

The first source of employment data comes from the County Business Plans of 1995, which provides employment data by county, and by the industry types listed below. These 11 types were aggregated into three general employment types: retail, service, and other. This was used to obtain the percent share of each labor type for each county.

- Retail
  - Retail Trade Division
- Service
  - Finance, Insurance, Real Estate Division
  - Services Division
- Other
  - Agricultural Services (non-production) Division
  - Mining Division
  - Construction Division
  - Manufacturing Division (SIC 19--)
  - Manufacturing Division (SIC 20--)
  - Transportation, Communications, and Utilities Division
  - Wholesale Trade Division
  - Non-classifiable Establishments Division

The 1997 control totals for county employment were obtained from Department of Labor and Industry Relations, which is considered to be the most recent and accurate employment estimate by county for the state. However, because this data source does not list employment by industry type, the percent share of employment calculated from the CBP were applied to the DOLIR county totals to arrive at the county control totals by industry type for this project.

The following procedure was used to allocate employment to the block group level. The first data source looked at was the 1997 U.S. Census employment estimate obtained from CensusCounts 98. These data provide 1997 employment estimates at the block group level, but they are for total employment and are not divided into separate industry types. Therefore, this data source was used to determine the total employment percentage share of each block group for its respective county. These percentages were applied to the industry type employment control totals found from the DOLIR to estimate the number of employees within each block group by industry type. For future employment projections, it was assumed that population/employment ratios remained constant, and the employment was factored by the same percent change in population for each respective five-year projection.

e. Highway Operations (Level-of-Service)

Using the base year (1997) and forecasted (2030) traffic volumes along I-70, operational analyses using level-of-service calculations were performed using the freeways module of the highway capacity software to determine the ability of the existing I-70 facility to serve the corridor's travel demands. The highway capacity software program developed under the sponsorship of the FHWA, estimates the level of service for freeway sections based upon hourly volumes, percent of heavy vehicles in the vehicle mix, and the freeway segment attributes. The base year (i.e., "existing") and forecasted traffic volumes utilized for these analyses were developed based upon the assumed highway system network described earlier in this chapter.

The hourly volumes used in the level-of-service analysis were derived from the model. The model generates volumes for a 24-hour period, but hourly volumes are required for level-of-service analysis. Peak-hour traffic percentages were derived from traffic counts along I-70 and were applied to the 24-hour volumes. The peak hour adjustment percentages ranged from a high of 13 percent in Jackson County near Kansas City, to a low of seven percent in some of the more rural areas of I-70. Similarly, truck percentages were adjusted to reflect the higher percentage of trucks in the rural areas.

A brief description of each of the level of service categories is as follows

- **Level of Service A** - uninterrupted traffic flow, lower volumes and higher travel speeds.
- **Level of Service B** - stable traffic flow, increasing traffic and reduced travel speeds due to congestion.
- **Level of Service C** -stable flow, increasing traffic; travel speeds and maneuverability restricted by higher volumes.
- **Level of Service D** - approaching unstable flow, tolerable travel speeds although considerably affected by changes in operating conditions.
- **Level of Service E** - unstable flow, with possible stopped conditions, lower operating speeds than level of service D, volume approaching capacity of the roadway.

- **Level of Service F** - unstable flow, with speeds at low or stopped condition for varying times caused by congestion when downstream traffic volumes are at or over the roadway capacity.

Level-of-Service calculations were made for roadway segments of I-70 and at interchange locations to identify the congestion that will occur if no improvements are made to I-70 by 2030. The results of the roadway level-of-service analysis for 1997 and 2030 are presented in Table I-2. This analysis shows those segments of I-70 that do not have sufficient capacity (i.e., number of lanes) to adequately serve the daily traffic demand according to MoDOT's desired service standards – LOS C in rural areas and LOS D in urban areas. The shaded LOS designations indicate those locations that are expected to operate at a level of service greater than C in rural areas and D in urban areas. This standard is consistent with that used in the I-70 Feasibility Study prepared by MoDOT in 1999. These segments of I-70 will operate under conditions of unstable flow, lowered operating speeds, congested stop-and-go travel, and traffic volumes that exceed the capacity of the roadway. It can be seen from Table I-2 that in 2030 all segments of I-70 will operate at an unacceptable level of service.

Table I-2: I-70 Daily Travel Demand and Roadway LOS - Base (1997) and Forecast (2030)

Location				1997		2030	
				Volume (ADT)	LOS	Volume (ADT)	LOS
1	West of I-470	- -	Exit 15	72,400	F	80,600	F
2	I-470 to Woods Chapel	Exit 15	Exit 18	72,700	F	86,000	F
3	Woods Chapel to MO-7	Exit 18	Exit 20	69,500	F	83,900	F
4	MO-7 to Adams Dairy	Exit 20	Exit 21	56,600	F	77,500	F
5	Adams Dairy to MO-AA/MO-BB	Exit 21	Exit 24	43,900	D	74,700	F
6	MO-AA/MO-BB to MO-H/MO-F	Exit 24	Exit 28	33,400	C	69,600	F
7	MO-H/MO-F to MO-D/MO-Z	Exit 28	Exit 31	35,700	D	70,200	F
8	MO-D/MO-Z to MO-131	Exit 31	Exit 37	31,300	C	62,200	F
9	MO-131 to MO-O/MO-M	Exit 37	Exit 41	27,000	C	56,700	F
10	MO-O/MO-M to MO-E/MO-H	Exit 41	Exit 45	26,600	C	57,400	F
11	MO-E/MO-H to MO-13	Exit 45	Exit 49	26,200	C	56,600	F
12	MO -13 to MO-T	Exit 49	Exit 52	25,700	C	55,300	F
13	MO-T to MO-23	Exit 52	Exit 58	26,800	B	56,500	E
14	MO-23 to MO-Y/MO-VV	Exit 58	Exit 62	26,600	B	55,500	E
15	MO-Y/MO-VV to MO-127	Exit 62	Exit 66	25,600	B	54,400	D
16	MO-127 to MO-EE/MO-K	Exit 66	Exit 71	25,800	B	54,600	D
17	MO-EE/MO-K to MO-YY	Exit 71	Exit 74	25,800	B	54,600	D
18	MO-YY to US-65	Exit 74	Exit 76	25,300	B	54,100	D
19	US-65 to MO-J	Exit 76	Exit 84	24,800	B	52,000	D
20	MO-J to MO-K	Exit 84	Exit 89	24,900	B	52,100	D
21	MO-K to MO-41/MO-135	Exit 89	Exit 98	25,000	B	52,200	D
22	MO-42/MO-135 to MO-5	Exit 98	Exit 101	25,900	B	53,500	E
23	MO-5 to MO-B	Exit 101	Exit 103	27,000	B	55,000	E
24	MO-B to MO-87	Exit 103	Exit 106	27,300	B	53,400	E
25	MO-87 to MO-179	Exit 106	Exit 111	29,400	C	56,600	E
26	MO-179 to MO-BB	Exit 111	Exit 115	30,900	C	58,900	E
27	MO-BB to MO-J/MO-O	Exit 115	Exit 117	31,800	C	60,200	E
28	MO-J/MO-O to US-40/MO-UU	Exit 117	Exit 121	34,100	C	62,800	E

29	US-40/MO-UU to MO-E/MO-740	Exit 121	Exit 124	46,500	C	78,900	F
30	MO-E/MO-740 to Loop 70	Exit 124	Exit 125	57,400	D	85,000	F
31	Loop 70 to MO-163	Exit 125	Exit 126	46,500	D	72,500	F
32	MO-163 to MO-763	Exit 126	Exit 127	49,700	D	80,300	F
33	MO-763 to Loop 70	Exit 127	Exit 128	45,100	C	73,900	F
34	Loop 70 to US-63	Exit 128	Exit 128A	60,700	D	92,400	F
35	US-63 to St. Charles	Exit 128A	Exit 131	52,200	D	81,500	F
36	St. Charles to MO-Z	Exit 131	Exit 133	41,000	C	69,300	F
37	MO-Z to MO-DD/MO-J	Exit 133	Exit 137	31,300	C	58,400	E
38	MO-DD/MO-J to MO-M/MO-HH	Exit 137	Exit 144	27,300	B	52,200	D
39	MO-M/MO-HH to US-54	Exit 144	Exit 148	28,200	B	53,600	E
40	US-54 to MO-A/MO-Z	Exit 148	Exit 155	26,400	B	50,600	D
41	MO-A/MO-Z to MO-D/MO-YY	Exit 155	Exit 161	27,000	B	51,700	D
42	MO-D/MO-YY to MO-161/MO-J	Exit 161	Exit 170	26,900	B	51,300	D
43	MO-161/MO-J to MO-19	Exit 170	Exit 175	27,000	B	51,200	D
44	MO-19 to MO-F	Exit 175	Exit 179	28,000	B	54,000	D
45	MO-F to MO-E/MO-Y	Exit 179	Exit 183	28,000	B	54,000	D
46	MO-E/MO-Y to MO-A/MO-B	Exit 183	Exit 188	28800	B	55,000	D
47	MO-A/MO-B to MO 47	Exit 188	Exit 193	28,600	B	57,000	E
48	MO-47 to Exit 199	Exit 193	Exit 199	31,700	C	63,500	E
49	Exit 199 to MO-J/MO-F	Exit 199	Exit 200	31700	C	63,100	E
50	MO-J/MO-F to MO-W/MO-TT	Exit 200	Exit 203	36600	C	71,200	F
51	MO-W/MO-TT to Exit 208	Exit 203	Exit 208	36,400	C	73,500	F
52	Exit 208 to MO-Z	Exit 208	Exit 209	49,800	D	88,700	F
53	MO-Z to US-61	Exit 209	Exit 210	58,100	E	104,300	F
54	US-61, US-40 to MO-A	Exit 210	Exit 212	48,500	E	97,000	F
55	MO-A to Lake St. Louis	Exit 212	Exit 214	55,000	E	106,700	F
56	East of Lake St. Louis	Exit 214	- -	54,900	E	126,400	F

= Unacceptable operations based on target LOS C in rural areas and LOS D in urban areas.

Interchange operational analyses were also performed to determine how I-70 might operate if no improvements were constructed at the interchange locations. Analyses were conducted at 22 interchanges located within the Study Corridor – those interchanges with higher volumes where operational issues might be anticipated. Three different modules within the Highway Capacity Software were used for the analyses -- Ramps, Signalized Intersections and Unsignalized Intersections. Of the 22 interchanges analyzed, 19 were diamond type interchanges consisting of four ramps (two on-ramps and two off-ramps), one was a combination type interchange; and two were cloverleaf type designs, consisting of no intersections with eight ramps. Table I-3 shows the results of the interchange operational analyses.

