INTERSTATE IOWA 29 | INTERSTATE IOWA 129 | INTERSTATE IOWA 35 | INTERSTATE IOWA 235 | INTERSTATE IOWA 74 | INTERSTATE IOWA 80 | INTERSTATE IOWA 280 | INTERSTATE IOWA 380 | INTERSTATE IOWA 480 | INTERSTATE IOWA 680

# IOWA INTERSTATE CORRIDOR PLAN

IOWA IN MOTION
planning ahead 2040

Iowa Department of Transportation

# Iowa Interstate Corridor Plan

2013

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# 1. Introduction

Prior to the 1950s, few had even considered the possibility of a freeway network the likes of the Interstate Highway System championed by President Dwight D. Eisenhower. Originally authorized by the Federal Aid Highway Act of 1956, approximately 370 miles of new Iowa interstate was open to traffic within the first decade of construction. Iowa's current system is comprised of 782 centerline miles, providing connections to the national transportation network and major metropolitan areas.

## 1.1 Purpose and need for a plan

The purpose of this Interstate Corridor Plan (plan) is to provide the Iowa Department of Transportation (Iowa DOT) with an initial screening and prioritization of interstate corridors/segments. This process evaluates the entire interstate system, independent of current financial constraints, using a select group of criteria weighted in terms of their relative significance. The resulting segments would then represent those areas that should be considered for further study (e.g., environmental, design, engineering), with the possibility of being considered for programming by the Iowa Transportation Commission.

There was a dominant theme present in conversations with those department stakeholders who have a keen interest in the product of this planning effort. A statement that was often heard was that staff needed more information to help answer the question, "Where do we need to be looking to next, and when?" There was a strong desire to be able to use this plan to help populate that initial pool of candidate segments that would progress towards further study, as discussed below. It was this theme that framed the need for this plan and ultimately guided its development.

### Further study

As acknowledged at the beginning of this section, the product of this planning effort will be an initial screening and prioritization of interstate corridors/segments. While this initial screening will assist the Iowa DOT in identifying those areas that should be considered for further study, the plan will not identify specific projects or alternatives that could be *directly* considered as part of the programming process. Bridging the gap between this plan and the programming process are a variety of environmental, design, and engineering activities conducted by various Iowa DOT offices. It is these activities that will further refine the priority corridors/segments identified in this plan into candidate projects.

In addition, should the evaluation process developed through this planning effort prove to be successful, it is possible that there will be additional applications, such as future primary system highway plans and statewide freight plans.

## 1.2 Relationship to the state transportation plan

The three goals of *Iowa In Motion – Planning Ahead 2040* are identified as safety, efficiency, and quality of life. These goals are the basis for decision making and will guide investments covering all modal areas. The following explains how the Interstate Corridor Plan is consistent with these goals.

### Safety

Transportation safety and security continue to be primary concerns and integral elements in the planning and programming processes. Increased transportation safety through the reduction of crashes is the foremost element in an effective transportation system, and safety is an inherent component in the design of all roadways.

On the interstate system, however, safety issues are less often a function of design characteristics. When it comes to roadway characteristics that can impact safety (e.g., access control, lane/shoulder/median width, pavement slope, sight distance, clearances, etc.), the interstate has the highest design standards of any roadway classification. So, while safety-related data is not factored directly into the evaluation contained in this plan, the specific investment decisions that may follow would certainly consider safety.

### Efficiency

Transportation efficiency is a system-wide theme, which at its core implies the best use of available funding, a reduction in financial costs, and a dependable and flexible system. Effective use of resources enhances Iowa's ability to compete economically. As noted in the state transportation plan, many evaluation tools are available and will be used to achieve optimal investment decisions. This Interstate Corridor Plan is a prime example of such a tool.

As Chapter 4 will begin to illustrate, this plan utilizes a process that incorporates a wide variety of criteria into a single comprehensive evaluation tool. This allows every segment of Iowa's interstate system to be fairly evaluated against the others, leading to better-informed and more cost-effective programming recommendations. Ultimately, efficiencies derived from this evaluation tool will allow the Iowa DOT to be a better steward of public funds.

### Quality of life

One of Iowa's greatest resources is the quality of life that exists within its borders, which is directly supported by the state's transportation services. Iowans value the ability to travel with ease, and the mobility provided by Iowa's transportation services supports its residents and economy while being sensitive to the environment.

Nowhere is ease of travel and mobility better exemplified than in the interstate system. Of course, as measures like surface condition, ride quality, and congestion decrease, so too does the quality of the travel experience. With this in mind, the previously mentioned criteria were selected and weighted in such a way that interstate segments can be flagged for possible improvement prior to experiencing a drastic reduction in these quality of life measures.

## 1.3 Relationship to MAP-21 performance measures

The "Moving Ahead for Progress in the 21st Century Act" (MAP-21) directed the Secretary of the U.S. Department of Transportation to promulgate a rulemaking that establishes performance measures and standards to support the seven national goal areas. These goal areas include safety, infrastructure condition, congestion reduction, system reliability, freight movement, environmental sustainability, and reduced project delivery delays.

The associated rulemaking is expected to be completed by spring 2015. In the meantime, the American Association of State Highway and Transportation Officials' (AASHTO) Standing Committee on Performance Management published a report highlighting their findings on national level performance measures. This report, which is expected to be influential during the rulemaking process, recommended a set of 15 measures. Of those 15 measures, the following are directly applicable to Iowa's interstate system.

## Safety

- **Number of fatalities:** Five-year moving average of the count of the number of fatalities on all public roads for a calendar year.
- **Fatality rate:** Five-year moving average of the number of fatalities divided by the vehicle miles traveled (VMT) for a calendar year.
- **Number of serious injuries:** Five-year moving average of the count of the number of serious injuries on all public roads for a calendar year.
- **Serious injury rate**—Five-year moving average of the number of serious injuries divided by the VMT for a calendar year.

## Pavement condition

- **Interstate pavement in good, fair, and poor condition based on the International Roughness Index (IRI):** Percentage of 0.1 mile segments of interstate pavement mileage in good, fair, and poor condition based on the following criteria: good if IRI<95, fair if IRI is between 95 and 170, and poor if IRI is greater than 170.
- **Pavement structural health index:** Percentage of pavement which meet minimum criteria for pavement faulting, rutting, and cracking.

## Bridges

- **Percent of deck area on structurally deficient bridges:** National Highway System (NHS) bridge deck area on structurally deficient bridges as a percentage of total NHS bridge deck.
- **NHS bridges in good, fair, and poor condition based on deck area:** Percentage of NHS bridges in good, fair, and poor condition, weighted by deck area.

## Freight


- **Annual hours of truck delay (AHTD):** Travel time above the congestion threshold in units of vehicle-hours for trucks on the Interstate Highway System.
- **Truck Reliability Index ($RI_{80}$):** The RI is defined as the ratio of the total truck travel time needed to ensure on-time arrival to the agency-determined threshold travel time (e.g., observed/preferred travel time).

### System performance

- **Annual hours of delay (AHD):** Travel time above a congestion threshold (defined by state departments of transportation and metropolitan planning organizations) in units of vehicle-hours of delay on interstate and NHS corridors.
- **Reliability Index ($RI_{80}$):** The RI is defined as the ratio of the 80th percentile travel time to the agency-determined threshold travel time.

The Interstate Corridor Plan aligns well with these potential national measures. Given the nature of the criteria incorporated into the evaluation tool, this plan lends itself to investment decisions that would likely promote progress toward meeting the Iowa DOT's target for each measure. This progress will be documented in the department's biennial reporting on performance targets as prescribed by MAP-21.

## 1.4 Vision statement

The state transportation plan identified a guiding principle with a focus on the provision of safe and modern transportation systems and services for individuals traveling in Iowa, as well as for the movement of freight. That guiding principle is:

> **"Safely moving people and goods through investments that strengthen our economic vitality."**

In addition, the Iowa DOT's 2012-2013 Strategic Plan's mission statement includes similar themes, while incorporating the concept of customer satisfaction:

> **"Delivering a modern transportation system that provides pathways for the social and economic vitality of Iowa, increases safety, and maximizes customer satisfaction."**

The Interstate Corridor Plan is consistent with these visions and the core themes that they promote. It is difficult to identify a system that better exemplifies safe and modern travel, or a system that has a greater impact on Iowa's economic vitality than the interstate. The investment decisions that may follow on this plan will only enhance the interstate's status and its role in achieving these visions.

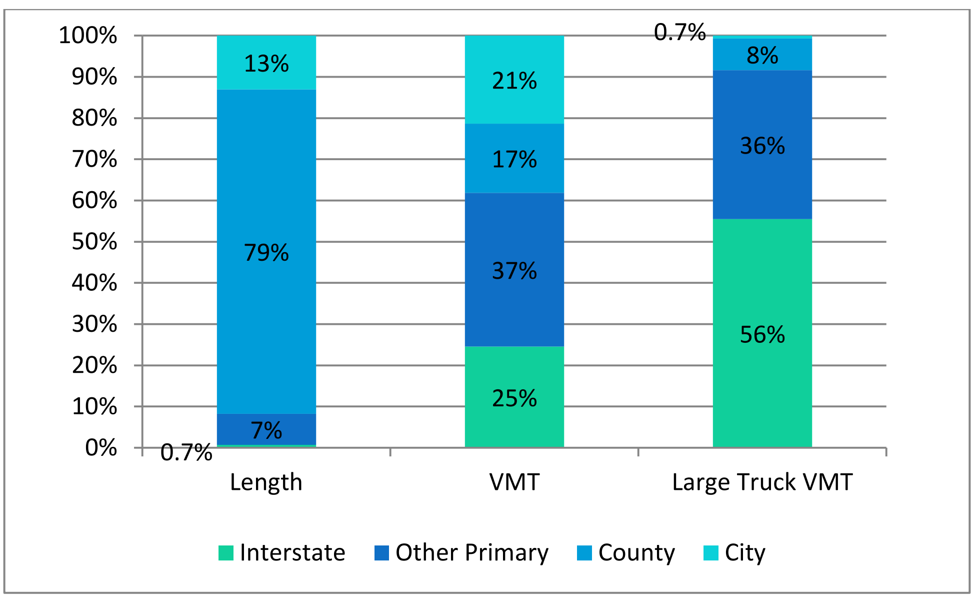
# 2. System characteristics

This chapter provides a brief and temporal summary of Iowa's interstate system, and examines many of the key trends that have impacted the system and are projected to impact the system into the future. An understanding of this information provides a foundation of knowledge that will help plan to meet the resulting challenges.

## 2.1 System summary

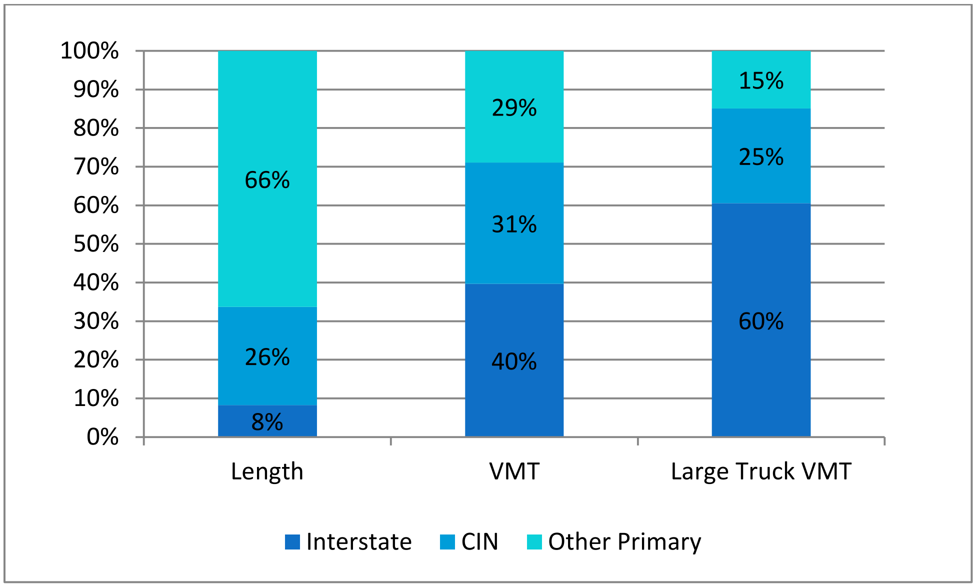
The first section of interstate in Iowa opened to traffic in September 1958. With the final section (I-380 from Iowa 150 to US 20) opening in September 1985, Iowa's interstate system had grown to its current size of 782 centerline miles. This system, which also consists of 271 miles of ramps, now supports nearly 8 billion vehicle miles of travel (VMT). While the interstate system comprises just 0.7 percent of the length of Iowa's full road and street system, it carries 25 percent of total VMT and 56 percent of large truck VMT (see Figure 2.1). Figure 2.2 shows a similar comparison for the primary highway system alone.

**Figure 2.1: Iowa road and street system comparison**




**Source: Iowa DOT**

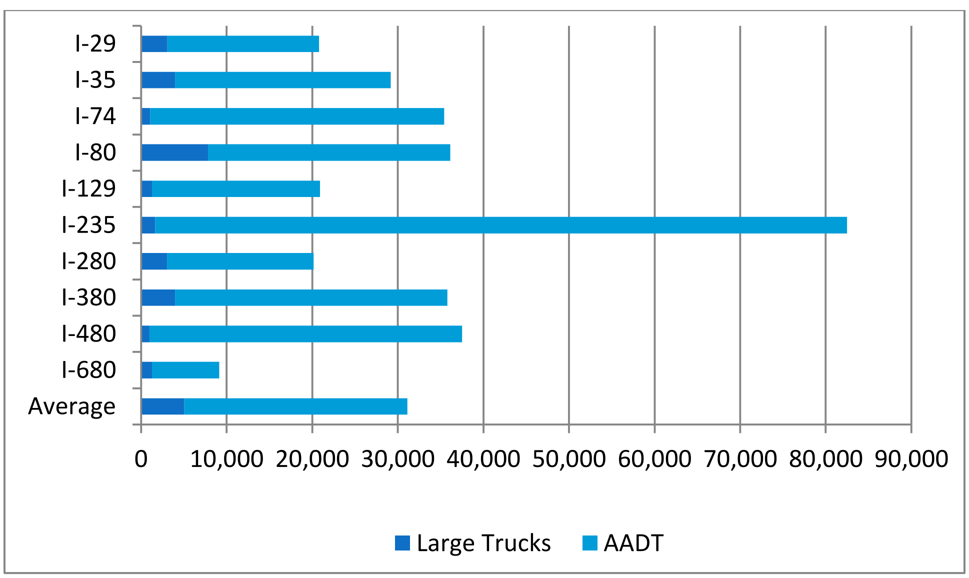
**Figure 2.2: Primary road system comparison**




**Source: Iowa DOT**

Figure 2.3 illustrates the differences in total and large truck traffic by interstate route. By far, the most heavily traveled route is I-235 in Des Moines, with the corridor between 56th Street and 42nd Street carrying approximately 125,000 vehicles per day. I-80 carries the most large truck traffic, where nearly one in every three vehicles is a large truck.