Table I-3: I-70 Interchange Operational Analyses LOS - 2030

Area	Exit Number	Route	County	Interchange Type	Signal (Y/N)	Ramps LOS	Intersections LOS
Urban	15A-B	I-470	Jackson	Cloverleaf	N/A	F	N/A
	20	MO-7	Jackson	Diamond	No	F	F
Rural	37	MO-131	Lafayette	¾ Diamond	No	F	F
	49	MO-13	Lafayette	Diamond	No	F	B
	58	MO-23	Lafayette	Diamond	No	F	B
	66	MO-127	Saline	Diamond	No	D	A
	78	US-65	Saline	Cloverleaf	No	D	N/A

	98	MO-41	Cooper	Diamond	No	D	A
	101	MO-5	Cooper	Diamond	No	D	B
	106	MO-87	Cooper	Diamond	No	D	B
	111	MO-179	Cooper	Diamond	No	D	A
	121	US-40	Boone	Diamond	No	E	C
Urban	124	MO-740	Boone	Diamond	No	F	F
	126	MO-163	Boone	Diamond	No	F	C
	127	MO-763	Boone	Diamond	No	F	F
	128A	US-63	Boone	Diamond	No	F	F
Rural	148	US-54	Callaway	Diamond	Yes	D	B
	170	MO-161	Montgomery	Diamond	No	D	A
	175	MO-19	Montgomery	Diamond	No	C	A
	193	MO-47	Warren	Diamond	Yes	E	D
Urban	210	US-40/61	St. Charles	Combination	No	F	N/A
	213	Lake St. Louis	St. Charles	Diamond	Yes	F	B

As shown in Table I-3, all interchanges, except for Route 19, will have unacceptable ramp operations in 2030. Additional capacity at each of these locations will be needed by 2030 to adequately serve the entering or exiting I-70 traffic. The operations at the ramp terminals (i.e., intersections) are not as systematically deficient, with only six locations with unacceptable levels. At each of these locations, additional capacity could be added through the additional of signal improvements and/or intersection roadway approach improvements.

f. Need for Additional Capacity

The results of the capacity analysis reveal that for the analysis scenarios, the level of service deteriorates measurably along I-70 between the years 1997 and 2030. Exhibit I-2 shows the unacceptable congested areas along I-70 in 1997 and Exhibit I-3 shows the projected conditions in 2030. The pattern of deterioration moves from the end points of I-70 toward the center of the state, while the Columbia area exhibits similar deterioration as it moves outward toward the ends. The preceding analysis shows that in 2030, much of I-70 will operate below level of service F (congested flow). For the I-70 corridor to operate under improved conditions, additional roadway capacity and/or significant reductions in travel growth need to be provided. Exhibit I-4 shows the current (1997) and projected (2030) daily traffic volumes along I-70.

2. TRAFFIC SAFETY

a. Statewide Accident Statistics

Accident information for this analysis was obtained through the MoDOT Traffic Management System database and reports prepared for other purposes. Accidents on the state's interstate system for the nine years from 1990 to 1998 are presented in Table I-4 with their corresponding numbers of fatalities and rates. Accident rates are reported per 100 million vehicle miles of travel.

The number of accidents and number of fatalities have generally increased over the five-year period from 1994 to 1998, but because of a related increase in vehicle miles traveled, the increase in accident and fatality rates has been tempered. There were decreases in the number of fatalities from 1991 to 1995 followed by increases in 1996 and later. The speed limit on Missouri interstates was raised to 70 mph in 1996 and is likely a contributing factor for the increase in fatalities from 130 in 1995 to 199 in 1996.

Table I-4: Statewide Accidents - Missouri Interstate Routes

Description	1990	1991	1992	1993	1994	1995	1996	1997	1998

Number of Accidents	17,878	16,722	15,709	19,610	19,487	20,871	22,958	22,995	24,612
Accident Rate	126	118	111	131	127	131	139	136	143
Number of Fatalities	166	150	155	150	143	130	199	196	183
Fatality Rate	1.17	1.06	1.09	1.00	0.92	0.81	1.20	1.15	1.06

Source: MoDOT Office of Transportation Management System
Note: Accident rates based on 100 million vehicle miles of travel.

For purposes of comparison, accident frequency on Missouri interstates were compared with national experiences using a report published by the Federal Highway Administration in 1993[2]. The 1990 national average is reported to be 170 fatal accidents per 1,000 miles on urban interstates. In Missouri, the approximate 1990 fatal accident experience was 166 accidents per 1,000 miles of interstate for both urban and rural segments. In general, accident experiences on Missouri interstate routes appear to be consistent with national experiences.

b. I-70 Accident Statistics

Accidents and fatalities on I-70 were aggregated for each county. Table I-5 tabulates the accident rates for I-70, by county, for the five-year period between 1993 and 1997. From county to county, variations can be seen. In general, accident rates have increased in nearly all counties, with the larger increases occurring in counties that have a large urban population or are becoming more urbanized.

Table I-5: I-70 Accident Rates by County (per 100MVMT)

County	1993	1994	1995	1996	1997
Jackson	193	179	162	212	222
Lafayette	72	75	69	74	92
Saline	67	51	55	59	69
Cooper	75	76	54	53	62
Boone	116	135	133	122	126
Callaway	71	63	68	89	88
Montgomery	67	70	79	105	127
Warren	69	61	94	122	121
St. Charles	95	127	105	115	119

Source: MoDOT Office of Transportation Management System
Note: Accident rates based on 100 million vehicle miles of travel.

As illustrated in Table I-5, the I-70 accident rate fluctuates considerably from county to county. In general, accident rates have increased in all counties, with the larger increases occurring in the more urbanized counties. In 1997, the statewide average for interstate accidents was 136. Along I-70, only Jackson County consistently had 1997 rates above the statewide average. The rural counties of Lafayette, Saline, Cooper and Callaway were below the statewide average accident rate, with rates ranging from 62 to 92. The more urbanized counties of Boone, Montgomery, Warren, and St. Charles were closer to the statewide average, with rates ranging from 119 to 127. An analysis of shorter sections within each of the counties reveals sections of I-70 having an accident rate higher than the statewide average. These sections include:

- Boone County through Columbia.
- Warren County between Route A/B and Route 47.
- Montgomery County for six miles in the Loutre River area.
- Callaway County from US 54 to Route A.

[2] Highway Safety Performance 1991: Fatal and Injury Accident Rates on Public Roads in the United States, USDOT.

The accident rates for these sections and through Columbia, are above the statewide average accident rate. Accident rates through Columbia vary between 163 and 472, depending upon segment location.

To examine the I-70 accident experience, data recorded between 1994 and 1998 were compiled in more detail. Accidents were classified by truck, cross-median, property-damage-only (PDO), injury, and fatal.

c. Truck Accident Analysis

According to 1998 MoDOT truck counts, trucks comprise between 21 and 32 percent of the traffic stream on I-70, depending on location. For purposes of this analysis, trucks are defined as single unit, tractor, tractor and trailer, multi-unit (two or more trailers), and mobile home trailer. Table I-6 summarizes accidents in which trucks were involved for the five-year period between 1994 and 1998. The data represent accidents and not the number of vehicles or number of fatalities involved in each accident.

Table I-6: Truck Accidents by Missouri Interstate Routes

Year	Accident Type	Interstate Route				
		I-29	I-35	I-55	I-44	I-70
1998	PDO	239	161	373	746	1127
	Injury	86	49	103	195	336
	Fatal	2	4	6	15	19
1997	PDO	230	133	382	609	1025
	Injury	83	47	106	210	377
	Fatal	2	1	8	13	18
1996	PDO	169	127	321	576	1022
	Injury	52	40	104	170	306
	Fatal	1	1	8	8	10
1995	PDO	142	85	221	402	604
	Injury	45	28	69	122	207
	Fatal	3	1	4	4	9
1994	PDO	168	130	314	450	836
	Injury	66	41	110	173	285
	Fatal	1	1	2	8	16
Total Truck Accidents		1289	849	2131	3701	6197
Route Length (miles)		124	114	209	291	251
Accidents Prorated to 100 Miles	PDO	765	558	771	1332	1838
	Injury	268	180	235	416	602
	Fatal	7	7	13	23	29
	Total	1040	745	1020	1771	2469

Source: MoDOT Office of Transportation Management Systems

For the five-year period from 1994 to 1998, there was an average of 494 truck accidents per 100 miles of I-70 compared to an average of 229 on the other interstate routes. Property-damage-only accidents per 100 miles of I-70 averaged 368; injury accidents averaged 120; and fatal accidents average six. Similar statistics for the other interstates were: property-damage-only accidents averaged 171; Injury accidents averaged 55; and fatal accidents averaged three.

Trucks were involved in 18.7 percent of the total accidents from 1994 to 1998, and 28.3 percent of the fatal accidents. Of greater significance is the relationship between trucks and fatal accidents in 1997 and 1998, when these fatal accidents nearly doubled the preceding years. The reason for this increase is not apparent from the available information. It can be reasonably assumed that increases in traffic and raising the speed limit to 70 mph in 1996 were contributing factors. While speed does not influence the cause of accidents, speed is a major factor in severity of injuries and fatalities.

According to MoDOT truck accident data, the predominant types of accidents are rear-end, out-of-control, and changing lane accidents, in that order. The statistics are consistent over a five-year reporting period from 1994 to 1998. In 1998, these three types accounted for 75 percent of the truck accidents on I-70. The data reported for pavement conditions are also consistent over the same five-year period. In 1998, 68 percent of truck accidents occurred on dry pavement. Lastly, Light conditions followed the same pattern. In 1998, 69 percent of truck accidents happened during daylight hours.

d. Cross-Median Accident Analysis

In the past few years, the issue of cross-median accidents has become a public concern. During the summer of 1999, MoDOT's Traffic Division studied the statewide cross-median accidents on the interstates from 1989 to 1997. Results were compiled for each interstate as totals for the entire length. Total cross-median accidents peaked in 1997 at a total of 94 accidents. As a percent of total accidents, the 94 cross-median accidents in 1997 made up two percent of the total number of accidents. During the time frame the data were collected, the percent of cross-median accidents resulting in a fatality had risen from five percent in 1989 to a high of 38 percent in 1998.

There are five interstate highways that are primarily located in rural Missouri: I-29, I-35, I-44, I-55, and I-70. Table I-7 presents a comparison of cross-median accidents occurring on the five interstates from 1989 to 1997. In each instance, accidents were pro-rated to a 100-mile section. The accident rates were calculated based on average traffic volumes for each interstate. As can be seen from the table, I-70 has more cross-median accidents per 100 miles than the other four interstate highways. I-70 also has a higher rate of accident occurrence than the other four interstates. According to the MoDOT study, there is no conclusive data to support the theory that the narrow, 40-foot median on I-70 is the cause of the higher numbers. However, studies have been conducted in other states that conclude a 60-foot median reduces cross-median accidents significantly. Another finding from the MoDOT study is that there does not appear to be a correlation between the year the speed limit was raised on the interstate and the number of cross-median accidents in the statewide system.