**Figure 2.3: Average annual daily traffic by route, 2011**



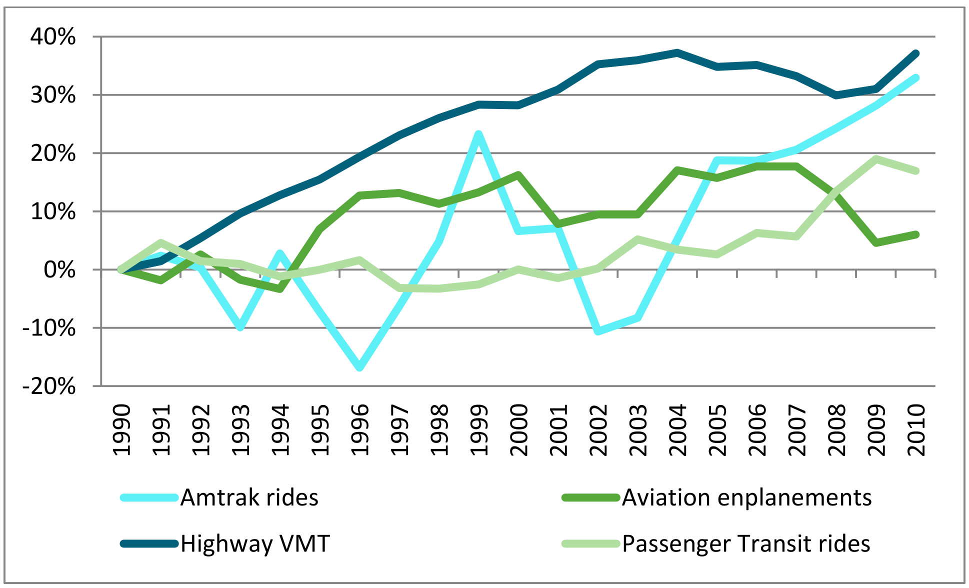

**Source: Iowa DOT**

# 2.2 Passenger and freight trends

## Iowa's passenger travel is increasing but not uniformly across all modes

Growth in passenger travel in the past 20 years has not been uniform. Highway passenger VMT and aviation enplanements grew the most between 1990 and 2000, while public transit and passenger rail had the most significant percent increases in passenger travel between 2000 and 2010. If passenger travel trends from the past decade continue, public transit and passenger rail ridership will continue to grow, highway VMT will remain steady or slowly increase, and aviation enplanements may slightly decrease. It should be noted that passenger travel trends are influenced in part by the cost of fuel, and fluctuations in these costs can create some uncertainty in forecasting future travel trends. Figure 2.4 shows the passenger transportation trends for each mode from 1990 to 2010.

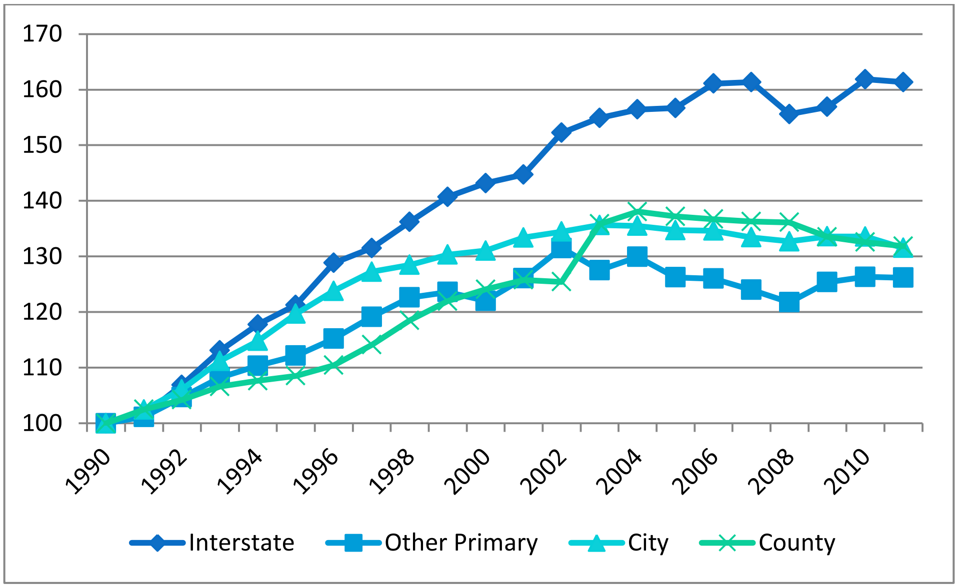
**Figure 2.4: Percent change in travel by mode since 1990**




**Source: Iowa DOT (Note: Highway VMT includes automobiles, pickup trucks, and motorcycles)**

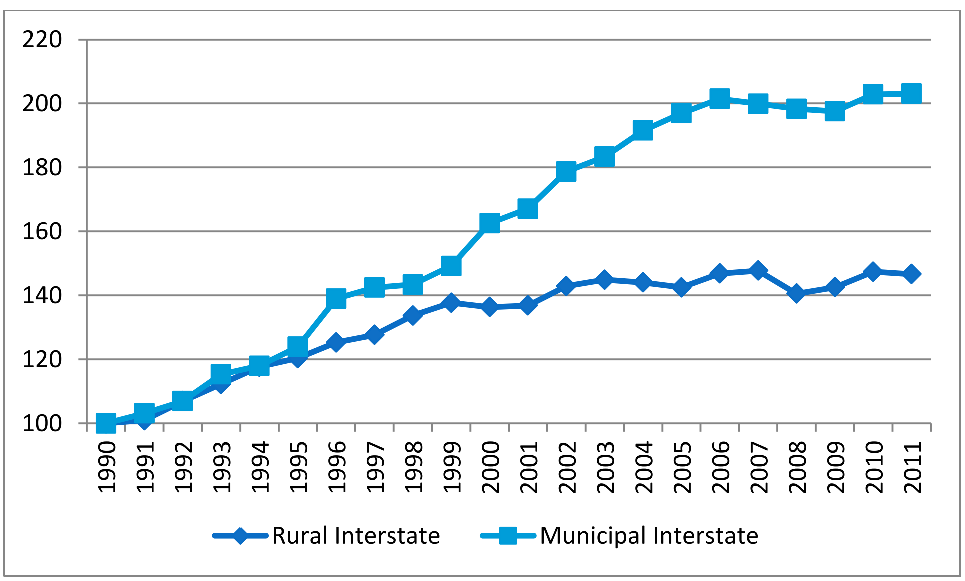
In terms of total VMT growth on Iowa's road and street system, the interstate system has far outpaced the remainder of the system (see Figure 2.5). In addition, a similar disparity exists on the interstate system itself, with growth on the municipal portion of the system significantly outpacing growth on the rural portion of the system. This disparity is illustrated in Figure 2.6.

Figure 2.5: Indexed growth of VMT by system




Source: Iowa DOT

Figure 2.6: Indexed growth of interstate VMT

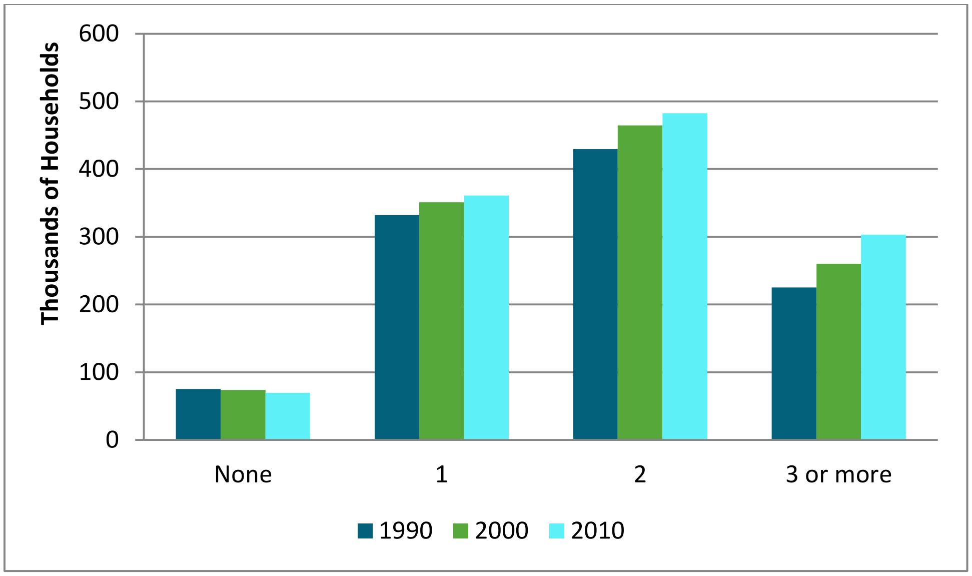



Source: Iowa DOT

## Vehicles per Iowa household is increasing

Since 1990, the number of households with three or more vehicles has increased by 35 percent, while the number of households with no vehicles decreased eight percent. However, as in 1990, the majority of households still have one or two vehicles. Figure 2.7 illustrates the increase in vehicles per household from 1990 to 2010. As vehicle ownership increases, there will be more travel on Iowa's roadways, including the interstate.

**Figure 2.7: Number of vehicles available per household in Iowa, 1990-2010**




**Sources: U.S. Census Bureau, 2006-2010 American Community Survey 5-Year Estimates**

## Most Iowans drive alone to work

In 2010, 78.7 percent of workers commuted to work by driving alone, 10.3 percent of Iowans carpooled to work, 3.8 percent walked, and 1.1 percent took public transportation. Additionally, 1.3 percent of the working population took "other" modes of transportation to work, and 4.8 percent of Iowans worked from home. These trends remained largely the same between 2000 and 2010 with the exception of those traveling by "other" modes, which saw a 42 percent increase in the past decade. However, between 1980 and 2010, the percentage of workers driving to work alone increased 27 percent, while carpooling decreased 44 percent, and walking to work decreased 56 percent. Table 2.1 shows how Iowans got to work from 1980 to 2010.

Table 2.1: How Iowans got to work, 1980-2010

| | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|
| Drove alone | 62.1% | 73.4% | 78.6% | 78.7% |
| Carpooled | 18.4% | 11.9% | 10.8% | 10.3% |
| Public transportation | 1.9% | 1.2% | 1.0% | 1.1% |
| Walked | 8.6% | 5.8% | 4.0% | 3.8% |
| Other (incl. bicycle, motorcycle, taxi) | 1.6% | 0.9% | 0.9% | 1.3% |
| Worked at home | 7.3% | 6.7% | 4.7% | 4.8% |

Sources: U.S. Census Bureau, 2006-2010 American Community Survey 5-Year Estimates

## Iowa's multimodal freight flows and values are increasing

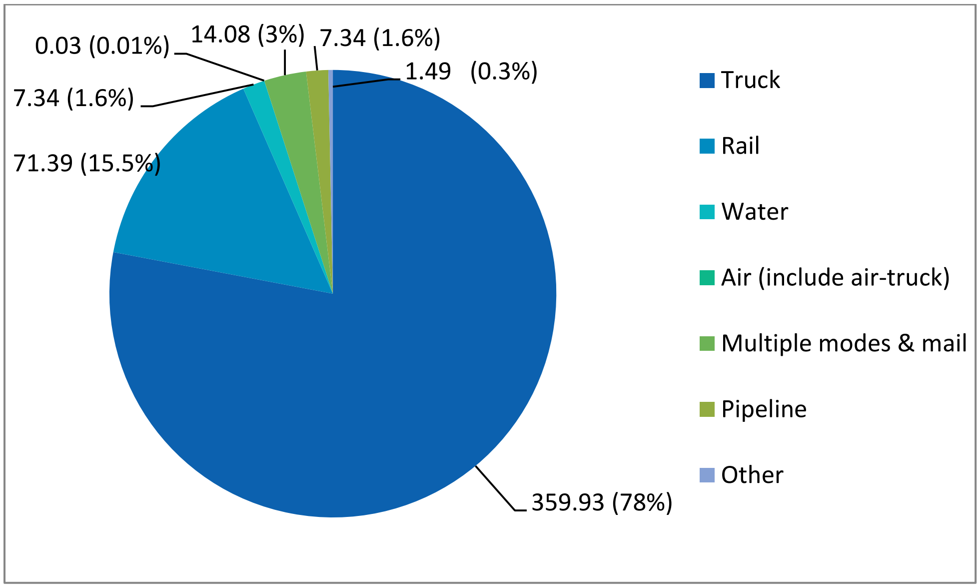
In 2011, more than 460 million tons of freight was moved to, from, and within the state of Iowa. This number is projected to increase to more than 820 million tons by the year 2040. It has also been estimated that freight shipments crossing state lines account for nearly 75 percent of all freight ton-miles in Iowa, which is why it is so important to consider Iowa's transportation infrastructure as part of a regional and national network for moving freight. Table 2.2 shows projected increases in freight values by truck and non-truck modes. Figures 2.8 and 2.9 show the freight tonnage by mode in 2011, and the projected freight tonnage in 2040.

Table 2.2: Iowa freight values, 2011 and 2040 (billions of dollars)

| | Within Iowa | | From Iowa | | To Iowa | |
|---|---|---|---|---|---|---|
| | 2011 | 2040 | 2011 | 2040 | 2011 | 2040 |
| Truck | $104.4 | $204.2 | $82.6 | $146.4 | $88.2 | $198.6 |
| Non-truck | $5.2 | $12.9 | $30.9 | $65.2 | $31.1 | $95.8 |

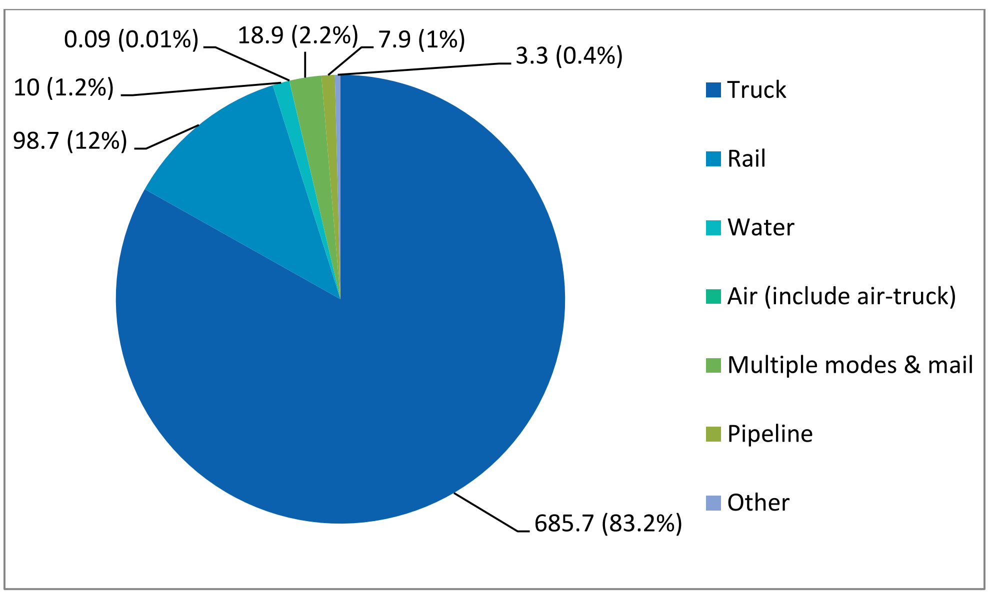
Source: Freight Analysis Framework, FHWA

**Figure 2.8: Freight tonnage to, from, and within Iowa, 2011 (millions of tons)**




**Source: Freight Analysis Framework, FHWA**

**Figure 2.9: Freight tonnage to, from, and within Iowa, 2040 (millions of tons)**

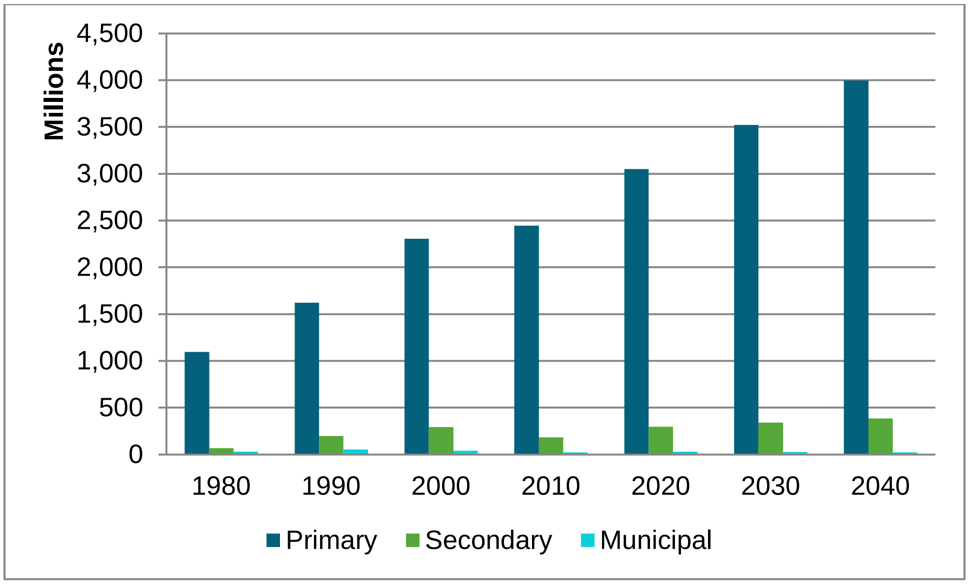



**Source: Freight Analysis Framework, FHWA**

## Freight movements on Iowa's interstate system are increasing

Large truck traffic on Iowa's highways will continue to increase in the future.  Freight movement by truck in Iowa is heavily concentrated on the Interstate and Commercial and Industrial Network (CIN), which comprise the majority of the National Highway System (NHS). This system carried 85 percent of Iowa's large truck traffic (combination units) in 2010.  Figure 2.10 shows the growth in large truck VMT by jurisdiction from 1980 to 2010, and projected to 2040.

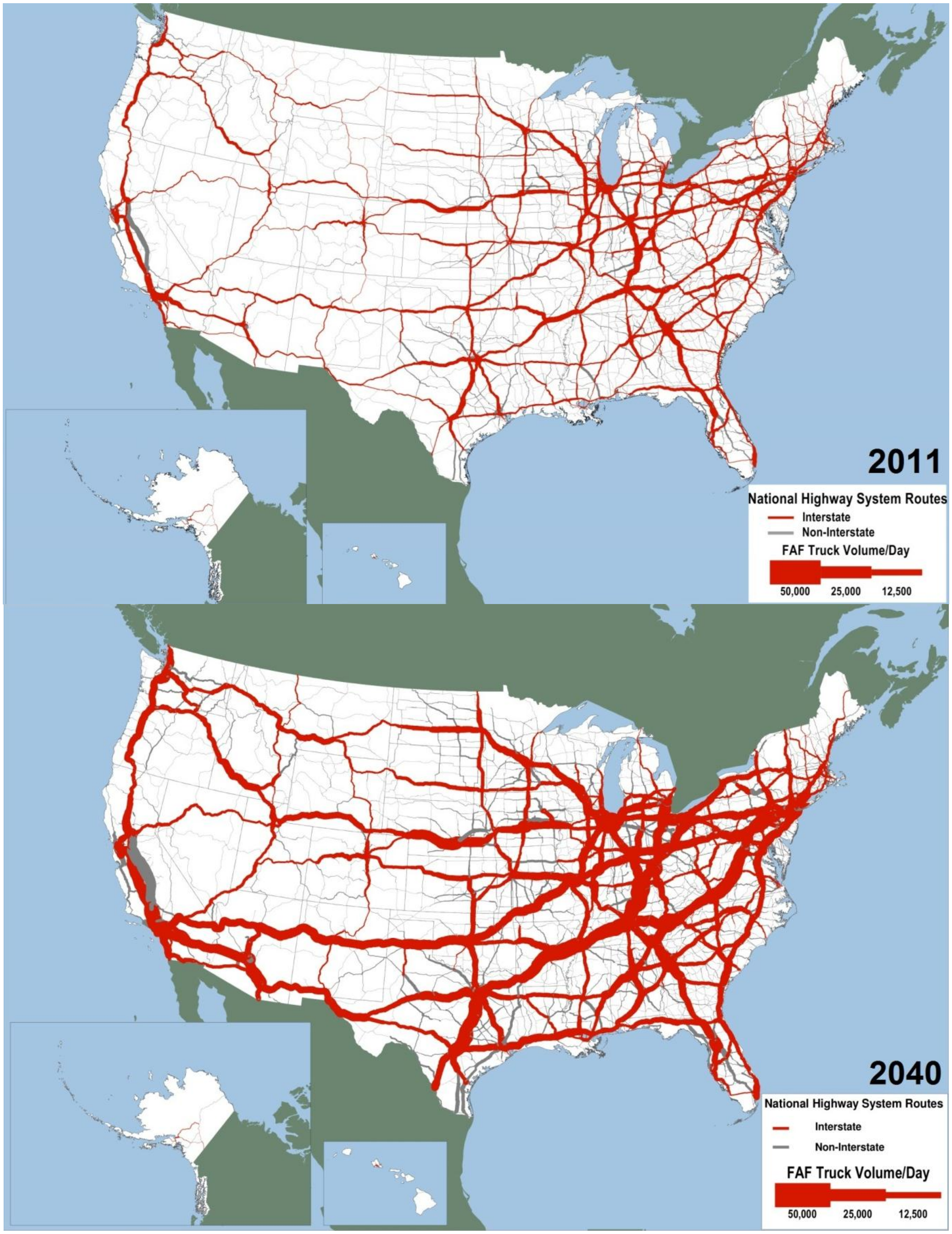
**Figure 2.10: Large truck VMT by jurisdiction, 1980-2040**




**Source: Iowa DOT**

Over the past 30 years, large truck traffic on Iowa's primary roads showed an increase of 123 percent with the highest truck activity on I-80 in eastern Iowa.  During this same period, truck traffic on secondary roads also increased substantially, while truck traffic on municipal roads has remained relatively stable.  If these trends continue, large truck traffic will grow approximately 66 percent between now and 2040, which will certainly impact Iowa's highways through increased congestion and deteriorating pavement conditions.  Figure 2.11 illustrates the projected increase in average daily long-haul truck traffic on the NHS, and particularly the interstate system.

**Figure 2.11: Average daily long-haul freight truck traffic on the NHS, 2011 and 2040**



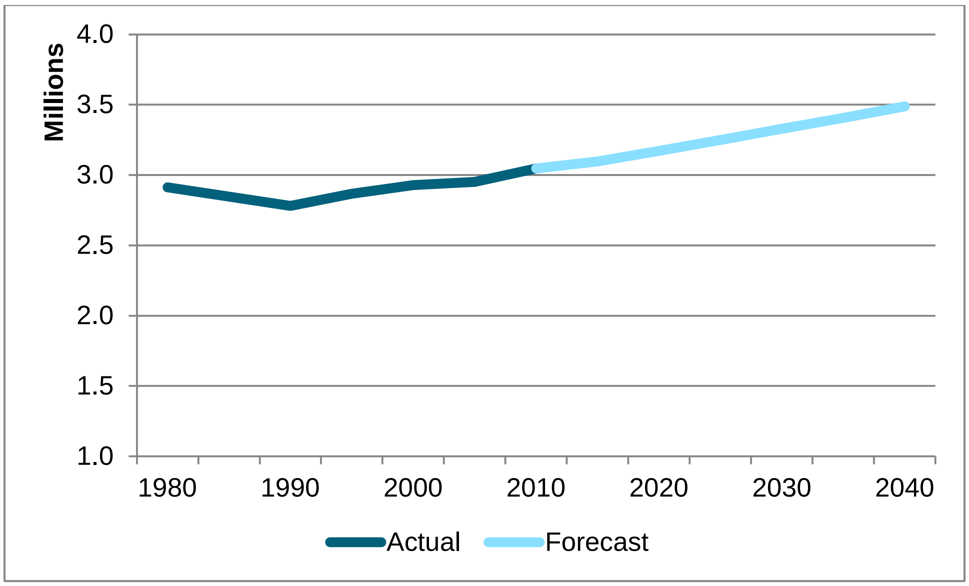

**Source: Freight Analysis Framework, FHWA**

# 2.3 Socioeconomic trends

## Iowa's population is growing at a slow pace

Iowa's population has remained relatively stable since 1980, growing 4.55 percent over the past 30 years. It is projected that Iowa's population will increase from 3.04 million in 2010 to approximately 3.49 million in 2040.

**Figure 2.12: Iowa population, 1980-2040**



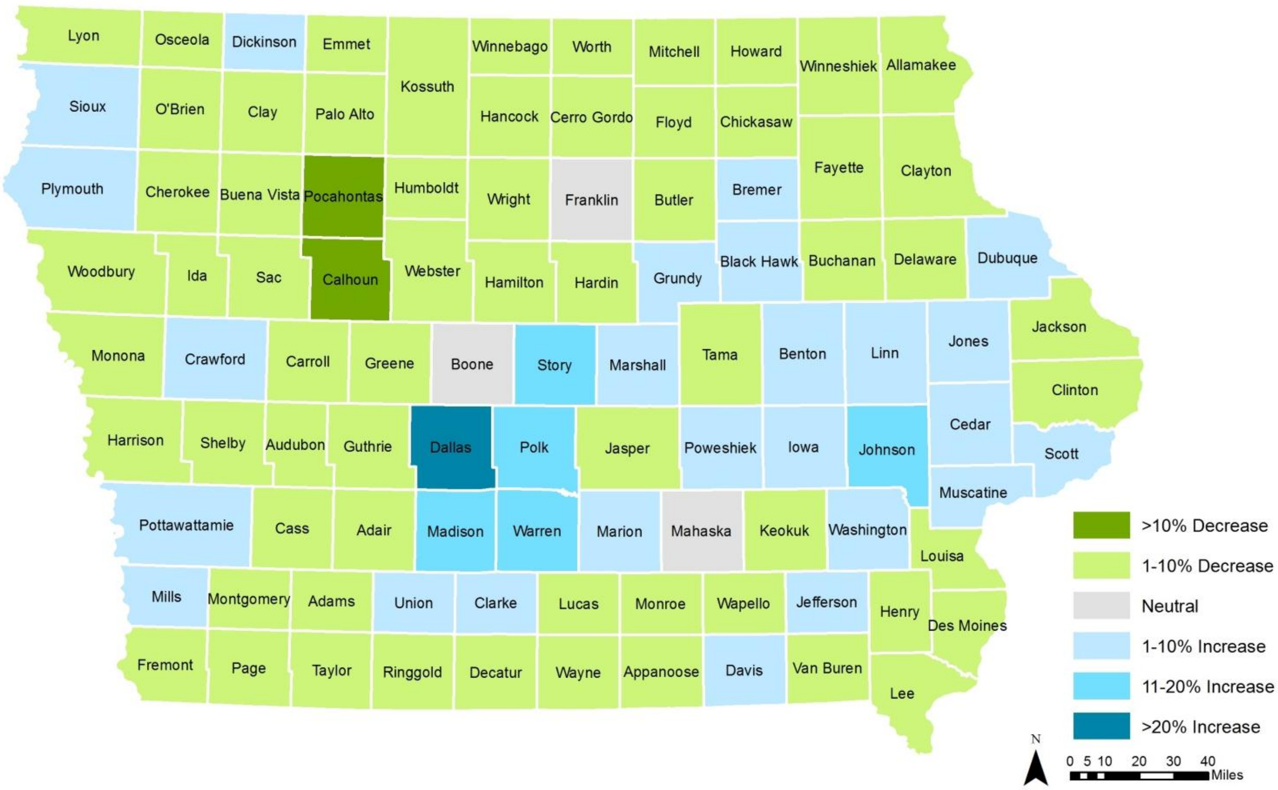

**Sources: U.S. Census Bureau, Woods and Poole Economics, Inc.**

Iowa's population growth from 2000 to 2010 was slower than the national growth rate, but was fairly consistent with the Midwest region (the U.S. Census Bureau defines this region as the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin). According to the 2010 census, Iowa's population grew 4.1 percent from 2000 to 2010, compared to 3.9 percent in the Midwest region and 9.7 percent nationally.

## Iowa's population growth is in and around the urban areas

Areas of population growth and decline are scattered around the state. Between 2000 and 2010, 31 of Iowa's 99 counties grew in population, three remained virtually unchanged, and 65 counties declined in population. While there was growth in various locations across Iowa, the majority of population increases took place within or near metropolitan areas. Figure 2.13 illustrates the 2000 to 2010 population change distributed across Iowa's 99 counties.

**Figure 2.13: County population change, 2000-2010**

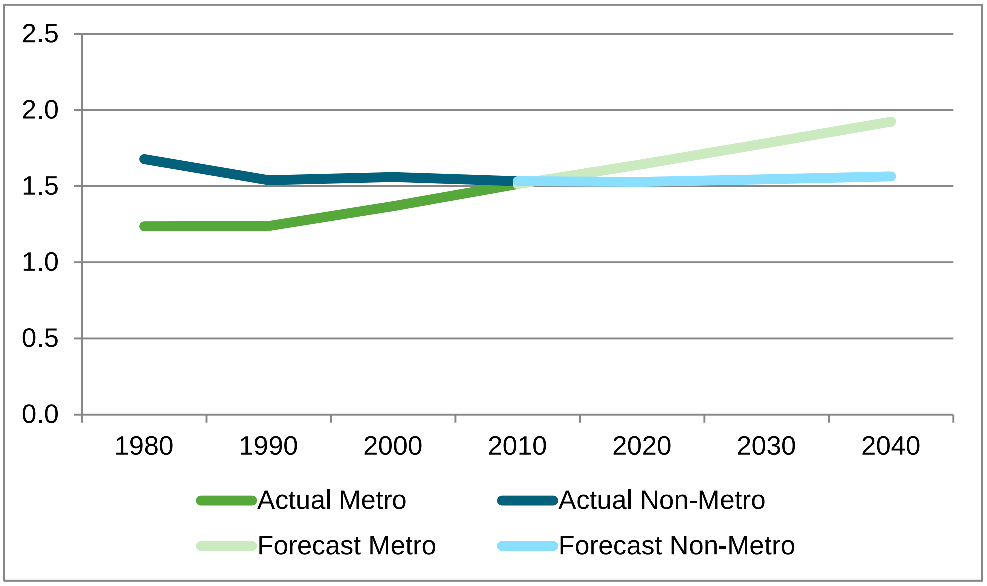



**Source: U.S. Census Bureau**

As mentioned previously, Iowa's population is continuing to migrate toward the state's nine metropolitan areas, which have an urban core of at least 50,000 people. Historically, the majority of Iowa's population has resided in non-metropolitan areas, yet most of the population growth in recent decades has been in counties that contain or are adjacent to metropolitan areas. Assuming that this trend continues, Iowa's metropolitan population is expected to account for nearly 60 percent of the state's total population by 2040. Figure 2.14 charts this trend since 1980, and forecasts the expected gap between metropolitan and non-metropolitan population levels in 2040.