As part of the study, Traffic Division personnel analyzed cross-median accidents by the location of occurrence. There were no obvious physical reasons for the accidents. Most of the cross-median accidents are randomly spaced through the entire length of I-70. Because the incidences of cross-median accidents are not site specific, localized improvements would not address the causes of these crashes. The Traffic Division report concludes that counties with the following cross-median accident experience should be studied in greater detail. For both Jackson and St. Charles County, significant portions of I-70 currently include a roadway median barrier which prohibits the occurrence of cross-median crashes.

- Jackson County –from nine in 1995 to 46 in 1998.
- Lafayette County –from none in 1995 to 19 in 1997 and 12 in 1998.
- Montgomery County –from none in 1995 to 14 in 1996, 13 in 1997, and 10 in 1998.
- Warren County –from five in 1995 to 17 in 1997, and seven in 1998.
- St. Charles County – from two in 1995 to 20 in 1997, and 12 in 1998.

Table 1-7: Interstate Cross-Median Accidents – 1987 to 1997

Interstate	Total Miles	Median Width (feet)	Accidents for Total Length		Accident Rates		Pro-Rated to 100 miles	
			Fatal	Total	Fatal	Total	Fatal	Total
I-29	124	60	7	79	0.062	0.720	6	64
I-35	114	60	13	79	0.150	0.982	11	69
I-44	291	40	38	314	0.128	0.982	13	108
I-55	209	60	14	132	0.076	0.677	7	63
I-70	251	40	68	435	0.163	1.046	27	173
						Total	**64**	**477**

Source: MoDOT Traffic Division
Note: 1. Accident rates are based on accidents per 100 million vehicle miles of travel.
2. Data only available in these 5 counties due to location of data stations.

e. Property Damage Only (PDO) Accident Analysis

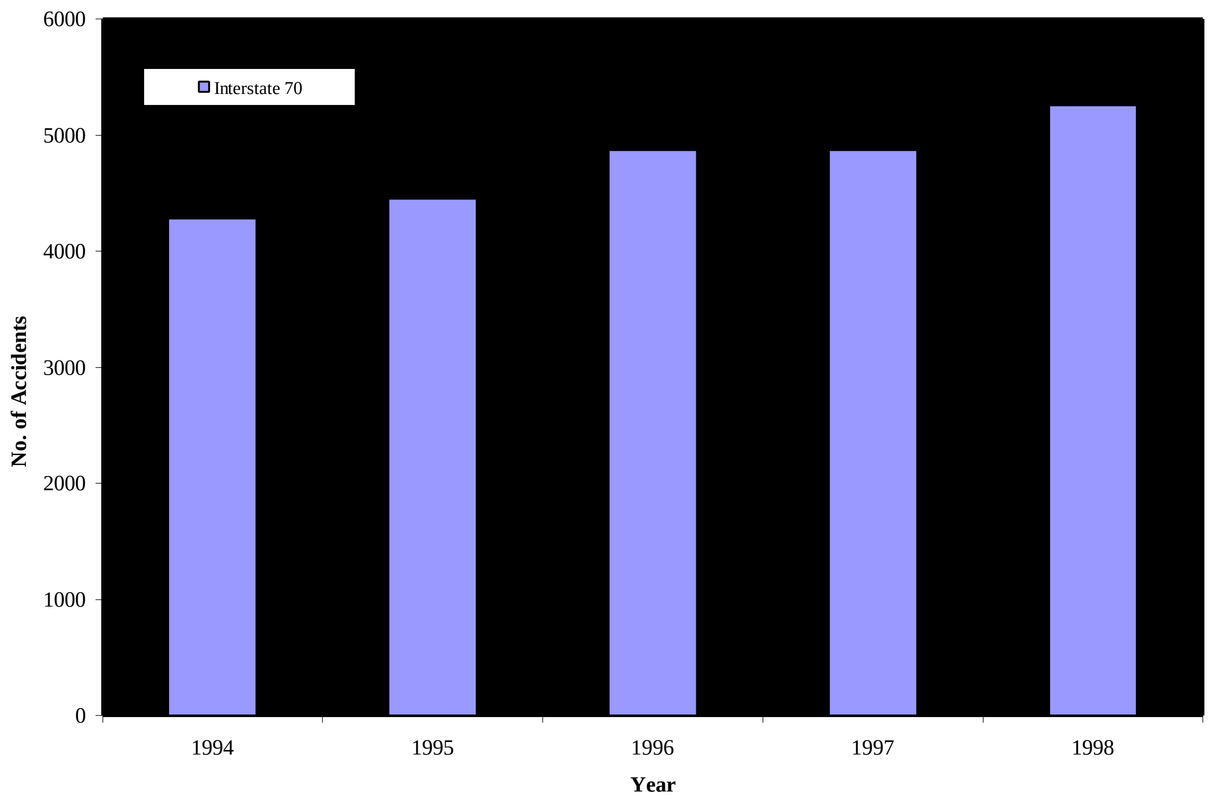
The number of I-70 property damage only accidents steadily increased from 1994 to 1998, as shown graphically in Figure I-3. Table I-8 provides a breakdown of the accidents by type. It can be seen that I-70 "rear end" and "out of control" accidents are prevalent. "Changing lanes" represents the third most occurring accident type. There were also 89 cross-median accidents reported on I-70 for the five-year period.

Table I-8: Property Damage Only Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
TOTAL	11,485	22,238	33,723
Rear End	4,100 (36%)	8,072 (36%)	12,172 (36%)
Out of Control	2,352 (20%)	5,927 (27%)	8,279 (25%)
Changing Lane	1,595 (14%)	2,477 (11%)	4,072 (12%)
Avoiding	445 (4%)	970 (4%)	1,415 (4%)
Left Turn Right Angle Collision	366 (3%)	758 (3%)	1,124 (3%)
Passing	338 (3%)	463 (2%)	801 (2%)
Sideswipe	282 (2%)	463 (2%)	745 (2%)
Deer	283 (2%)	338 (2%)	621 (2%)
Left Turn	165 (1%)	427 (2%)	592 (2%)
Other	1,559 (15%)	2,343 (11%)	3,902 (12%)

Source: MoDOT Office of Transportation Management Systems

Figure I-3: I-70 Property Damage Only Accidents



f. Injury Accident Analysis

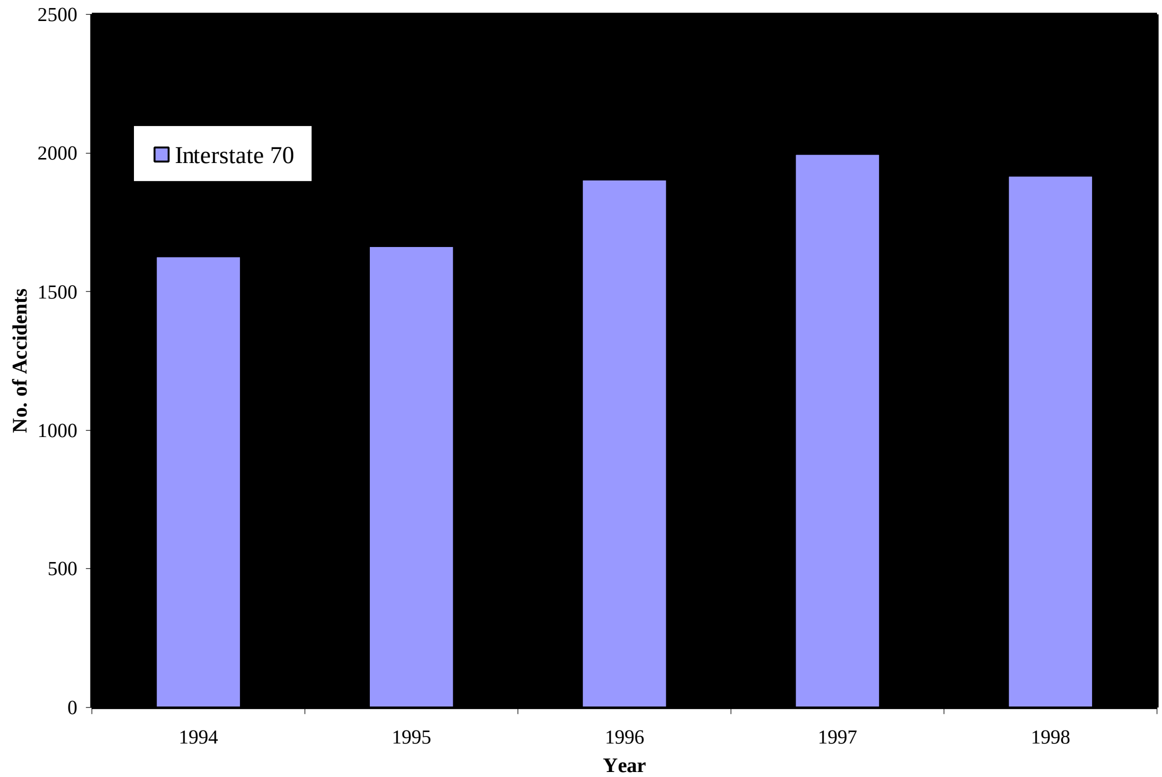
Accidents in the personal injury category follow a similar pattern as the property damage only accidents. “Out of control” and “rear end” accidents are roughly equal in magnitude. There were 107 cross-median injury accidents reported for the five-year period. Table I-9 presents the total number of injury accidents by type from 1994 to 1998 that occurred on I-70. Figure I-4 shows the annual injury accidents by year, from 1994 to 1998.