Although Iowa's population as a whole is growing at a slow pace, the shift in population from rural to urban communities in recent years has impacts on the transportation system. Increased population in metropolitan areas can create congestion and capacity issues, while local jurisdictions with decreasing population can be faced with less funding for deteriorating roadways.

Figure 2.14: Metropolitan and non-metropolitan population, 1980-2040 (millions of persons)

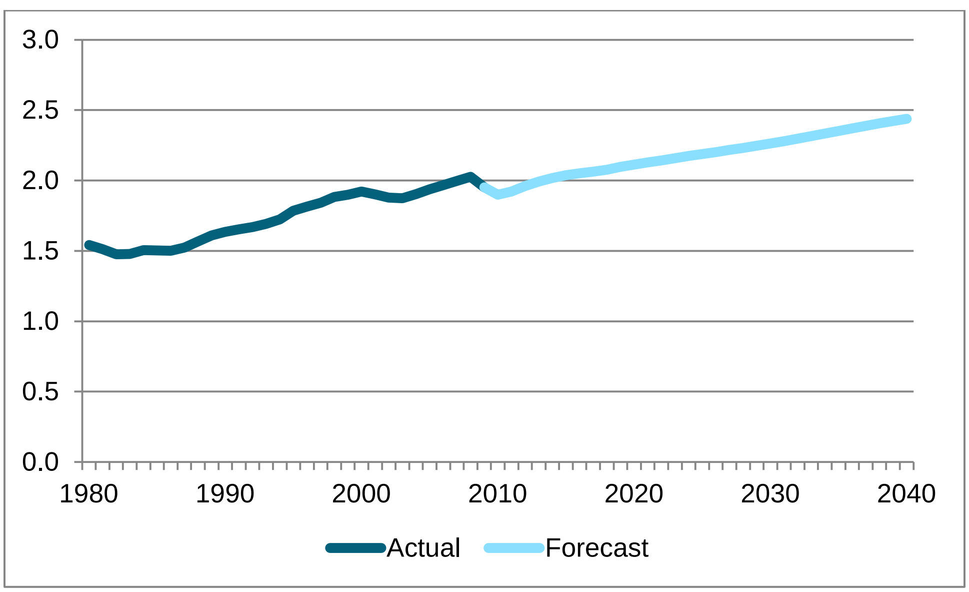



Sources: U.S. Census Bureau, Woods and Poole Economics, Inc.

## Iowa's total employment is growing at a slow pace

In the past 30 years, total employment in Iowa has slowly increased, growing about 27 percent from 1980 to 2009. Iowa's employment is expected to continue this growth by increasing another 28 percent by 2040. Figure 2.15 charts the actual and projected total employment in Iowa from 1980-2040.

Figure 2.15: Iowa employment, 1980-2040 (millions of jobs)



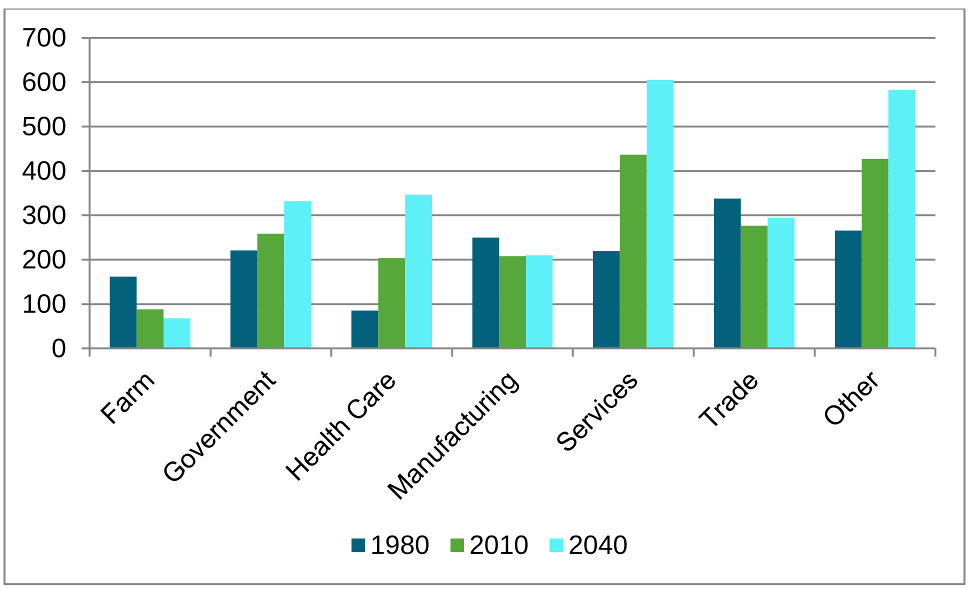

Sources: U.S. Bureau of Economic Analysis, REMI Economic Models Inc.

## Iowa's traditional employment sectors have changed

Traditionally, farming and manufacturing have been two of the primary employment sectors in Iowa. Technological advancements and economic diversification have changed this in recent years. Since 1980, the farm sector has lost about 73,000 jobs, which represents a decline of nearly 45 percent in total farm employment in Iowa. This trend is projected to continue, with this sector losing an additional 19,800 jobs through 2040. There has also been a significant decrease in manufacturing employment since 1980 with about 41,700, or 17 percent, fewer jobs than there were 30 years ago. As for the future, manufacturing jobs in Iowa are expected to remain nearly flat, growing an estimated one percent over the next 30 years.

The largest employment gain from 1980 to 2010 was in the health care and social assistance sector, which grew 138 percent, or nearly 118,000 jobs. The second-largest gain was in the services sector, growing by 99 percent, or about 217,000 jobs, between 1980 and 2010. Through 2040, the number of farm jobs is projected to continue to decrease; manufacturing jobs will remain relatively stable; and jobs in other areas, such as health care and services, are forecasted to increase. As a result, there will be changing demands on urban and rural transportation infrastructure to accommodate growing employment sectors.

**Figure 2.16: Iowa employment by sector, 1980-2040 (thousands of jobs)**



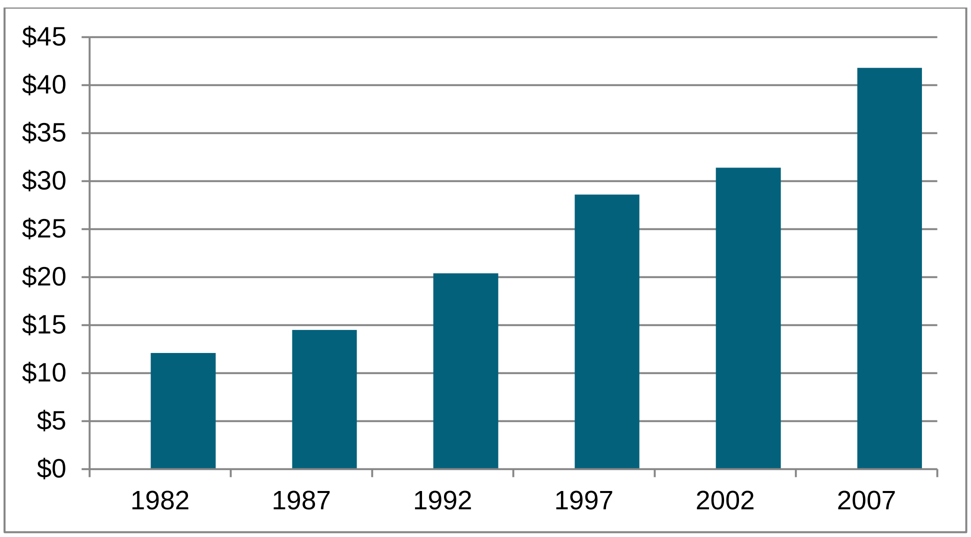

**Sources: U.S. Bureau of Economic Analysis, REMI Economic Models, Inc.**

## Iowa's value-added production is increasing

Iowa continues to be a leader in such areas as food production and processing, ethanol and bio-diesel production, and livestock production. These industries are very dependent on transportation with more movements being involved in the "adding of value" throughout the production process. The demand for value-added production will continue to grow and will depend on a reliable transportation system.

Adding value to a product, such as a manufacturing or agricultural product, increases the consumer appeal and economic value of that commodity. For example, rather than shipping raw agricultural products such as corn out of Iowa, that corn can be converted to ethanol before it leaves the state. By-products of that process such as dry distiller's grain can be utilized as feed for cattle, resulting in further value to the product. As shown in Figure 2.17, these processes have resulted in billions of dollars of value added to manufacturing in Iowa, and can also result in more freight movements within the state.

**Figure 2.17: Value added to all manufacturing in Iowa, 1982-2007 (billions of dollars)**




**Source: U.S. Census Bureau, Economic Census**

## Iowa's biofuels and wind energy industries

In addition to the aforementioned socioeconomic trends, Iowa's emergence as a national leader in both the biofuels and wind energy industries will force the state to deal with the physical and financial impacts of these industries. An example of these impacts is increased large truck traffic during the construction of a biofuels plant, which remains relatively high even after construction to support plant operations. Increased rail traffic is also common on the lines that service these plants. This traffic growth leads to accelerated infrastructure deterioration and increased maintenance costs. It is critical that such issues are considered in the transportation planning process.

A 2010 report from Iowa State University's Center for Transportation Research and Education titled "Iowa's Renewable Energy and Infrastructure Impacts" summarized the importance of addressing these issues as follows. "For both the cellulosic biofuels and the wind power industries in Iowa, the need to support the transportation infrastructure should be understood. Even more, it is necessary to ensure that the transportation infrastructure support needs of these industries are addressed in a fiscally sustainable manner. Otherwise, these industries will not be able to compete in the long run." The study identified several policy and administrative changes that could be made in order to better plan for the impacts of these industries to the state and local jurisdictions. Three of these proposed changes have direct ties to transportation:

- Consider developing policies or regulations as to where these types of plants may locate, based on the proximity of a paved road system.
- Conduct regular pavement evaluations on a county's system to help facilitate the comparison of pavement condition before and after a plant's opening.
- Consider more effective ways to tax (or assess) the industry for appropriate additional costs to the local jurisdiction, such as a tax or fee per bushel of corn, gallon of product, kilowatt-hour, or per axle-weight-mile.

The implications of failing to consider these issues in the transportation planning process could be far-reaching. If the supporting transportation infrastructure is allowed to deteriorate, costs to move the materials and products associated with these industries will increase. As this happens, the state will slowly lose its competitive edge in these growing economies.

# 3. Macro-level considerations

In addition to the trends and projections highlighted in Chapter 2, there are a variety of more global or macro-level forces at work that have the potential to dramatically impact Iowa's interstate system, particularly in terms of freight activity. This chapter highlights some of these factors while acknowledging that most are largely beyond control and, in some instances, the capacity to accurately forecast.

The considerations presented in this chapter do not represent an exhaustive list. Rather, the intent is to simply highlight a handful of examples in an effort to illustrate the nature of these macro-level forces that could impact the analysis contained in the following chapters.

## 3.1 Changes to the global transportation network

Significant physical changes to the global transportation network have the ability to noticeably impact Iowa's interstate system. This is especially true for major freight corridors such as I-80, which carry both domestic freight and freight that originates or terminates overseas. Changes to existing sea or land routes could divert freight traffic from or to such routes, which would then impact infrastructure needs at the local level.

An oft-cited example of such a change in the global transportation network is the expansion of the Panama Canal. The expansion project, which is expected to be completed in the next couple of years, will double the current capacity of the canal by allowing more and larger ships. This has the potential to dramatically change shipping routes, particularly those currently utilized by Asian exporters sending containers to the United States.

Currently, most containers coming from Asia enter the United States at West Coast ports, such as Los Angeles. Containers headed to the Midwest or East Coast are then mounted on trains or trucks headed east. Expanding the Panama Canal will allow the very large "Post-Panamax" container ships to bypass the West Coast and sail further to ports in the Gulf of Mexico or the Atlantic, assuming these ports are eventually equipped to handle these larger vessels.

The impact for corridors such as I-80 could be decreased freight flows as much of these eastbound imports bypass the upper Midwestern states. Westbound flows of American exports could also be impacted, shifting south from routes like I-80 towards the Gulf Coast ports to take advantage of a lengthier but more cost-effective sea route through the Panama Canal.

While significant work remains for the Gulf Coast and East Coast ports to be able to be able to handle these Post-Panamax ships, freight flows associated with eastbound imports and westbound exports are likely to be impacted by this particular change in the global transportation network. And as a major east-west corridor across the United States, I-80 would not be immune to the impacts.

## 3.2 Changes in supply and demand

Changes in supply and demand for products currently shipped across Iowa's interstates could also impact freight flows along these corridors. The same is true for changes in the origin or destination of those products relative to the freight corridors on which they are shipped. Such changes impact freight flows both in terms of volume and location.

An example of this type of change can be seen in the shifting manufacturing market, which impacts regional demand on the freight network. Manufacturing creates demand on the freight network to ship raw materials, parts, supplies, and finished products. If manufacturing in the upper Midwest continues to decline, this will decrease freight flows on the surrounding freight network, including Iowa's interstates.

Not all manufacturing declines in the upper Midwest can be attributed to facilities closures. Some facilities have simply relocated to new or expanded operations in the southern United States. This occurs for a variety of reasons, including economic incentives, limited organized labor, and lower taxes and energy costs. Regardless of the reason, as manufacturing relocates to other areas of the country, the role of Iowa's interstates in the supply chain for the affected products diminishes.

While demand on the freight network is clearly impacted by business, it is also impacted by the consumer. Consumer demand for many products directly correlates to population density. As a result, freight flows for these categories of products should experience growth similar to the rate of population growth. With population growth in the upper Midwest lagging behind other regions of the United States, this is likely to be reflected in regional consumer demand and the associated freight flows.

## 3.3 Changes in modal share

Changes in modal share and the percentage of freight that is shipped by truck as opposed to train will change over time, having some level of impact on Iowa's interstate system. The critical questions are how much will the mode share change and how quickly. These changes will largely be decided by the health of the trucking industry and the service capacity of the railroad network.