Table I-9: Injury Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
TOTAL	4,264	4,995	9,259
Rear End	1,594 (37%)	1,850 (37%)	3,444 (37%)
Out of Control	1,497 (35%)	1,722 (34%)	3,219 (35%)
Changing Lane	351 (8%)	405 (8%)	756 (8%)
Avoiding	192 (5%)	265 (5%)	457 (5%)
Left Turn Right Angle Collision	149 (3%)	179 (4%)	328 (4%)
Left Turn	57 (1%)	122 (2%)	179 (2%)
Right Angle	72 (2%)	82 (2%)	154 (2%)
Passing	66 (2%)	50 (1%)	116 (1%)
Cross Median	47 (1%)	60 (1%)	107 (1%)
Other	239 (6%)	260 (5%)	499 (5%)

Source: MoDOT Office of Transportation Management Systems

Figure I-4: I-70 Injury Accidents



g. Fatal Accident Analysis

A 1999 traffic study conducted by the Missouri Department of Transportation for cross-median accidents reported that five of the counties had increases in fatal cross-median accidents for the period 1995 through 1998. Table I-10 represents a summary of the findings of that report

Table I-10: I-70 Cross-Median Fatal Accidents History

County	1995	1998	Highest Year/No. of Accidents
Jackson	9	46	1998/46
Lafayette	0	12	1997/19
Montgomery	0	10	1996/14
St. Charles	2	12	1997/20
Warren	5	7	1997/17

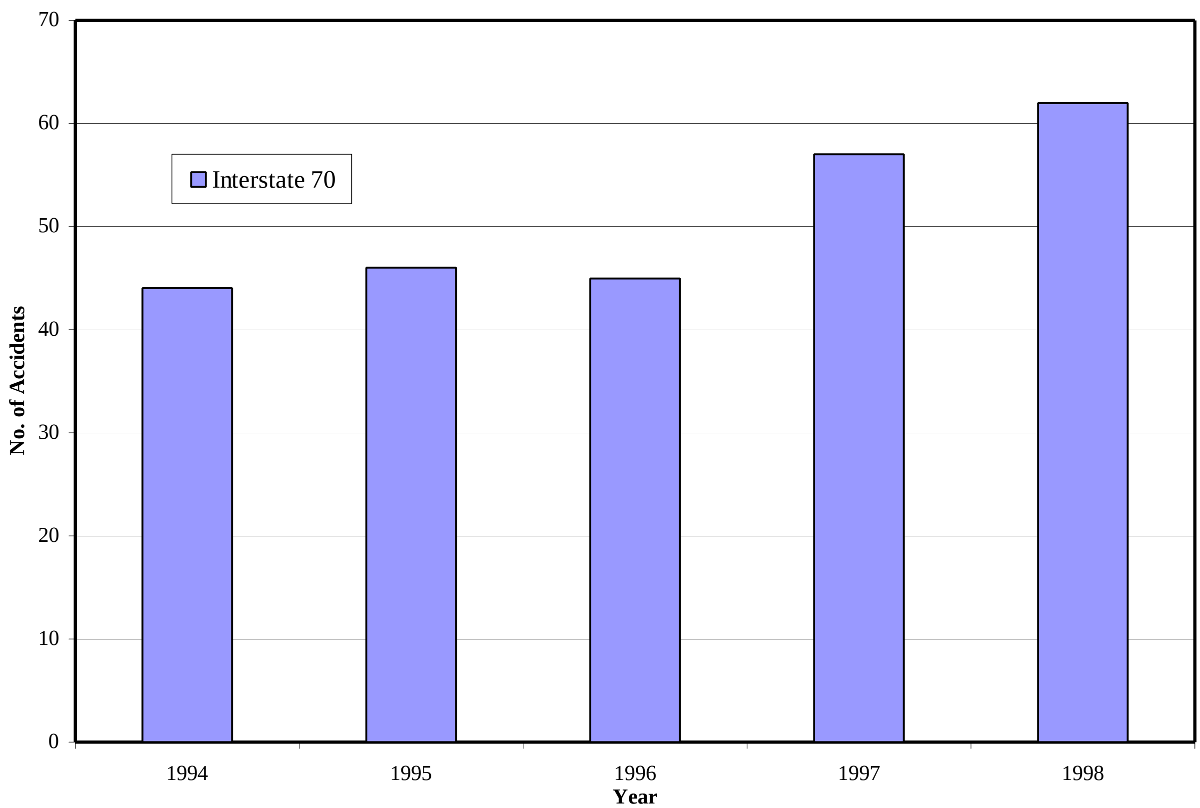
Source: MoDOT Traffic Division

A breakdown of fatal accidents by type is presented in Table I-11, and Figure I-5 shows the I-70 annual number of fatal accidents by year from 1994 to 1998. Out of control accidents are the most frequent fatal accident cases (113), with 40 pedestrian fatalities outnumbering the 37 cross-median accidents. It is possible that some of the reported pedestrian fatalities occurred during attempts to cross the roadway on foot. Also, the reported accidents include interchanges and some of the pedestrian accidents could have occurred on ramps or at intersections with adjacent frontage roads.

Table I-11: I-70 Fatal Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
TOTAL	133	121	254
Out of Control	55 (41%)	58 (48%)	113 (44%)
Pedestrian	20 (15%)	20 (17%)	40 (16%)
Cross Median	24 (18%)	13 (11%)	37 (15%)
Rear End	12 (9%)	13 (11%)	25 (10%)
Changing Lane	5 (4%)	6 (5%)	11 (4%)
Avoiding	5 (4%)	2 (2%)	7 (3%)
Passing	3 (2%)	1 (1%)	4 (2%)
Sideswipe	1 (1%)	3 (2%)	4 (2%)
Wrong Way on Divided Highway	3 (2%)	1 (1%)	4 (2%)
Deer	2 (2%)	1 (1%)	3 (1%)
Other	3 (2%)	3 (2%)	6 (2%)

Figure I-5: I-70 Fatal Accidents



Clearly, as shown on the preceding tables and figure, there is a significant increase in the number of fatal accidents on I-70. The increase in fatal accidents between 1995 and 1998 could be a result of increased travel speeds and increased traffic growth.

h. Accident Severity Analysis

Tables I-12, I-13, and I-14 present a detailed breakdown of the more prevalent accident types by severity. Table I-13 summarizes cross-median accidents by severity as reported on I-70. Cross-median accidents comprise nearly 18 percent of the fatal accidents on I-70 eastbound and less than two percent of injury and property damage only accidents occurring on I-70.

Table I-12: Cross Median Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
Fatal	24 (18%)	13 (11%)	37 (15%)
Injury	47 (1.1%)	60 (1.2%)	107 (1.2%)
PDO	43 (0.4%)	46 (0.4%)	233 (0.7%)

Out of control accidents make up nearly half of the fatal accidents and more than a third of injury accidents on I-70. Out of control accidents are the highest cause of fatalities experienced on I-70. Table I-13 summarizes out of control accidents on I-70.

Table I-13: Out of Control Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
Fatal	55 (41%)	58 (48%)	113 (44%)
Injury	1497 (35%)	1722 (34%)	3219 (35%)
PDO	2352 (21%)	5927 (27%)	8279 (25%)

Rear end accidents, summarized in Table I-14, are the leading cause of both injury and property damage only accidents on I-70. Rear end accidents comprise approximately 10 percent of all fatal accidents.

Table I-14: Rear End Accidents (1994-1998)

	I-70 EB	I-70 WB	I-70 Total
Fatal	12 (9%)	13 (11%)	25 (10%)
Injury	1594 (37%)	1850 (37%)	3444 (37%)
PDO	4100 (36%)	8072 (36%)	12172 (36%)

These statistics serve to demonstrate that possible causes are related to a combination of speed and congestion.

i. Accident Rates

Accident information for this analysis was obtained through the MoDOT Traffic Management System database and reports prepared for other purposes. Summaries of reported accidents on I-70 were prepared to identify probable causes related to roadway geometry, conditions, and traffic volume.

The travel demand model was used to estimate base year (1997) and forecast year (2030) traffic. The calculation of accident rates for I-70 by severity uses the 1997 model vehicle miles traveled for consistency. Table I-15 summarizes the determination of accident rates to establish 1997 rates on I-70.

The total accident rate on I-70 of 147 accidents (1997) per 100 million vehicle miles traveled, given total I-70 travel within the Study Corridor, was compared to experience on I-80 in neighboring Iowa. The Iowa DOT reports a rate of 66 accidents (1998) per 100 million vehicle miles traveled on I-80. Expressing accident rates in terms of vehicle miles traveled establishes a common basis for comparison. The rate for I-70 is over twice as high as I-80. However, higher traffic volumes, higher posted speed limits, and a higher degree of congestion all likely contribute to I-70's higher accident rates.

Table I-15: I-70 Accident Rates (1997) by Severity

Accident Type	1997 I-70 Accidents	Total Length Daily VMT	Annual VMT	Annual 100M VMT	Acc. Rate
PDO	4875	12,881,100	4,701,601,500	47.01602	103.7
Injury	1999	12,881,100	4,70,1601,500	47.01602	42.5
Fatal	57	12,881,100	4,70,1601,500	47.01602	1.2
Total	6931	12,881,100	4,70,1601,500	47.01602	147.4

Literature specifically related to future accident rates is practically non-existent. An intensive search on the Internet located a Federal Highway Administration Fact Sheet in which data indicated that increased investment in road improvements reduces the severity of accidents. The Road Information Program research suggests that making lanes wider, widening shoulders, and improving bridges has reduced accident experience by various percentages. These are the kinds of improvements that are consistent with upgrading I-70 or construction on a new location. The procedure for estimating the impact certain improvements might have on accident experience in future years was incorporated in the FHWA report findings.

Accident data obtained from MoDOT categorizes accidents by type, such as rear-end, left turns, and sideswipes. While this type of accident is not consistent with the kinds expected on I-70, the accident data for I-70 does include crashes on ramps and at ramp intersections with local streets. Some 26 categories are included in the MoDOT reporting system. The FHWA fact sheet lists accident reductions for intersection improvements, bridge improvements, roadway improvements, and roadside improvements. Each of these major groups has sub-feature improvements with varying percent reductions. The percent reductions were applied to the appropriate accident type and a weighted rate was developed. The rated weight was then applied to the 1997 accident rates to create a set of adjusted future rates for each of the severity categories. The final adjusted accident rates to be used for forecasting purposes are:

- Property damage only 73.9 per 100MVMT
- Injury 30.4 per 100MVMT
- Fatal 0.6 per 100MVMT

The future rates will be applied to the various improvement strategies VMTs to derive estimates of future accidents.

j. Need for Safety Upgrades

It is apparent from these accident statistics that safety on I-70 should be a primary concern. As the trend of increasing vehicle miles traveled on I-70 continues, the number of accidents occurring on I-70 will also increase. Even if the accident rate continues to stay between 180 and 190 accidents per 100 million vehicle miles traveled, the increase in travel alone will result in increasing numbers of accidents on I-70. Exhibit I-5 shows the projected increase in annual accidents along I-70 by county that could be expected with the continued growth of traffic.

Interstate improvements could solve some of the congestion problems occurring on I-70. Adding capacity to the I-70 corridor would improve operational conditions, relieve congestion, and reduce the density of traveling vehicles, thereby lessening the number of accidents. Interstate improvements could include adding capacity, installing median barriers and making pavement and geometric improvements. Providing capacity improvements to the I-70 corridor would create the opportunity to directly address the localized or systematic safety issues that cause the corridor's accident problems.