Each mode has its distinct strengths and weaknesses. Perhaps the most obvious benefit of rail transportation is cost, with trucking typically being more expensive. That said, trucking wins out in most of the remaining aspects that are critical in the mode share competition.

For example, truck shipment times are both minimal and predictable thanks to an extensive highway system. The pool of truck transport equipment is large, flexible, and available on-demand. Trucks can navigate freight across virtually the entire highway system without needing to transfer a shipment. All of these things lead to a performance advantage that, for the time being, often points to truck as the preferred mode.

It is also worth noting that much of the nation's current transportation system has developed around the trucking industry and its technology and practices. These developments have led to productivity gains that have further grown the trucking industry. At the same time, railroads have abandoned many miles of track while focusing their business on a more concentrated segment of the market.

For all of these reasons, it is difficult to project anything but a growing dependence on trucks for freight movement (see Table 3.1). However, increasing highway congestion, volatile fuel prices, and increasing driver shortages could all begin to erode away the competitive advantage currently enjoyed by trucks. It will be important to monitor developments in these areas as they are likely to impact Iowa's interstate system.

**Table 3.1: Iowa tonnage by mode, 2011-2040 (millions of tons)**

| | 2011 | 2020 | 2030 | 2040 | % Change |
|---|---|---|---|---|---|
| Total | 980.5 | 1,255.2 | 1,513.6 | 1,826.3 | 86.3% |
| Truck | 864.3 | 1,121.2 | 1,367.9 | 1,661.2 | 92.2% |
| Rail | 84.2 | 97.6 | 106.5 | 121.8 | 44.7% |
| Multiple modes & mail | 14.9 | 16.5 | 18.0 | 20.4 | 37.4% |
| Pipeline | 7.3 | 8.2 | 7.9 | 7.9 | 7.2% |
| Water | 7.3 | 8.5 | 9.2 | 10.0 | 36.8% |
| Other and unknown | 2.4 | 3.2 | 4.0 | 4.9 | 100.8% |
| Air (includes Truck-Air) | 0.0 | 0.0 | 0.1 | 0.1 | 232.5% |

Source: FHWA, Freight Analysis Framework

# 4. Evaluation criteria

In order to begin evaluating Iowa's interstate system, we must first examine the pool of available data from which the evaluation criteria will be derived. This chapter does not include an exhaustive list of available data, but rather highlights a selection of available data that is most appropriate for the purposes of this plan, why it is significant, and how it was collected.

## 4.1 Data selection and significance

The pool of data available for use in evaluating interstate segments includes information contained in hundreds of fields across dozens of tables. The data is also maintained in several different locations, further compounding the complexity of this process. Each individual piece of data was considered for its value in the evaluation, but ultimately only seven were selected to serve as the core evaluation criteria and foundation of this plan. These criteria, which are defined in detail in the following section, include the following (listed alphabetically).

- Average annual daily traffic, combination truck count
- Average annual daily traffic, passenger count
- Average annual daily traffic, single-unit truck count
- Congestion Index value
- International Roughness Index (IRI) value
- Pavement Condition Index (PCI) rating
- Structure Inventory and Appraisal (SIA) sufficiency rating

While each of these individual criteria indicates something different, they were chosen due to their collective utility in evaluating the service and structural condition of an interstate segment. As input was gathered during the development of this plan, these criteria very quickly separated themselves from the remaining data. This clear distinction aligned well with one of the initial goals for the evaluation tool, which was to ultimately derive a single composite condition rating for each interstate segment that factored in a selection of the most critical evaluation criteria. Without such distinction, this would have proven to be a very difficult task.

### Current and forecasted data

It should be noted that it was decided to initially base the evaluation on current data, meaning forecasted data would not be factored in. The primary reason for this was the current inability to forecast all of the selected criteria. While the option to factor in forecasted data for just some of the criteria was considered, it was decided that an evaluation based purely on current data was more rational and defensible.

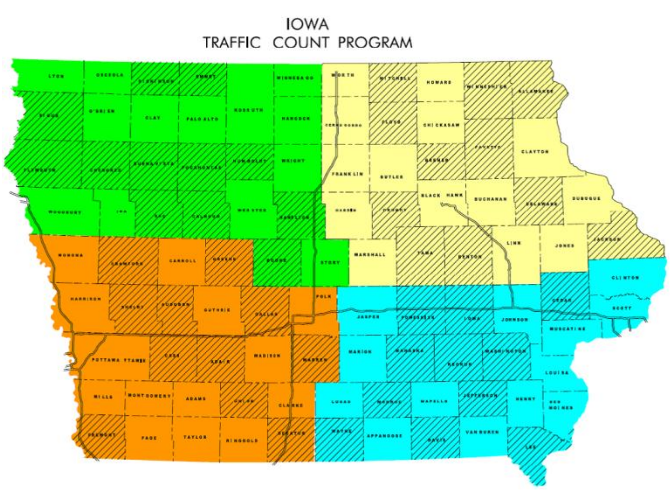
This decision, however, does not preclude future evaluation tools from incorporating forecasted data. In fact, as of the date of this plan, efforts are underway that would allow each of the selected criteria to be forecasted. Also, should the output of the evaluation process be updated on a routine basis, this would eventually provide trend data from which forecasts could be developed within the context of this plan.

## 4.2 Data definitions and collection methodologies

The following information includes a brief definition of the selected data, an explanation of how this data is collected, and where it is stored.

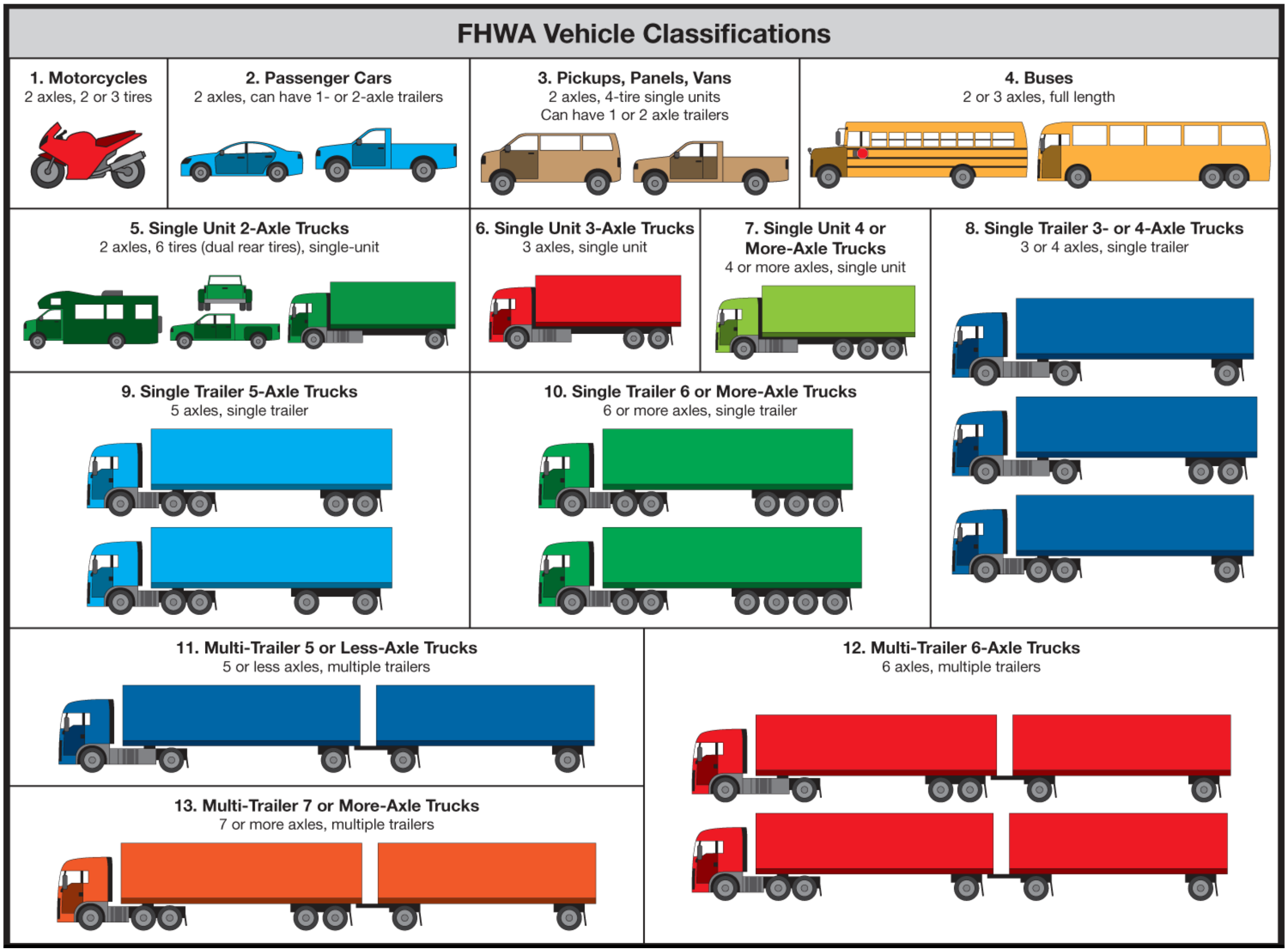
### AADT

AADT is a general unit of measurement for traffic, which represents the annual average daily traffic that travels a roadway segment. Vehicular traffic counts can be collected on a short-term duration using portable counting devices or on a long-term duration using permanent counting devices. Short duration counts ensure geographic diversity and coverage while continuous counts help understand time-of-day, day-of-week, and seasonal patterns. Continuous counts are also used to accurately adjust short duration counts into accurate annual estimates of conditions.




For the purposes of collecting traffic count data, the Iowa DOT divides the state into quadrants and counts traffic in these quadrants on a rotating four-year cycle. The interstate system is on a more frequent schedule, with traffic counts conducted in every even year. In Iowa, traffic counts are conducted by vehicle classification based on number of axles. The FHWA Traffic Monitoring Guide classifies traffic into 13 categories, which are illustrated in Figure 4.1.

**Figure 4.1: FHWA 13-Category Vehicle Classification Scheme**




**Source: Traffic Recorder Instruction Manual, Texas DOT**

The 13 traffic count categories can be summarized into fewer categories depending on the desired summary level. In Iowa, the standard traffic count summary categories include passenger car and motorcycles, single-unit trucks, and combination trucks. Generally, and for the purposes of this plan, passenger traffic includes vehicle classifications 1 through 3, single-unit truck traffic includes classifications 4 through 7, and combination truck traffic includes classifications 8 through 13. The source of traffic data at the Iowa DOT is the Geographic Information Management System (GIMS).

## Congestion index

The congestion index is a measure that characterizes operational conditions within the flow of traffic. This measure is expressed as a volume-to-capacity (V/C) ratio for a roadway segment. The ratio is an indicator of highway capacity sufficiency, where it is estimated that a facility is congesting as V/C approaches a value of 1. This index emphasizes the relative congestion of interstate segments one to another.

For the purposes of this plan, the numerator or volume portion of the V/C ratio is derived from the most recent observed daily traffic data on an interstate segment. Truck traffic is increased by a factor of 1.5 to account for this vehicle type's more significant impact on congestion. Total traffic is then halved to account for directionality (assumed to be 50 percent in each direction) and then converted to an hourly rate by applying a peak-hour factor that is based on each segment's area type (i.e., rural or urban) and data from the Iowa DOT's automatic traffic recorders.

The denominator or capacity portion of the ratio is calculated in a manner consistent with the methodology used for the Iowa Traffic Analysis Model (iTRAM), as well as guidelines contained in the Transportation Research Board's *Highway Capacity Manual*. The calculation establishes a capacity by applying a per-lane capacity figure to the number of through lanes on each segment, ultimately providing a reasonable planning estimate of a segment's capacity. The source of the data used for these calculations at the Iowa DOT is GIMS.

## IRI value


IRI is a numerical roughness index that is commonly used to evaluate and manage road systems. It is calculated using measured longitudinal road profile data to determine units of slope of a roadway segment. The profile data can be obtained using anything from traditional surveying equipment to more modern inertial profiling systems. There is no defined upper limit to IRI.

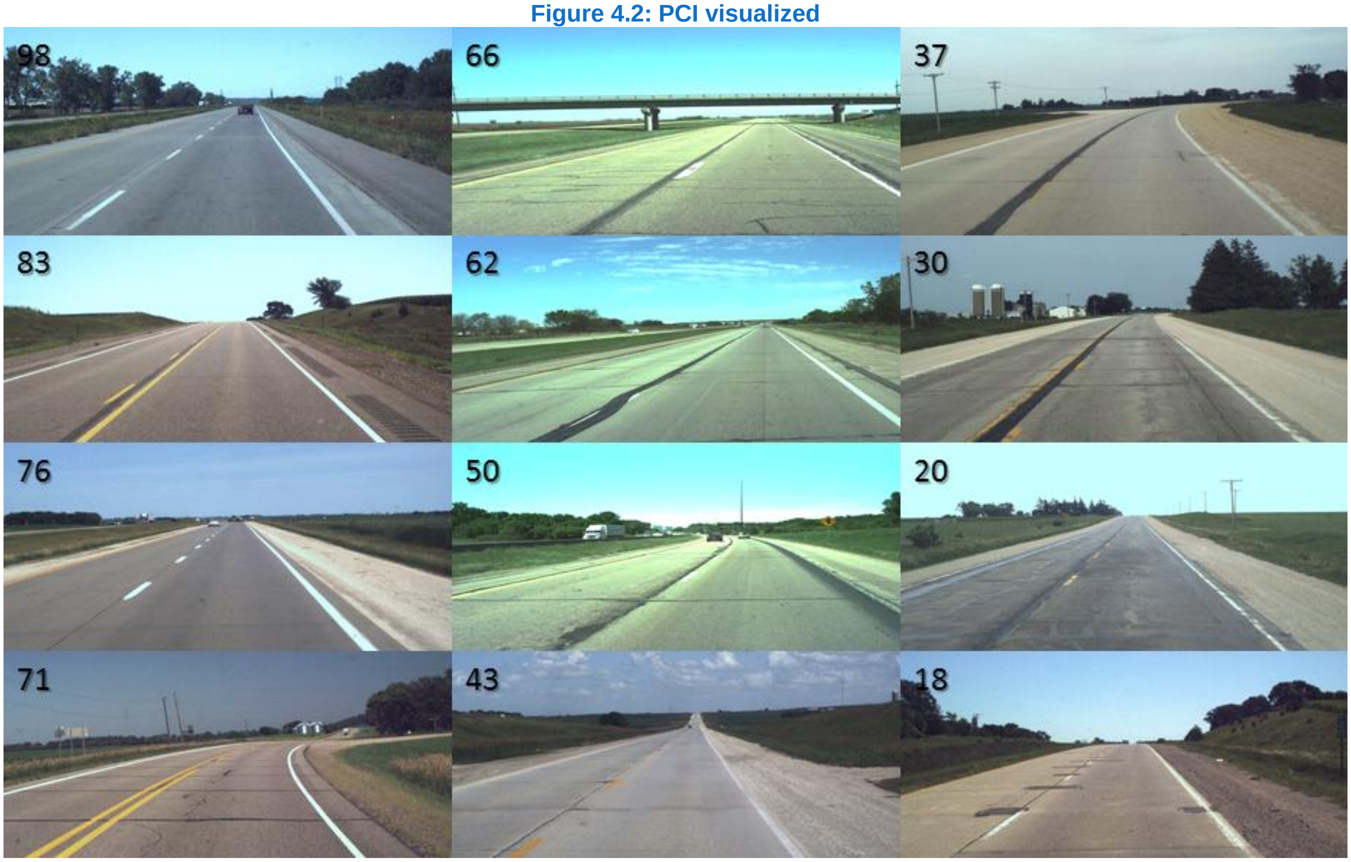
In Iowa, IRI is primarily measured using what is known as a profilometer. This tool utilizes a laser in combination with an odometer and an inertial unit, which establishes a reference plane against which the laser can measure distance. Profilometers are able to collect data at highway speed, typically sampling the surface at intervals of one to six inches. The data collected by the profilometer is used to calculate the IRI, expressed as inches/mile or meters/kilometer. The source of IRI data at the Iowa DOT is the Iowa Pavement Management Information System (PMIS).

## PCI rating

PCI is a numerical index, initially developed by the United States Army Corps of Engineers, which is used to indicate the condition of pavement.  The index is based on a field survey of the pavement and is expressed as a value between 0 and 100, with 100 representing excellent condition.  Generally, the surveying process involves breaking the pavement section into sample units; determining how many units are to be tested; recording the type, extent, and severity of pavement distress; calculating a value for these distresses; and then subtracting that value from a base value to derive the PCI value.

As Figure 4.2 illustrates, the appearance of a pavement is not always an indicator of its underlying condition, which is also considered in PCI.  Many different variables factor into the Iowa DOT's calculation of PCI on interstate segments, including age, percent of life used, high/moderate/low severity longitudinal cracking, IRI, aggregate class durability, pavement thickness, friction value, moderate severity patching, total asphalt depth, relative structural ratio, and base thickness.  Ultimately, the condition index is a reasonable indicator of the pavement condition of a network.  The source of PCI data at the Iowa DOT is PMIS.

**Figure 4.2: PCI visualized**




**Source: Iowa DOT**

## SIA sufficiency rating

SIA is a method of evaluating roadway bridge structures by calculating four separate factors to obtain a numeric value that is indicative of a structure's sufficiency to remain in service. These factors include structural adequacy and safety, serviceability and functional obsolescence, and essentiality for public use of the structure. From there, various reductions are then factored into the rating. Table 4.1 highlights the information that factors into the sufficiency rating.

**Table 4.1: Structure Inventory and Appraisal Sufficiency Rating**

| Summary | Alias | Weight | Item Description |
|---|---|---|---|
| Structural Adequacy & Safety | S1 | 55% | Superstructure |
| | | | Substructure |
| | | | Culverts |
| | | | Inventory Ranking |
| Serviceability and Functional Obsolescence | S2 | 30% | Lanes on Structure |
| | | | AADT |
| | | | Approach Roadway Width |
| | | | Structure Type, Main |
| | | | Bridge Roadway Width |
| | | | VC over deck |
| | | | Deck Condition |
| | | | Structural Evaluation |
| | | | Deck Geometry |
| | | | Underclearnances |
| | | | Waterway Adequacy |

| | | | |
|---|---|---|---|
| | | | Approach Roadway Alignment |
| | | | STRAHNET Highway Designation |
| Essentiality for Public Use | S3 | 15% | Detour Length |
| | | | AADT |
| | | | STRAHNET Highway Designation |
| Special Reductions | S4 | 13% | Detour Length |
| | | | Traffic Safety Features |
| | | | Structure Type, Main |

**Source: Iowa DOT**

The sufficiency rating is then calculated using the formula: S1+S2+S3-S4. A value of 100 represents a wholly sufficient structure, while a value of zero represents an insufficiency or deficient structure. The full structure inventory contains dozens of data fields, which are used to meet several Federal reporting requirements set forth in the National Bridge Inspection Standards (23 CFR 640.3). The information is collected through on-site inspections conducted at regular intervals, not to exceed 24 months. The source of structure sufficiency rating data at the Iowa DOT is GIMS.

## 4.3 Supplementary data

While only seven criteria were selected to factor directly into the evaluation of interstate segments, additional supplementary data has been included in this plan. This information, which is communicated primarily through the mapping contained in Chapter 6, was included due to its value in further evaluating a segment as it progresses beyond this initial screening and prioritization. This supplementary data currently includes:

- Structurally deficient/functionally obsolete bridges
- Fatal and major injury crashes (last five years)
- Five Year Program projects

# 5. Evaluation process

The internal collaboration that ultimately led to the creation of the interstate evaluation process that is the basis for this plan began with discussions between the Office of Systems Planning, the Office of Location and Environment, and other Highway Division personnel. From these initial discussions, both the need for the plan and the evaluation criteria were identified. These topics were discussed in sections 1.1 and 4.1, respectively.

## 5.1 Internal stakeholder participation

Once the evaluation criteria were identified, the Office of Systems Planning working group began developing the structure for the evaluation process, also referred to as the evaluation "tool." As defined at the outset, this tool needed to provide a comprehensive screening and prioritization of interstate segments, independent of current financial constraints, using a select group of criteria weighted in terms of their relative significance. To do this, data maintained in different locations was merged, and a composite rating based on this data was developed.

As noted in Chapter 4, the two primary sources of data used for this evaluation include GIMS and PMIS. The process used to merge this data is known as a linear overlay operation, which was performed by staff from the Performance and Technology Division. More specifically, a union operation was used to merge this spatial data into a single data set based upon a common geometry. This process returns new segmentation based on the combined merge of the various overlaid datasets. The new data can then be analyzed using these previously independent attributes, facilitating the development of the evaluation tool.

Details regarding the structure of the evaluation tool are discussed in the following section. Generally speaking, a tool was developed that would assign a composite rating to every interstate segment using the seven criteria identified in Chapter 4, weighted in terms of their relative significance. When the Office of Systems Planning working group was satisfied with the initial structure of this tool, it was presented to stakeholders in the Office of Location and Environment. Once feedback was received, minor refinements were made.

The next level of internal stakeholder input involved a presentation of the refined evaluation tool to the previously-involved stakeholders, as well as the director of the Planning, Programming and Modal Division. Following this presentation, a similar presentation was made to a broader group of internal stakeholders, including the directors of the Highway Division and the Performance and Technology Division. Again, based on the feedback that was received following these presentations, minor refinements were made before the structure of the evaluation tool was eventually finalized.

Prior to finalizing the structure of the evaluation tool, this structure was discussed with an internal Technical Guidance Committee, which included staff from a broad cross-section of the department, including the offices of Bridges and Structures, Design, Location and Environment, Program Management, Systems Planning, and Traffic and Safety, as well as the divisions of Information Technology and Performance and Technology. Once the structure was eventually finalized, this group was again utilized to vet the output of the evaluation tool via a web map similar to the Highway Portal.

## 5.2 Normalization and weighting

To ultimately develop a composite rating that could be assigned to interstate segments, a process was used that normalized criteria values to a common scale and then applied an appropriate weighting or multiplier. This process is described below and highlighted in Table 5.1.

### Value ranges

The first step in the process was to examine the range of possible values for the seven evaluation criteria identified in Chapter 4. For three of the seven criteria, there was either a logical scale or a rigid scale that could be used. The ranges for these criteria are noted below.

- Congestion index: 0 - 1.00+
- PCI: 0 - 100
- SIA sufficiency rating: 0 - 100

For the remaining four criteria, the range of possible values did not necessarily have a strict upper bound. For these criteria, the upper bound was set at a level where only five percent of all interstate segments would currently exceed this value. The logic behind this is explained in the following subsection. The resulting ranges for these criteria are noted below.

- Combination truck count: 0 - 5,000+
- Passenger count: 0 – 35,000+
- Single-unit truck count: 0 – 1,200+
- IRI: 0 - 2.30+

This step is represented in the first two columns of Table 5.1.

## Normalization to common scale

The next step in the process was to normalize the ranges of possible values for the evaluation criteria to a common scale. This was done to establish a common base to which the weighting would eventually be applied. With the goal of ultimately creating a maximum composite rating of 100, a common scale of 1 to 10 was used for the seven criteria.

Another goal was to limit the summarization or “washing out” of data in this normalization process. Therefore, the ranges of possible values identified previously were distributed across the 1 to 10 scale in equal increments. This was also why the upper bounds for combination truck count, passenger count, single-unit truck count, and IRI were set at a level where only five percent of interstate segments would currently exceed this value, allowing a high level of distinction between segments.

The ranges of possible values were assigned to the 1 to 10 scale in such a way that a lower value indicates poorer conditions/greater need/higher priority, and vice versa. For example, the lowest PCI values would be assigned a 1 and the highest PCI values would be assigned a 10. For other criteria, such as IRI, the scale was flipped where the highest IRI values would be assigned a 1 and the lowest IRI values would be assigned a 10. This step is represented in the third and fourth columns of Table 5.1.

### Weighting and multipliers

Once the seven criteria had been normalized to a common scale, appropriate weighting could be examined. Again, given the goal of creating a maximum composite rating of 100, weighting was initially viewed in terms of a percentage. In other words, criteria that would have greater influence on the composite rating were assigned a higher percentage, and vice versa. Initial percentages were assigned following working group discussions, with minor refinements made after feedback was solicited from a broader group of internal stakeholders.

From these percentages, which summed to 100, multipliers were derived that would ultimately allow for a maximum composite rating of 100. The percent values were simply divided by 10 to identify the multipliers for each criterion. For example, the structure sufficiency rating was given a weighting of 25 percent and a multiplier of 2.5. These multipliers would then be applied to the normalized value from the 1 to 10 scale for each criterion.

After the multipliers are applied to each normalized value across all seven criteria, the values are summed to calculate the composite rating. This step is represented in the final three columns of Table 5.1. The process was then applied to every segment of the interstate system, allowing for the comprehensive screening and prioritization that was initially envisioned.

It should be noted that, as part of the vetting process outlined in section 5.1, a basic sensitivity analysis was conducted to measure the effects of different weighting. While the working group was pleased with the output that resulted from the weighting identified in Table 5.1, there was a desire to examine other weighting options and, specifically, the effects of shifting weight from the condition criteria to the traffic and congestion criteria. Generally, the results were not desirable as this shift resulted in an unreasonable bias towards urban areas and even urban segments that were recently improved. Ultimately, the working group concluded that the weighting presented in Table 5.1 was most appropriate.

Table 5.1: Interstate Condition Evaluation (ICE) rating structure

| Criteria | Value range | Range | Normalized | Weighting | Multiplier | Max score |
|---|---|---|---|---|---|---|
| PCI | 0 - 100 | 1 - 10 | 1 | 25% | 2.5 | 25 |
| | | 11 - 20 | 2 | | | |
| | | 21 - 30 | 3 | | | |
| | | 31 - 40 | 4 | | | |
| | | 41 - 50 | 5 | | | |
| | | 51 - 60 | 6 | | | |
| | | 61 - 70 | 7 | | | |
| | | 71 - 80 | 8 | | | |
| | | 81 - 90 | 9 | | | |
| | | 91 - 100 | 10 | | | |
| SIA sufficiency rating | 0 - 100 | 1 - 10 | 1 | 25% | 2.5 | 25 |
| | | 11 - 20 | 2 | | | |
| | | 21 - 30 | 3 | | | |
| | | 31 - 40 | 4 | | | |
| | | 41 - 50 | 5 | | | |
| | | 51 - 60 | 6 | | | |
| | | 61 - 70 | 7 | | | |
| | | 71 - 80 | 8 | | | |
| | | 81 - 90 | 9 | | | |
| | | 91 - 100 | 10 | | | |

| Criteria | Value Range | Range | Normalized | Weighting % | Multiplier | Max Score |
|---|---|---|---|---|---|---|
| IRI | 0 - 2.30+ | >2.30 | 1 | 15% | 1.5 | 15 |
| | | 2.05 - 2.30 | 2 | | | |
| | | 1.80 - 2.04 | 3 | | | |
| | | 1.54 - 1.79 | 4 | | | |
| | | 1.29 - 1.53 | 5 | | | |
| | | 1.03 - 1.28 | 6 | | | |
| | | 0.78 - 1.02 | 7 | | | |
| | | 0.52 - 0.77 | 8 | | | |
| | | 0.27 - 0.51 | 9 | | | |
| | | 0 - 0.26 | 10 | | | |
| Combo truck AADT | 0 - 5000+ | >5000 | 1 | 15% | 1.5 | 15 |
| | | 4445 - 5000 | 2 | | | |
| | | 3890 – 4444 | 3 | | | |
| | | 3334 - 3889 | 4 | | | |
| | | 2779 - 3333 | 5 | | | |
| | | 2223 - 2778 | 6 | | | |
| | | 1668 - 2222 | 7 | | | |
| | | 1112 – 1667 | 8 | | | |
| | | 557 – 1111 | 9 | | | |
| | | 0 - 556 | 10 | | | |

| Criteria | Value range | Range | Normalized | Weighting | Multiplier | Max score |
|---|---|---|---|---|---|---|
| SU truck AADT | 0 - 1200+ | >1200 | 1 | 5% | 0.5 | 5 |
| | | 1068 - 1200 | 2 | | | |
| | | 934 - 1067 | 3 | | | |
| | | 801 - 933 | 4 | | | |
| | | 668 - 800 | 5 | | | |
| | | 534 - 667 | 6 | | | |
| | | 401 - 533 | 7 | | | |
| | | 268 - 400 | 8 | | | |
| | | 134 - 267 | 9 | | | |
| | | 0 - 133 | 10 | | | |
| Passenger AADT | 0 - 35000+ | >35000 | 1 | 5% | 0.5 | 5 |
| | | 31112 - 35000 | 2 | | | |
| | | 27223 - 31111 | 3 | | | |
| | | 23334 - 27222 | 4 | | | |
| | | 19445 - 23333 | 5 | | | |
| | | 15557 - 19444 | 6 | | | |
| | | 11668 - 15556 | 7 | | | |
| | | 7779 - 11667 | 8 | | | |
| | | 3890 - 7778 | 9 | | | |
| | | 0 - 3889 | 10 | | | |

| Criteria | Value range | Range | Normalized | Weighting | Multiplier | Max score |
|---|---|---|---|---|---|---|
| Congestion (V/C) | 0 - 1.00+ | >1.00 | 1 | 10% | 1.0 | 10 |
| | | 0.89 - 1.00 | 2 | | | |
| | | 0.78 - 0.88 | 3 | | | |
| | | 0.67 - 0.77 | 4 | | | |
| | | 0.56 - 0.66 | 5 | | | |
| | | 0.45 - 0.55 | 6 | | | |
| | | 0.34 - 0.44 | 7 | | | |
| | | 0.23 - 0.33 | 8 | | | |
| | | 0.12 - 0.22 | 9 | | | |
| | | 0 - 0.11 | 10 | | | |
| | | | | 100% | | **100** |

**Source: Iowa DOT**

## Other considerations

### Structure rating

With one exception, all data for the seven criteria could be easily summarized for each interstate segment. For the SIA sufficiency rating, however, a process needed to be defined to allow a rating associated with individual structures to be used at the segment level. The challenge came in the fact that interstate segments contain a varying number of structures, or perhaps no structures at all. To address this issue, some generalizations needed to be made.