Truck traffic on I-70 is a significant facet of the state's transportation system and economy. The heavy truck traffic affects safety, capacity and preservation of the physical structure of the roadway. An increase in the traffic-carrying capacity on I-70 would provide an ability to maintain reasonable operating speeds, improve levels of service and enhance a safer driving environment.

As I-70 travel continues to grow, safety conditions will continue to worsen. Only through implementation of aggressive, safety-related measures will the number of accidents on I-70 lessen. Until such a program is initiated, I-70 accidents will continue to increase.

3. ROADWAY DESIGN FEATURES

a. Roadside Features

Between Route 7 in Jackson County and the Lake St. Louis Exit in St. Charles County, the I-70 roadway consists of a four-lane divided freeway. In all rural areas, existing roadway lanes are 12 feet wide, with 10-or 12-foot outside shoulders and four-or six-foot inside shoulders. The median width, measured between the inside edge of the through lanes, typically measures 40 feet in width, with the non-shoulder areas being composed of a depressed grass median. The median width always includes the width of the inside shoulders. In some places, portions of the old US 40 roadway were used for two of the four I-70 lanes as part of the original I-70 construction. These areas represent less than 10 percent of the total length of the study corridor and are a maximum of four miles in length.

Many rural locations within the study area also have outer roadways along one or both sides of I-70 to provide access to adjoining properties. These frontage roads typically consist of two-lane roadways with 12-foot-wide lanes.

Through the urban areas of Columbia, Warrenton, Wright City, Wentzville and the Missouri River Bridge, the freeway section is collapsed from the 40-foot median to a narrow median with a concrete median barrier. These sections do not provide sufficient inside shoulder width, based on current American Association of State Highway and Transportation Officials standards. One of these sections has inside shoulders of only one foot. In addition, the majority of I-70 within the study corridor does not meet current requirements for a 30-foot, 6:1 safety clear zone, based on a 70 mph design speed. Current AASHTO and MoDOT standards recommend a minimum 60-foot median for a divided freeway with a 70-mph design standard.

b. Roadway Alignment Feature

The horizontal alignment of the existing freeway meets current minimum standards for an interstate facility. The following locations have curves with a degree of curvature greater than the desired 2 degrees:

- Montgomery County — 1.14 miles east of High Hill Exit — 3 degree
- Montgomery County — 1.89 miles east of High Hill Exit — 3 degree
- St. Charles County — Between Pearce Blvd. Exit & Rte Z — 3 degree
- St. Charles County — Between Pearce Blvd. Exit & Rte Z — 2 degree, 18 minutes

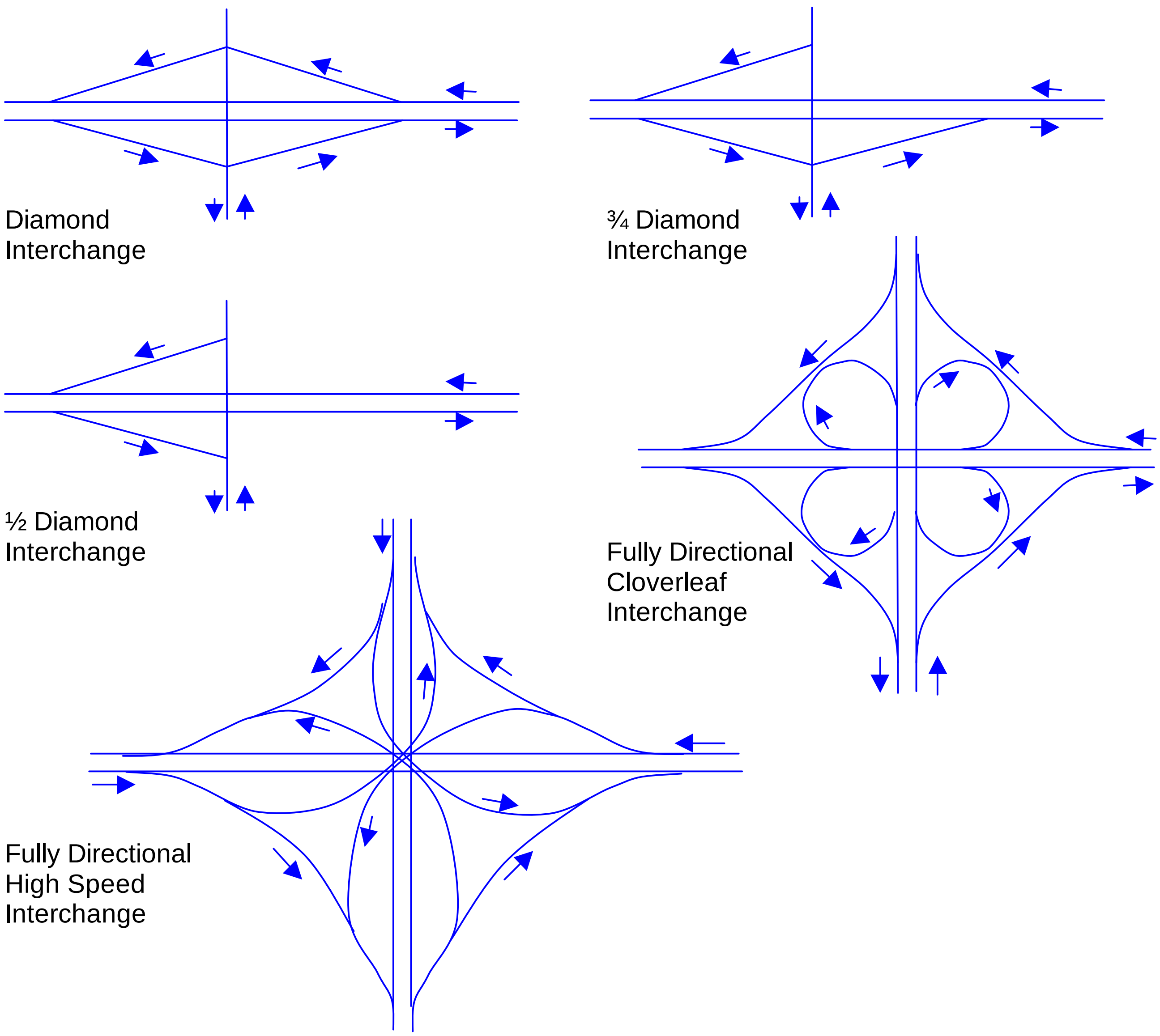
An analysis of the vertical curves on the existing freeway indicates that 45 percent meet the desired vertical curvature standards for interstate facilities. An additional 28 percent fall below the desired value, but above the minimum, while 26 percent fall below the minimum standard.

Vertical grades on the existing freeway meet current minimum standards for interstate facilities in most cases. There are 12 grades in the corridor that are greater than the four percent recommended maximum, but none exceed six percent. Excessive grades result in a large reduction in truck speeds and decrease safety due to larger speed differentials in these locations.

c. Typical Interchanges

There are 53 interchanges between Route 7 in Jackson County and the Lake St. Louis exit in St. Charles County, inclusive. Of these, 46 are diamonds, five are half or three-quarter diamonds, and two are fully directional. Figure I-6 illustrates these types of interchanges.

Figure I-6



In the MoDOT I-70 Feasibility Study, the diamond interchanges were evaluated as to whether or not they met current requirements of a minimum 700-foot spacing between ramp termini and a minimum spacing of 430 feet between ramp termini and outer roads. It was determined that 50 of the 51 diamond interchanges do not meet the requirement for 700 feet between ramp termini (the exception being the Adams Dairy Parkway interchange in Blue Springs). In addition, 44 of the 51 diamond interchanges do not meet the requirement for 430 feet between the ramp termini and outer roads. These diamond interchanges should be rebuilt to meet the current design standards concerning distances between ramp terminals and between outer roadway intersections and ramp terminals. Diamond interchange reconstruction would increase safety on cross roads and ramps but would not increase safety on I-70 travel lanes.

The cloverleaf interchange with US 65 in Saline County meets current interstate standards, as does the westbound I-70 exit to I-70 (Business) in Columbia. However, today's design conventions would not encourage left-hand exits or entrances unless absolutely necessary. Cloverleaf interchanges, by virtue of the undesirable weaving sections created at the ramp noses, are not recommended to replace the basic diamond interchanges along the route. The Columbia interchange is a left-hand exit configuration, which is less desirable. The directional interchange with US 40/US 61 in St. Charles does not meet interstate standards due to the unusual interchange configuration that includes left-hand exits and entrances, short weaving sections, and an at-grade ramp intersection.

d. Ancillary Features

There are four safety rest areas located within the I-70 Study Corridor -- one each in Lafayette, Cooper, Montgomery and Warren Counties. Each of these locations provides separate eastbound and westbound facilities including separate truck and car parking areas, rest rooms, picnic tables, pay telephones and vending machines. These facilities are heavily used, with truck parking often being filled to overflowing. A lack of available truck parking has resulted in trucks often using the shoulders of interchange ramps to park and rest.

Weigh stations have been or are currently being constructed in two locations. One is located in Lafayette County near Odessa, currently under construction, and the other is in St. Charles County near Foristell (construction completed). Each of these locations provides separate eastbound and westbound facilities including scales and inspection facilities. The St. Charles facility was recently reconstructed to provide longer acceleration and deceleration lanes, a longer storage length for trucks waiting to be weighed, and larger areas for the parking and inspection of trucks.

e. Need for Facility Upgrades

Compared to today's design standards for a state-of-the-art freeway, the existing I-70 facility has several deficiencies in its design that should be addressed as part of any improvement to the corridor. Exhibit I-6 illustrates the basic differences between the existing I-70 roadway and the current, more modern standards of today's freeways. Current roadway standards for freeways provide wider shoulders and medians than what was originally constructed on I-70. Facility upgrades to I-70 could include the following:

- **Roadway** - Widening of inside and outside shoulders to meet current AASHTO standards. A 12-foot wide, full-depth shoulder is recommended to allow for use as future through lanes or temporary lanes during maintenance activities.

- **Median** – Provide an improved median meeting the minimum standards, including 5.5:1 slopes, an eight-foot flat bottom ditch, and a four-foot ditch depth. A minimum median width of 76 feet between the inside edges of the through lanes (including two 12-foot shoulders) would be required. Current MoDOT standards recommend a minimum 60-foot median width, for a 70 mph design speed.

- **Clear Zone** - Provision for a 30-foot, 6:1 safety clear zone to meet requirements for 70 mph design.
- **Rest Areas** – Upgraded safety rest areas along the corridor to provide adequate parking for vehicles, particularly trucks.
- **Vertical Alignment** - Some vertical curves do not meet the current AASHTO Standards. Vertical curves need to provide at least a minimum, but preferably the desirable vertical curvature to meet sight distance requirements.
- **Climbing Lanes** - Additional climbing lanes are recommended for locations where vertical grades result in a 15-mph reduction in heavy truck speeds.
- **Interchanges** - Reconstruction of existing diamond Interchanges to provide 700 feet (minimum) between ramp termini and 430 feet between ramp termini and outer roads with improved access control.

4. SYSTEM PRESERVATION

a. Pavement Condition

The original pavement for I-70 was constructed between 1956 and 1965, with portions of incorporated US 40 being constructed in the 1940's. Since that time there have been numerous projects to rehabilitate, resurface and reconstruct portions of the roadway to maintain its structural integrity and provide a smooth riding surface.

Pavement rating information was compiled from the latest available MoDOT data for each of the following:

- **Ride Condition Index (RCI)** – An index measuring the overall condition of the ride using standardized procedures.
- **Condition Score** – The calculation for this score is the result of a formula that includes separate measures for surface roughness, surface distress, and the Average Annual Daily Traffic (AADT).
- **Pavement Serviceability Rating (PSR)** – A subjective indicator of ride quality and surface roughness based on human observation utilized by FHWA prior to 1993.
- **International Roughness Index (IRI)** – An object indicator of ride quality and surface roughness developed by the World Bank and utilized by FHWA starting in 1993.

Measurements for each rating were taken from MoDOT data at 0.02-mile increments along the eastbound and westbound lanes of the existing highway. The average score for each rating was compiled for each county and for the entire corridor. Also for each rating, the length of roadway falling into five rankings (Very Poor, Poor, Fair, Good, Very Good) was compiled for each county and for the entire corridor. This information is presented in Table I-16.

Table I-16: Existing Pavement Rating Measurements

County	Average Score*	Length in Each Condition Classification (in miles)					Total Length (miles)
		Very Good	Good	Fair	Poor	Very Poor	
RIDE CONDITION INDEX (RCI)[1]							
Jackson							
Lafayette	6.40	24.06	15.52	9.90	3.98	13.26	66.72
Saline	5.60	8.14	12.32	9.26	3.72	14.86	48.3
Cooper	4.91	1.08	7.32	16.32	10.18	21.02	55.92
Boone	6.00	11.30	10.02	7.38	3.66	11.28	43.64
Callaway	5.54	2.38	13.12	19.58	7.38	13.84	56.3
Montgomery	5.72	4.36	9.78	12.02	5.84	10.60	42.6
Warren	6.40	6.20	9.48	8.12	5.52	5.12	34.44
St. Charles	4.26	0.22	2.56	5.84	3.06	10.24	21.92
Entire Corridor	*5.69*	*57.74*	*80.12*	*88.42*	*43.34*	*100.22*	*369.84*
Percent of Total Length:		16%	22%	24%	12%	27%	
CONDITION SCORE[2]							
Jackson							
Lafayette	16.99	11.00	6.48	24.18	12.32	12.74	66.72
Saline	16.20	9.96	0.04	3.08	14.52	20.70	48.30
Cooper	16.95	4.66	24.30	6.86	5.06	15.04	55.92
Boone	16.64	7.08	6.94	12.72	5.16	11.74	43.64
Callaway	17.24	14.08	1.04	22.60	5.54	13.04	56.30
Montgomery	15.56	3.66	3.88	2.46	9.44	23.16	42.60
Warren	16.49	13.20	0.22	1.46	2.94	16.62	34.44
St. Charles	15.74	0.64	0.22	7.68	5.76	7.62	21.92
Entire Corridor	*16.59*	*64.28*	*43.12*	*81.04*	*60.74*	*120.66*	*369.84*
Percent of Total Length:		17%	12%	22%	16%	33%	
PAVEMENT SERVICEABILITY RATING (PSR)[3]							
Jackson							
Lafayette	29.79	14.22	12.76	17.42	7.22	15.10	66.72
Saline	27.40	7.66	2.04	11.84	8.58	18.18	48.30
Cooper	26.77	0.48	5.90	14.82	10.86	23.86	55.92
Boone	28.65	7.60	7.04	8.96	5.14	14.90	43.64
Callaway	28.32	4.54	9.28	15.46	10.36	16.66	56.30
Montgomery	26.99	4.04	3.12	6.04	9.38	20.02	42.60
Warren	29.28	10.46	2.84	2.02	5.78	13.34	34.44
St. Charles	24.29	0.02	0.38	3.30	4.96	13.26	21.92
Entire Corridor	*27.96*	*49.02*	*43.36*	*79.86*	*62.28*	*135.32*	*369.84*
Percent of Total Length:		13%	12%	22%	17%	37%	
INTERNATIONAL ROUGHNESS INDEX (IRI)[4]							
Jackson							
Lafayette	103.51	5.58	33.92	12.76	8.84	5.62	66.72
Saline	124.59	0.34	18.74	10.36	10.38	8.48	48.30
Cooper	118.71	0.02	14.14	21.20	15.64	4.92	55.92
Boone	114.21	1.70	17.82	8.28	10.94	4.90	43.64
Callaway	114.63	0.46	14.88	20.38	17.50	3.08	56.30
Montgomery	119.06	1.50	9.84	12.66	14.82	3.78	42.60
Warren	96.23	0.50	18.66	10.34	4.22	0.72	34.44
St. Charles	139.70	0.00	3.30	6.24	7.56	4.82	21.92
Entire Corridor	*114.78*	*10.1*	*131.3*	*102.22*	*89.9*	*36.32*	*369.84*
Percent of Total Length:		3%	36%	28%	24%	10%	

*Average Score	Very Good	Good	Fair	Poor	Very Poor
[1]Ride Condition Index (RCI) Score	7.9 to 10.0	7.0 to 7.8	5.8 to 6.9	4.9 to 5.7	0 to 4.8
[2]Condition Score	18.9 to 20.0	17.8 to 18.8	16.4 to 17.7	15.3 to 16.3	0 to 15.2
[3]Pavement Serviceability Rating (PSR) Score	34.5 to 40.0	32.1 to 34.4	29.3 to 32.0	26.9 to 29.2	0 to 26.8
[4]International Roughness Index (IRI) Score	0 to 60	60.01 to 94	94.01 to 119	119.01 to 170	>170

The information shows that, depending on the rating used, between 34% and 54% of existing I-70 pavement is ranked as Poor or Very Poor. Only 25% to 38% of existing I-70 pavement is ranked as Good or Very Good. The following table (Table I-17) summarizes the findings of the pavement condition analysis for the Study Corridor based on the four condition classification systems. As shown, based on these values, from one-third to one-half of the pavement on I-70 is in a Poor or Very Poor condition.

Table I-17: Summary of I-70 Pavement Conditions

Rating	RIC	Cond. Score	PSR	IRI
Very Good	16%	17%	13%	3%
Good	22%	12%	12%	36%
Fair	24%	22%	22%	27%
Poor	12%	16%	17%	24%
Very Poor	26%	33%	36%	10%

b. Condition of Bridges

Within the study corridor there are 130 bridges, categorized as follows:

- Bridges on I-70 60
- Bridges over I-70:
  - at Interchanges 43
  - Grade Separations 22
  - Railroad 5

All bridges within the Study Corridor meet current standards, with the exception of shoulder widths in some locations. Short spans on bridges over I-70 could preclude handling additional lanes of traffic on I-70.

Based on data from the MoDOT bridge database, the condition of these bridges can be summarized as follows:

Table I-18: Summary of I-70 Bridge Conditions

Location	Number of Bridges	Average Age	Average Ratings				No. with Sufficiency Rating < 50
			Deck	Super-structure	Sub-structure	Sufficiency	
On I-70	60	20	6.6	6.7	7.1	86.6	0
Over I-70	65	33	5.8	6.3	6.9	66.4	9
Combined	125	27	6.2	6.5	7.0	76.2	9

Note: There are 130 bridges along I-70, five are railroad bridges and therefore not rated, and one bridge did not have rating data available.

Structures with a sufficiency rating of less than 50 indicate structures that are in need of major repair or replacement.

Looking further at the deck, superstructure and substructure ratings, Table I-19 provides information on the number of bridges that fall into each of the 10 rating levels.

Table I-19: I-70 Bridges Component Ratings

No.	Description	Deck	Super	Sub
9	New Condition	1	2	5
8	Good Condition – no repairs needed	14	12	29
7	Generally Good Condition – needs minor Maintenance	41	52	51
6	Generally Fair Condition – needs major maintenance	45	45	36
5	Generally Fair Condition – needs major rehabilitation	11	11	3
4	Marginal Condition – needs major rehabilitation	3	0	0

3	Poor Condition – needs immediate repair or rehabilitation	9	2	0
2	Critical Condition – facility closed – needs urgent repair or rehabilitation	0	0	0
1	Critical Condition – facility closed – study to determine if repairs possible	0	0	0
0	Critical Condition – facility closed – needs urgent repair or rehabilitation	0	0	0

Average ratings by county, and overall, are shown in Table I-20. A summary of the number of structures falling into each of the 10 rating categories by county, and overall, is shown in Table I-21.

Table I-20: Existing Bridges Average Ratings

County	Number of Bridges	Average Age (Years)	Average Rating		
			Deck	Superstructure	Substructure
BRIDGES ON I-70					
Jackson	7	13	7.9	7.1	7.4
Lafayette	16	15	7.1	7.1	7.5
Saline	6	29	5.5	7.2	6.3
Cooper	7	11	6.9	6.4	7.6
Boone	16	31	6	6.3	6.7
Callaway	2	24	6.5	6.5	7.5
Montgomery	4	17	6.3	6.0	6.0
Warren	0	N/A	N/A	N/A	N/A
St. Charles	2	15	7.0	7.0	8.0
Overall Corridor	60	20	6.6	6.7	7.1
BRIDGES OVER I-70					
Jackson	2	24	6.5	6.5	7.5
Lafayette	12	38	6.1	6.1	6.9
Saline	7	39	6.3	6.0	6.9
Cooper	11	41	5.4	6.1	6.9
Boone	12	26	5.9	6.9	6.7
Callaway	9	31	4.5	6.1	6.5
Montgomery	7	38	6.0	6.0	7.3
Warren	5	21	6.8	6.8	6.8
St. Charles	5	23	6.3	7.0	7.0
Overall Corridor	70	33	5.8	6.3	6.9
COMBINED (ALL BRIDGES)					
Jackson	9	15	7.6	7.0	7.4
Lafayette	28	25	6.7	6.7	7.3
Saline	13	35	5.9	6.5	6.6
Cooper	18	28	6.0	6.2	7.2
Boone	28	29	6.0	6.5	6.7
Callaway	11	29	4.9	6.2	6.7
Montgomery	11	30	6.1	6.0	6.8
Warren	5	21	6.8	6.8	6.8
St. Charles	7	20	6.5	7.0	7.3
Overall Corridor	130	27	6.2	6.5	7.0