For segments with no structures, the segment would automatically be assigned a normalized value of 10, which is the highest possible normalized value. The logic behind this generalization was that such segments would essentially be treated the same as segments with structures that have no need for repair or replacement. In other words, a segment with no structures would receive no additional priority for that particular criterion.

For segments with structures, the SIA sufficiency rating used to determine the normalized value on the 1 to 10 scale would be an average rating for all structures on the segment, weighted by structure length. This generalization allowed segments with a varying number of structures to be compared one to another, while acknowledging that the SIA sufficiency rating for longer structures should be given additional weight. Staff from the Office of Bridges and Structures confirmed this as a valid generalization.

### Null values in original data

In reviewing the input data prior to finalizing the structure of the evaluation tool, the working group identified a small number of records that contained null IRI fields. Of these records, 90 percent could be attributed to recent reconstruction or resurfacing. These records had a null IRI field and a default value of 100 in the PCI field. For these records associated with recent improvements, the segment was automatically assigned a normalized value of 10. The logic behind this generalization was that, absent real data, these recently improved segments could be grouped among the best portions of the system in terms of IRI.

For the handful of records that had a null IRI field but were not associated with recent improvements (approximately 20 out of 4,700 records), the segment was assigned a normalized IRI value equal to the normalized PCI value (derived from that segment's real PCI value). The logic behind this generalization was that, absent real data, this could be justified given the correlation between PCI and IRI on an individual segment.

# 6. Segment evaluation and prioritization

Once the evaluation criteria had been identified, and the structure for the evaluation process had been developed, the working group then applied this process to the entire interstate system. The results of this analysis are described in the following sections.

## 6.1 Applying the evaluation

### Linear overlay process

As previously noted, the core of this plan is the evaluation tool itself. This tool uses data from both the Iowa DOT's Geographic Information Management System (GIMS) and Pavement Management Information Systems (PMIS). This data is then merged through the Linear Referencing System (LRS) and linear overlay functions to create a single table of data, which is stored in Oracle spatial.

This table is then further analyzed and processed using Structure Query Language (SQL) to achieve the data normalization, weighting, and composite rating outlined in Chapter 5. From that point, segment prioritization begins to take shape. Finally, the data is then prepared for final presentation using Geographic Information System (GIS) software and other tools.

### System segmentation

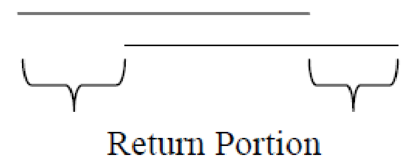
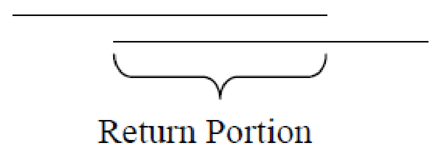
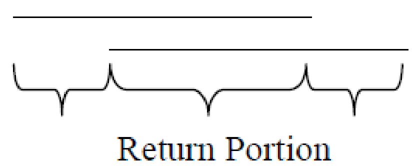
For the purposes of further framing the results of the analysis, it is important to identify how Iowa's interstate system was subdivided as part of the evaluation process summarized in Chapter 5. Generally, interstate routes, corridors, and segments are defined as follows.

- **Route:** Connects major population and economic activity centers
- **Corridor:** Portion of a route between logical terminal points, such as interchanges
- **Segment:** Portion of a corridor used as a basis for improvement needs analysis

The segmentation used for this analysis, however, was largely a product of the data chosen for the evaluation tool. As explained in Chapter 5, the process that was used to merge this data is known as a linear overlay operation. More specifically, a union operation was used to merge this spatial data into a single dataset based upon a similar datum reference, such as the coordinate (i.e., latitude and longitude) and route.

This process, which is identified in Table 6.1, returns new segmentation based on the combined merge of the various overlaid datasets. Essentially, the union operation merges all independent datasets together and creates segment breaks at every location where breaks existed in the previously independent datasets. In applying the analysis used for this plan, the interstate was divided into approximately 4,700 segments.

**Table 6.1: Linear overlay functions**

| Operator | ID | Returns | Visual Definition |
|---|---|---|---|
| Difference | 1 | Linear portion of an input event and reference event that do not overlay each other. |   |
| Intersection | 2 | Linear portion of an input event that completely overlays the reference event. |   |
| Union | 3 | Union of the difference and intersection sets. |   |

**Source: Iowa DOT**

## 6.2 Priority segments

The maps and tables presented in this section highlight the relative condition of interstate segments one to another, including information based not only on the composite Interstate Condition Evaluation (ICE) rating, but also each of the seven criteria. Note that two of these maps identify segments that were recently improved (2013) or are currently programmed in the Iowa DOT's Five Year Program (2014-2018). This information helps address the one-year lag that exists with the input data, which is based on 2012 conditions, while also identifying segments that may be in poor condition currently but are programmed for improvement. The Five Year Program highway projects include surface improvement projects only (e.g., grade and pave, pavement rehab, etc.).

Figure 6.1 is a statewide map displaying the ICE rating for the full interstate system. Figures 6.2 through 6.8 are statewide maps displaying the condition status for each of the seven criteria. The color designations in these maps are based on a segment's normalized value (1 to 10) for that criterion. Normalized values of 1 and 2 are displayed as red, 3 and 4 are displayed as orange, 5 and 6 are displayed as yellow, 7and 8 are displayed as green, and values of 9 and 10 are displayed as blue. The real criteria values that are associated with these normalized values are displayed in the map legend, and were also presented previously in Table 5.1. Figures 6.9 and 6.10 again display the statewide ICE rating for the full interstate system, while also incorporating structurally deficient/functionally obsolete bridge information and fatal/major injury crash information.

Figures 6.11 through 6.13 present different statewide summarizations of the data. Based on information from the Office of Contracts, on average roughly five percent of the interstate system has been improved annually over the past decade. With this average improvement rate in mind, Figure 6.11 displays the bottom 25 percent of the interstate system by ICE rating along with projects currently programmed in the Five Year Program (i.e., five percent annually over five years). Figures 6.12 and 6.13 represent a smaller subset, displaying the bottom five percent of the interstate system by ICE rating. These final two figures are tied to the segments highlighted in greater detail in Table 6.2. Note that this table incorporates the color designations from the seven criteria maps (Figures 6.2 through 6.8).

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Figure 6.1: Statewide Interstate Condition Evaluation (ICE) rating