Table I-21: Bridge Category Ranking

County	Number of Bridges Ranked in Each Category									
	0	1	2	3	4	5	6	7	8	9
BRIDGE DECKS										
Jackson	0	0	0	0	0	0	1	2	6	0
Lafayette	0	0	0	0	0	0	14	7	6	0
Saline	0	0	0	0	1	1	9	2	0	0
Cooper	0	0	0	2	2	0	4	8	1	0
Boone	0	0	0	3	0	7	5	10	1	1
Callaway	0	0	0	4	0	2	1	3	0	0

Montgomery	0	0	0	0	0	1	7	2	0	0
Warren	0	0	0	0	0	0	1	4	0	0
St. Charles	0	0	0	0	0	0	3	3	0	0
Overall Corridor	0	0	0	9	3	11	45	41	14	1
SUPERSTRUCTURE										
Jackson	0	0	0	0	0	0	1	4	1	1
Lafayette	0	0	0	0	0	0	14	7	6	0
Saline	0	0	0	0	0	0	7	5	1	0
Cooper	0	0	0	1	0	1	8	6	1	0
Boone	0	0	0	0	0	7	3	14	2	1
Callaway	0	0	0	1	0	1	2	6	0	0
Montgomery	0	0	0	0	0	2	6	2	0	0
Warren	0	0	0	0	0	0	4	5	1	0
St. Charles	0	0	0	0	0	0	1	4	1	0
Overall Corridor	0	0	0	2	0	11	45	52	12	2
SUBSTRUCTURE										
Jackson	0	0	0	0	0	0	0	3	5	0
Lafayette	0	0	0	0	0	0	6	8	13	0
Saline	0	0	0	0	0	0	5	8	0	0
Cooper	0	0	0	0	0	0	4	8	3	2
Boone	0	0	0	0	0	1	13	8	3	2
Callaway	0	0	0	0	0	1	4	3	1	1
Montgomery	0	0	0	0	0	1	2	5	2	0
Warren	0	0	0	0	0	0	4	10	1	0
St. Charles	0	0	0	0	0	0	0	4	2	0
Overall Corridor	0	0	0	0	0	3	36	51	29	5

In general, the bridges on the corridor are 27 years old and have average ratings as follows:

- Decks – 6.2
- Superstructure – 6.5
- Substructure – 7.0

These values fall within the Generally Fair to Generally Good categories, with a need for maintenance.

The Sufficiency Rating for the structures was also reviewed as shown in Table I-22. The Sufficiency Rating result is a percentage in which 100% would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient bridge. The value is a combination of the structural adequacy and safety (55% max), serviceability and functional obsolescence (30% max) and essentiality for public use (15% max).

Table I-22: Existing Bridges Sufficiency Rating

County	Number of Bridges	Average Age	Sufficiency	Number with Sufficiency < 50
BRIDGES ON I-70				
Jackson	7	13	91.8	0
Lafayette	16	15	93.1	0
Saline	6	29	86.4	0
Cooper	7	11	81.8	0
Boone	16	31	80	0
Callaway	2	24	87.6	0
Montgomery	4	17	81.7	0
Warren	0	N/A	N/A	N/A
St. Charles	2	15	94.8	0
Overall Corridor	60	20	86.6	0

BRIDGES OVER I-70				
Jackson	2	24	78.2	0
Lafayette	12	38	63.4	0
Saline	7	39	77.3	0
Cooper	11	41	56.1	3
Boone	12	26	69.1	3
Callaway	9	31	57.6	3
Montgomery	7	38	64.9	0
Warren	5	21	73.3	0
St. Charles	5	23	79.8	0
Overall Corridor	70	33	66.4	9
COMBINED (ALL BRIDGES)				
Jackson	9	15	88.8	0
Lafayette	28	25	81.0	0
Saline	13	35	81.5	0
Cooper	18	28	66.7	3
Boone	28	29	75.6	3
Callaway	11	29	63.6	3
Montgomery	11	30	71.6	0
Warren	5	21	73.3	0
St. Charles	7	20	84.8	0
Overall Corridor	130	27	76.2	9

The structures on I-70 score an average value of 86.6% while the structures over I-70 score an average value of 66.4%. This indicates that bridges over I-70 are deficient in more areas or in greater value than the bridges on I-70 and may require more immediate maintenance and repair to remain adequately sufficient.

These numbers indicate that a majority of the bridges in the corridor are in good to fair condition, but many will likely need major maintenance and rehabilitation over the next 30 years. The numbers also indicate that several structures are in need of immediate repair to keep them from dropping to critical condition and being closed.

c. Need for Preservation

The existing I-70 facility has preservation needs that must be addressed by any chosen improvement strategy. Exhibit I-7 shows those elements of I-70's infrastructure (i.e., pavement and bridges) that need to be repaired or replaced. In general, preservation improvements need to include the following:

- Existing pavement rated Very Good, Good, or Fair, and any new pavement needs to be adequately maintained on an on-going basis through repairs and rehabilitation/overlays to maintain the structural integrity and a smooth riding surface.

- Existing pavement rated Poor or Very Poor needs to be evaluated for major rehabilitation or complete replacement.

- Bridges with a rating of seven and above need to be adequately maintained on an on-going basis through repairs and rehabilitation to maintain the structural integrity and a smooth riding surface. A rating of seven or above indicates that the bridge will serve the needs of the public for years to come if properly maintained.

- Bridge with a rating below seven need to be programmed for major maintenance measures or for replacement, depending on the bridge's condition.

5. GOODS MOVEMENT

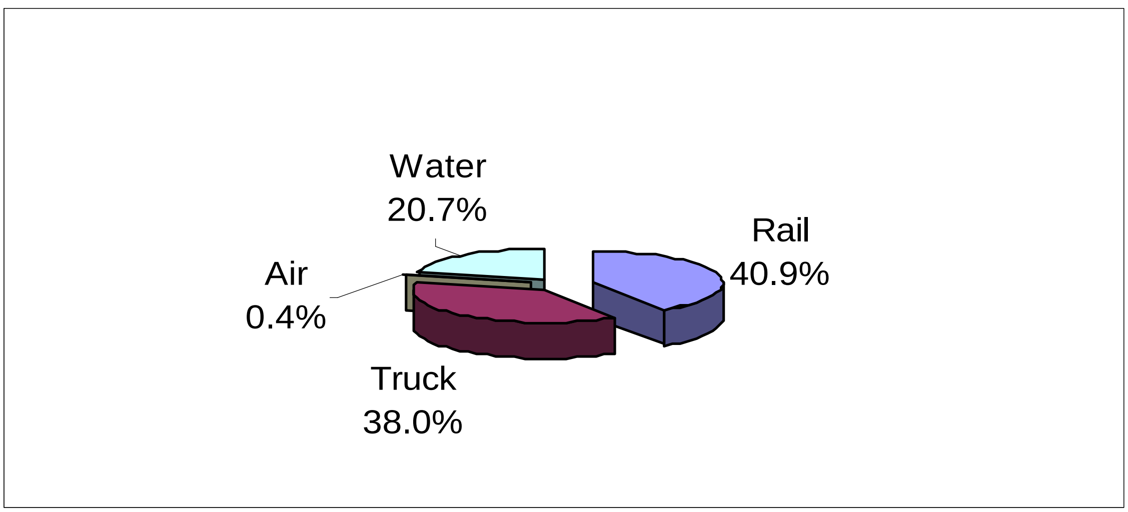
a. Overview of Freight Flow

The I-70 Corridor is a major east-west route that accommodates a significant volume of daily truck traffic. Commodities are moved into, out of, and through the state at a growing rate, and trucks and passenger vehicles compete for the available roadway capacity. Freight movement encompasses all modes of transportation. Each mode available for the movement of goods, specifically rail, air, and water, have a market niche that in some ways compete with trucking but are not able to totally replace the need for over-road transport and delivery of products.

Generally, water is used to transport heavier non-perishable items that are not time sensitive. Conversely, air is used to transport high dollar, time-sensitive goods over long distances. Typically, rail is used to transport heavier non-perishables by the carload, or time-sensitive goods by way of intermodal transportation where the cargo is switched from rail to truck while enroute. The trucking mode is primarily used for short hauls (500 miles or less) of time-sensitive goods.

As shown in Figure I-7, the primary mode of transportation used to move outbound goods from Missouri has been rail (40.9 percent), followed closely by trucks, which account for 38 percent of the goods shipped out of Missouri

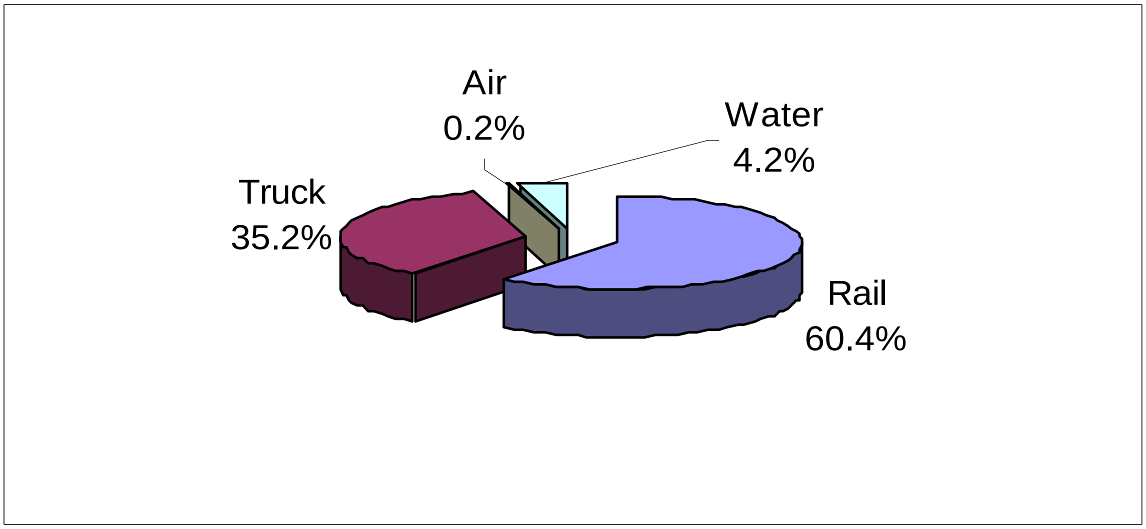
Figure I-7: Outbound Missouri Freight by Mode



Source: MoDOT Long-Range Transportation Plan

Figure I-8 illustrates the percent of goods moving into Missouri by truck is 35.2 percent, nearly equal to the truck outbound movement. In contrast, there is a shift of approximately 20 percent from outbound water to rail for inbound freight.

Figure I-8: Inbound Missouri Freight by Mode



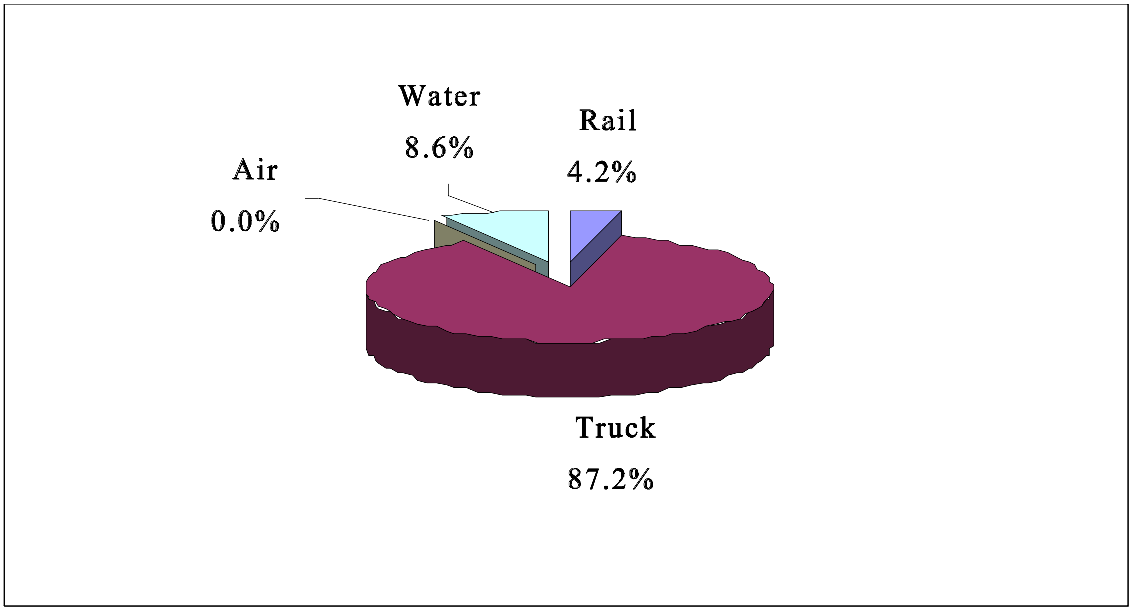
Source: MoDOT Long-Range Transportation Plan

Because of the predominance of annual commodity tonnage moving by truck between Kansas City and St. Louis (a 20-to-1 ratio), a review of modal freight movements was conducted to determine whether certain tonnage can be moved from truck to rail, thereby providing some degree of relief of truck traffic on I-70. An exact number of diverted commodities is difficult to estimate because manufacturers in the state can receive bulk raw materials via a certain mode (rail or water) and ship the finished goods by truck. Raw materials can be stockpiled and are less time sensitive than finished goods being shipped to market. The method of shipment is market driven, and a significant volume of the tonnage would have to be diverted from trucks to the other modes before there would be a noticeable change in the volume of truck traffic on I-70. If improved rail service doubled the tonnage moved between Kansas City and St. Louis, the trucks would carry approximately 1,000,000 tons less annually (3,800 tons daily). At an average commodity weight of 40 tons per truck and a load factor of 75 percent (30 tons), a reduction of approximately 125 trucks daily could be expected on I-70.

b. Statewide Truck Freight Analysis

Most of the goods both originating from and destined to areas within Missouri are transported on trucks. As shown in Figure I-9, over 87 percent of these goods are transported by truck. This is consistent with what one would expect since all trips within Missouri are under 500 miles and trucks are usually used for these types of short-haul freight movement trips.

Figure I-9: Intrastate Freight Flow within Missouri by Mode



Source: MoDOT Long-Range Transportation Plan

Table I-23 shows intrastate truck freight movement between business economic areas within Missouri. As part of this analysis, the state is disaggregated into five areas centeredaround the metropolitan areas. As could be expected, the majority of intrastate freight either originates or terminates in the Kansas City and St. Louis areas for each mode of transportation, thus reinforcing the important role of I-70 to accommodate the movement of freight by truck.

Table I-23: Annual Intrastate Freight Movement by Truck (in Thousands of Tons)

Origin BEA	Destination BEA					Total
	Columbia	Joplin	Kansas City	Springfield	St. Louis	
Columbia	N/A	293	2,204	919	3,945	7,360
Joplin	117	N/A	1,000	293	1,503	2,914
Kansas City	1,235	1,428	N/A	3,386	14,761	20,811
Springfield	395	256	2,272	N/A	4,008	6,931
St. Louis	1,226	1,080	6,844	2,872	N/A	12,023
Total	2,974	2,765	12,319	7,471	24,217	**50,039**

c. I-70 Truck Traffic

The important role of I-70 in accommodating the movement of freight is further described through the review of recent traffic count information. Truck traffic on I-70 has been steadily increasing according to truck count data. Table I-24 presents truck volumes at five locations along I-70. Counts were taken for total trucks and combinations. As indicated in Table I-24, truck traffic has averaged a two to three percent increase each year for the past five years. With this high degree of truck traffic growth, given the lower growth of overall travel in the rural areas of the Study Corridor (approximately one percent per year), over time trucks will represent a higher percentage of the total travel in the Corridor. As the percentage of truck traffic continues to grow in the rural areas of the Corridor, the operations of the I-70 roadway will continue to degrade at an ever-increasing rate. Another important finding is that between 77 and 90 percent of trucks are combinations, depending upon the section of I-70 being analyzed.

When the truck counts are compared to total traffic at the five locations, it can be seen that in locations outside the metropolitan areas, trucks comprise between 21 and 32 percent of the total traffic on I-70. Roadways with a high percentage of trucks are more likely to experience congestion, increased travel times, and less safe travel conditions than roads with fewer trucks.

Table I-24: I-70 Truck Traffic – 1994 and 1998

Location	1994 [1]	1998 [2]	Percent Inc./Year	Total 1998 Traffic [3]	Percent Trucks - 1998
e/o Lafayette County Line					
Total Trucks	7,840.00	8,720.00	2.2%	42,200	21%
Combination Trucks	6,150.00	7,520.00	2.4%		
Percent Combination	78%	86%	2.2%		
e/o US 40					
Total Trucks	7,450.00	8,290.00	2.2%	32,900	25%
Combination Trucks	5,720.00	6,990.00	2.4%		
Percent Combination	77%	84%	2.2%		
w/o US 54					
Total Trucks	5,940.00	9,320.00	3.1%	29,500	32%
Combination Trucks	5,220.00	8,340.00	3.2%		
Percent Combination	88%	89%	2.0%		
w/o M19					
Total Trucks	6,080.00	8,220.00	2.7%	33,900	24%
Combination Trucks	5,470.00	6,810.00	2.5%		
Percent Combination	90%	83%	1.8%		
e/o M47					
Total Trucks	7,650.00	8,870.00	2.3%	40,800	22%
Combination Trucks	6,040.00	7,660.00	2.5%		
Percent Combination	79%	86%			

Sources:

1. Missouri Commercial Vehicle Map - 1994
2. Missouri Commercial Vehicle Map - 1998
3. Missouri Traffic Volume Map - 1998

Trucks traveling between St. Louis and Kansas City and the out-of-state areas east and west of these two areas represent the longest trips on I-70. The out-of-state areas represent locations of trip origins and destinations external to the study area. Travel between externals, St. Louis and Kansas City was evaluated to determine the percentage of trucks making these trip exchanges on I-70. The results for 2030 are as follows:

- Between St. Louis and Kansas City – 84 percent
- Between St. Louis and external areas west beyond Kansas City – 65 percent
- Between Kansas City and external areas east beyond St. Louis – 75 percent
- Between areas east of St. Louis and west of Kansas City – 52 percent

The combined movements suggest that in 2030, 66 percent of the end-to-end travel on I-70 will be trucks. The base year truck percentages quoted in Table I-24 include all trucks on I-70, however short or long their trips, and are not comparable to the percentages of through trips stated above.

d. Need for Efficient Movement of Goods

Table I-25 represents an example of the degradation of travel times and operating speeds between the base year and 2030. The analysis indicates that given no further improvement to I-70, future congestion would add approximately 44 minutes to the truck traveling across the study corridor. This decrease in travel efficiency would result in higher freight transport costs.

Table I-25: I-70 Travel Time and Speeds (1997 and 2030)

	1997	2030
Distance [1] (miles)	197	197
Travel Time (minutes)	171	215
Speed (mph)	69	55

The freight flow analysis and supporting truck traffic counts indicate the important role that I-70 has in the movement of goods into, out from and within Missouri. The use of other travel modes such as rail and water are also important in moving freight over longer distances. A majority of intrastate movement of goods takes place via truck. Truck traffic along I-70 has been increasing at a rate slightly greater than two percent per year. Without improvements to I-70, the movement of goods by truck in the I-70 corridor would be degraded as a result of future traffic congestion, resulting in higher transport costs.

6. ACCESS TO RECREATIONAL FACILITIES

In rural Missouri, I-70 carries more traffic daily than any other interstate highway. As one of only two east-west interstates in Missouri, and the only interstate facility which connects the two largest cities in Missouri, St. Louis and Kansas City, I-70 is the largest gateway to the vast amount of tourist and recreational destinations in the state. In some locations, summer traffic volumes on I-70 can increase by 50 percent compared to winter volumes, with many travelers seeking access to recreational and tourist facilities.

Convenient access to recreational areas in Missouri is important to the quality of life of many Missourians and Midwesterners. Branson/Table Rock Lake and the Lake of the Ozarks are two of the largest tourist/recreational destinations in Missouri. But in addition to these, travelers use the I-70 connections to major north/south highways, such as US 54, US 63, US 61 and US 65, to arrive at tourist and recreational facilities throughout the state. These destinations include Long Branch Lake, Mark Twain Lake, Truman Lake, Stockton Lake, Pomme de Terre Lake, numerous rivers, streams, reservoirs and state parks.

Tourism is a $7.8 billion per year industry in Missouri, employing nearly 191,000 Missourians. $625 million in state taxes and $272 million in local taxes are generated by Missouri tourism[3] annually. Given the economic importance of the tourist and recreational destinations in Missouri, safe and efficient access is needed on I-70 to recreational facilities, especially during summer months when the number of recreational travelers increases.

Also important is the intrinsic recreational value of I-70 to those who travel on it. The I-70 "experience", whether simply enjoying the beauty of Central Missouri or experiencing the possible recreational activities potentially associated with the Corridor, can provide travelers additional recreational and entertainment opportunities. The enjoyment of the I-70 "experience" can further highlight the underlying importance of this Corridor to the tourism industry within the state.

[3] Missouri Division of Tourism.