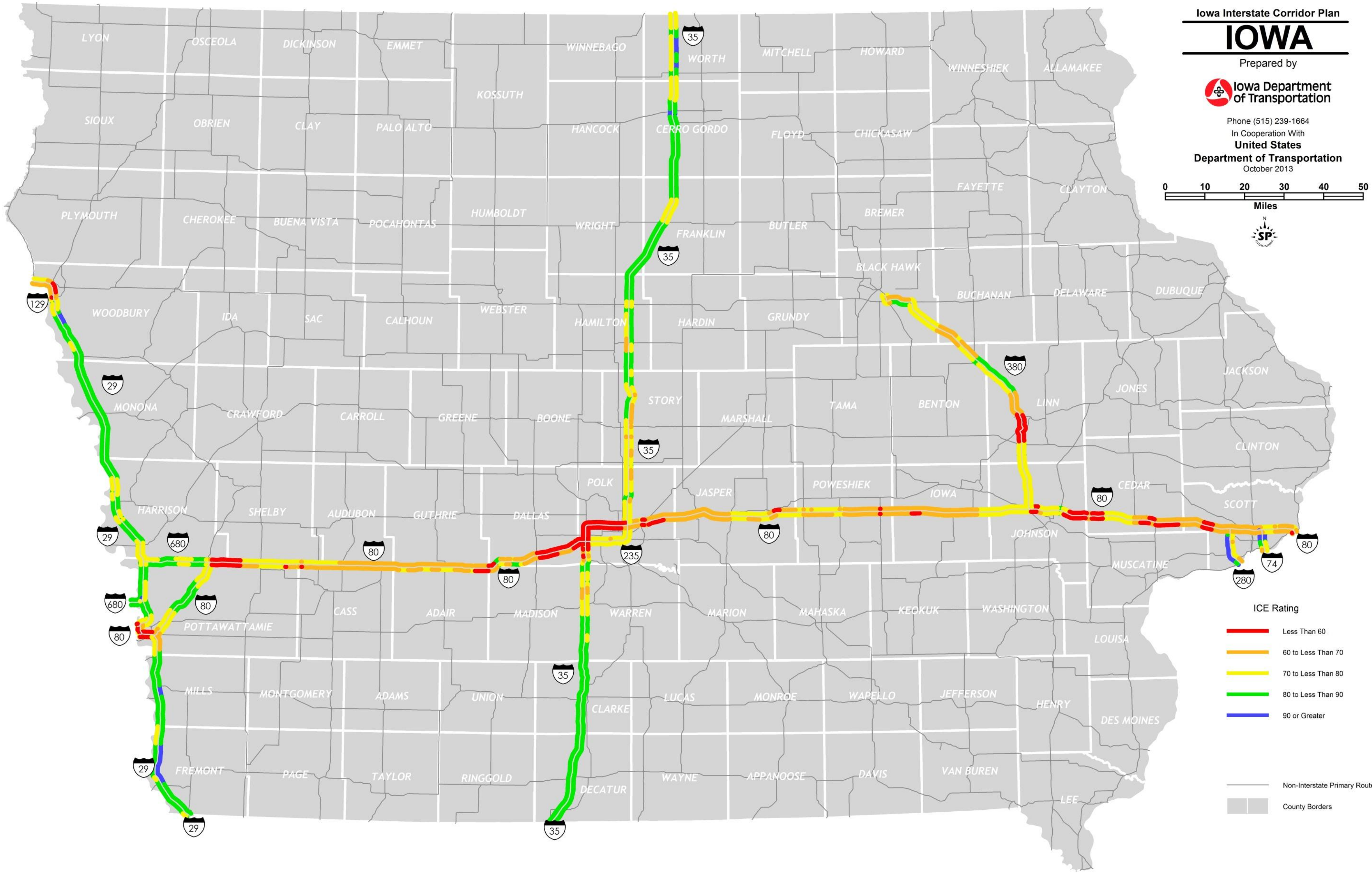

**Figure 6.2: Statewide Pavement Condition Index**

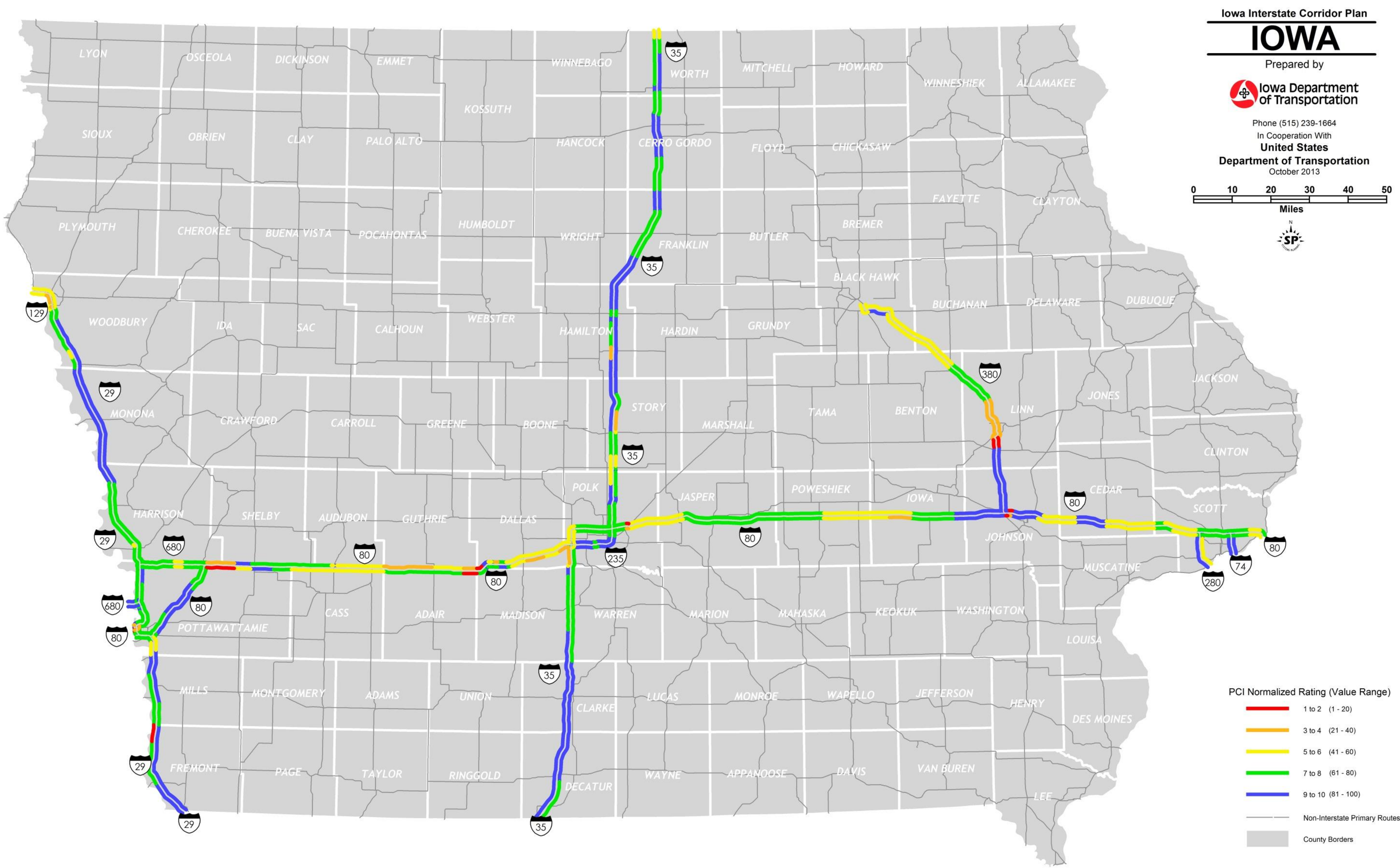

Figure 6.3: Statewide SIA Sufficiency Rating

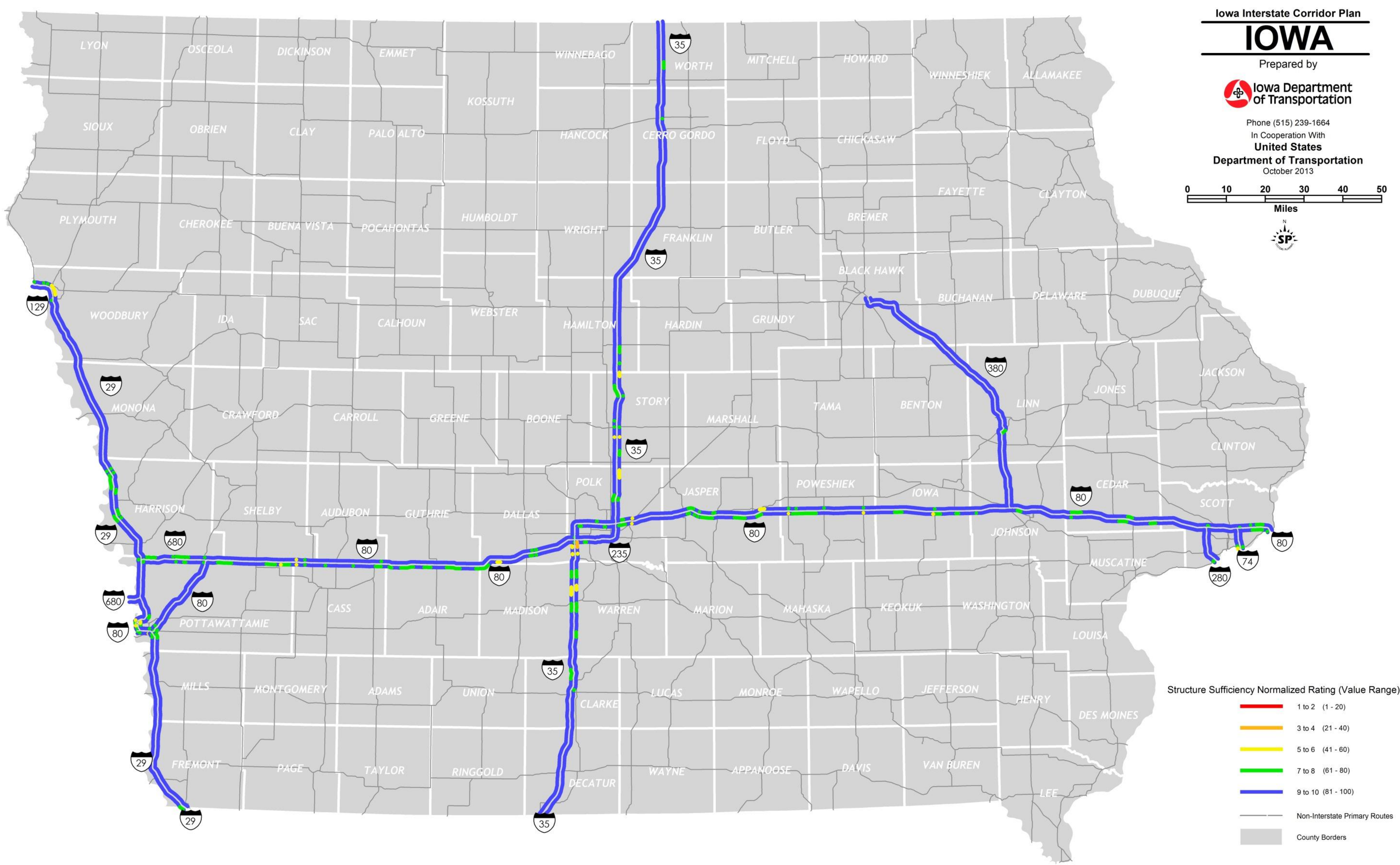

Figure 6.4: Statewide International Roughness Index

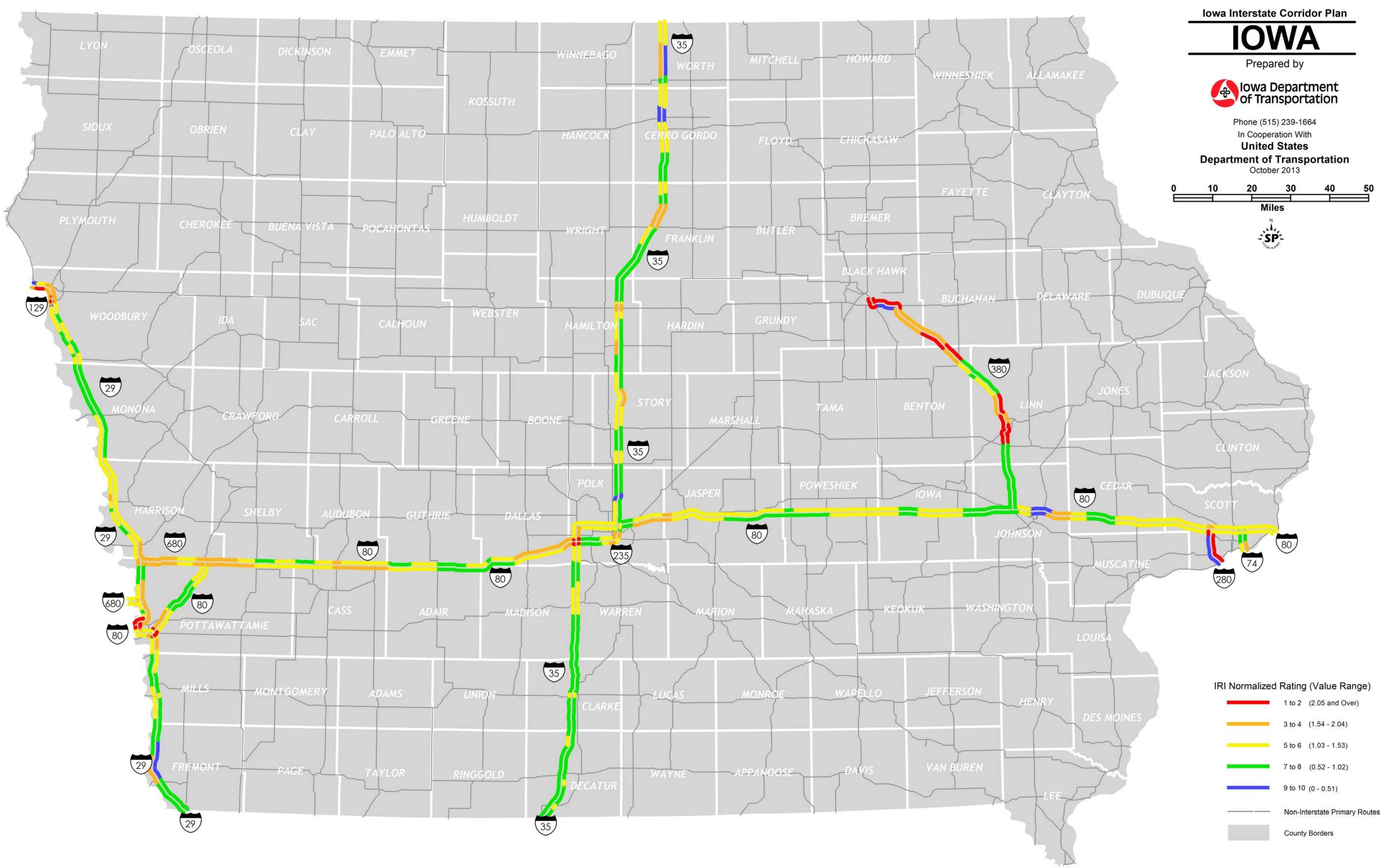

Figure 6.5: Statewide Combination Truck AADT

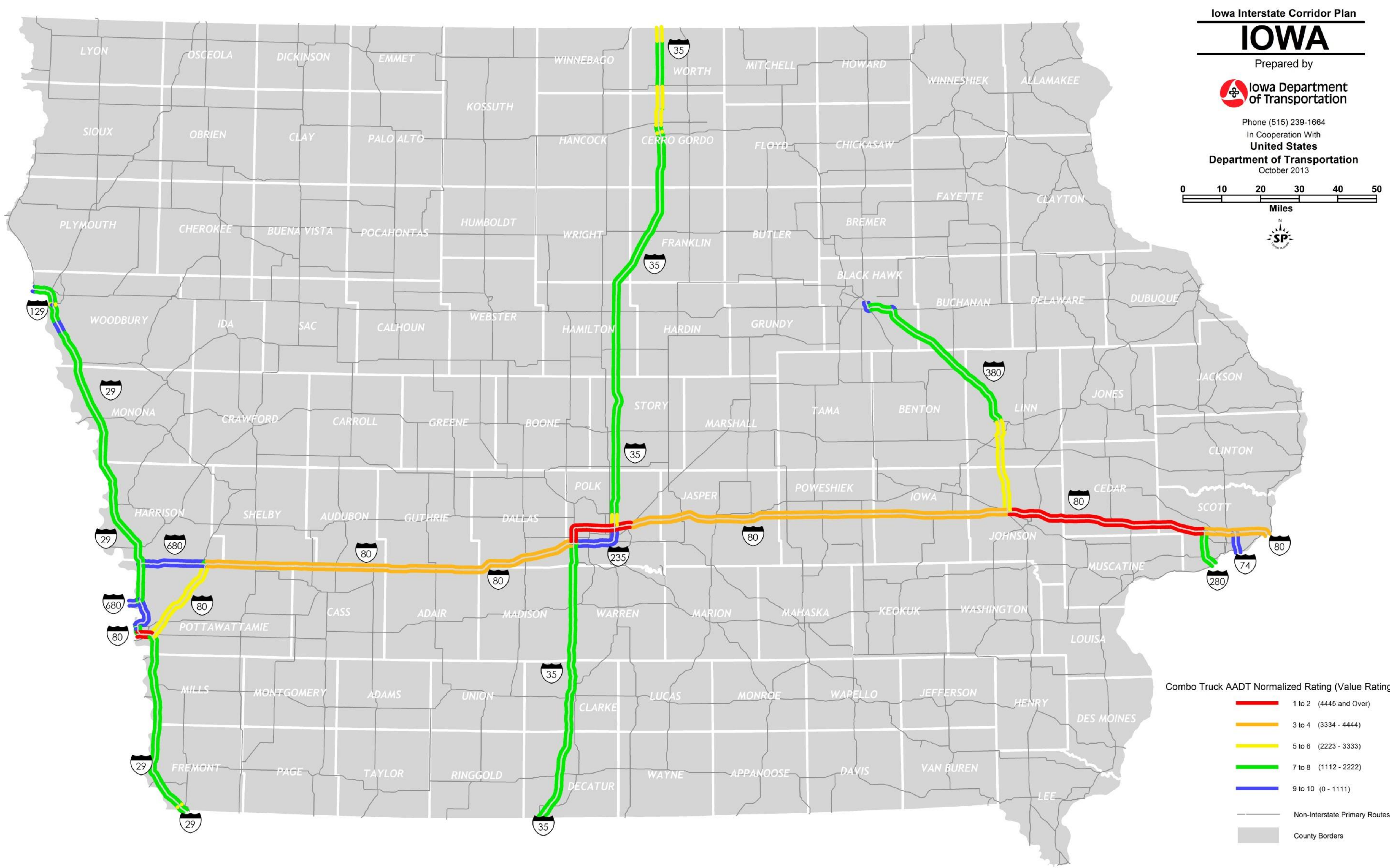

**Figure 6.6: Statewide Single-Unit Truck AADT**

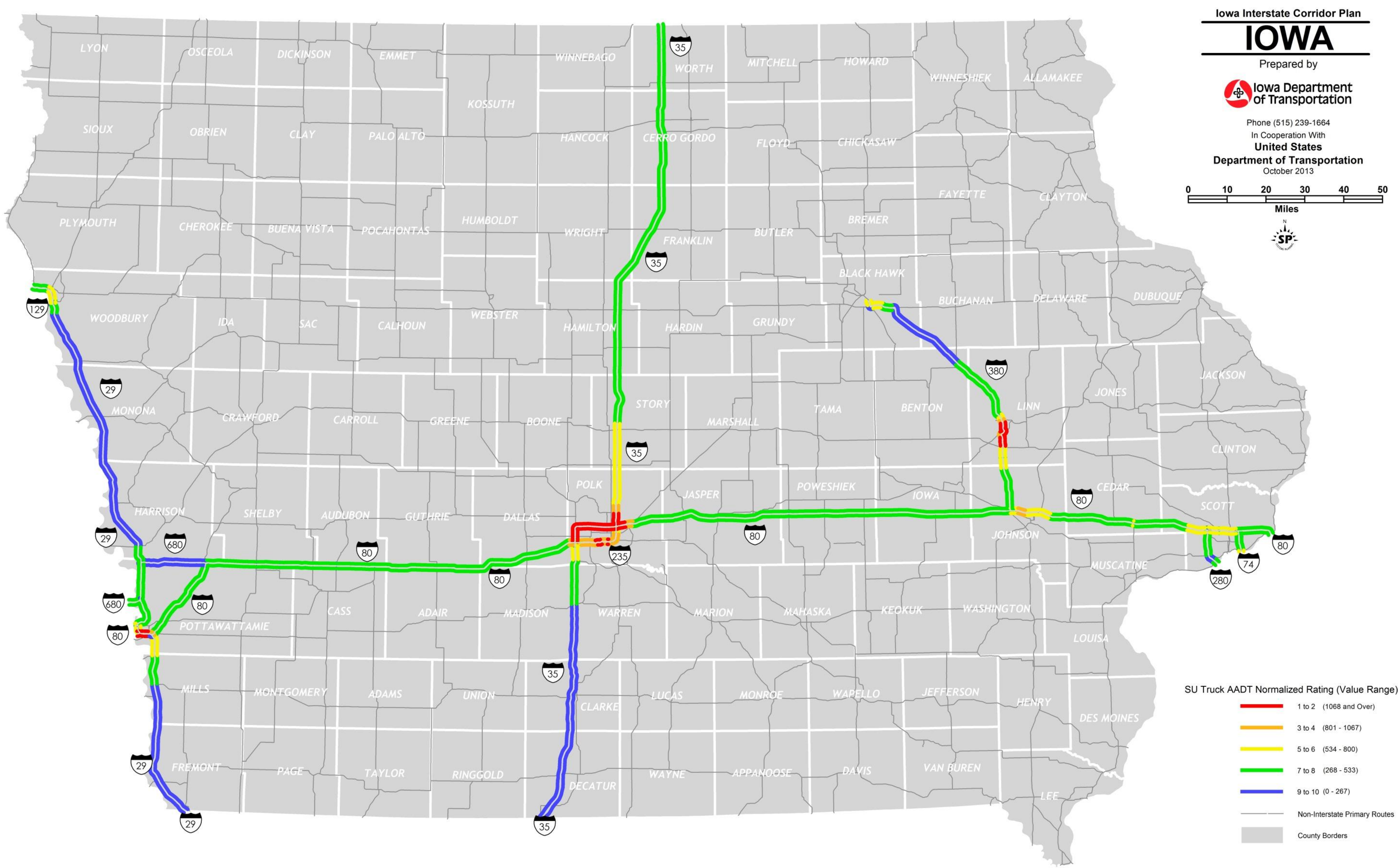

**Figure 6.7: Statewide Passenger AADT**

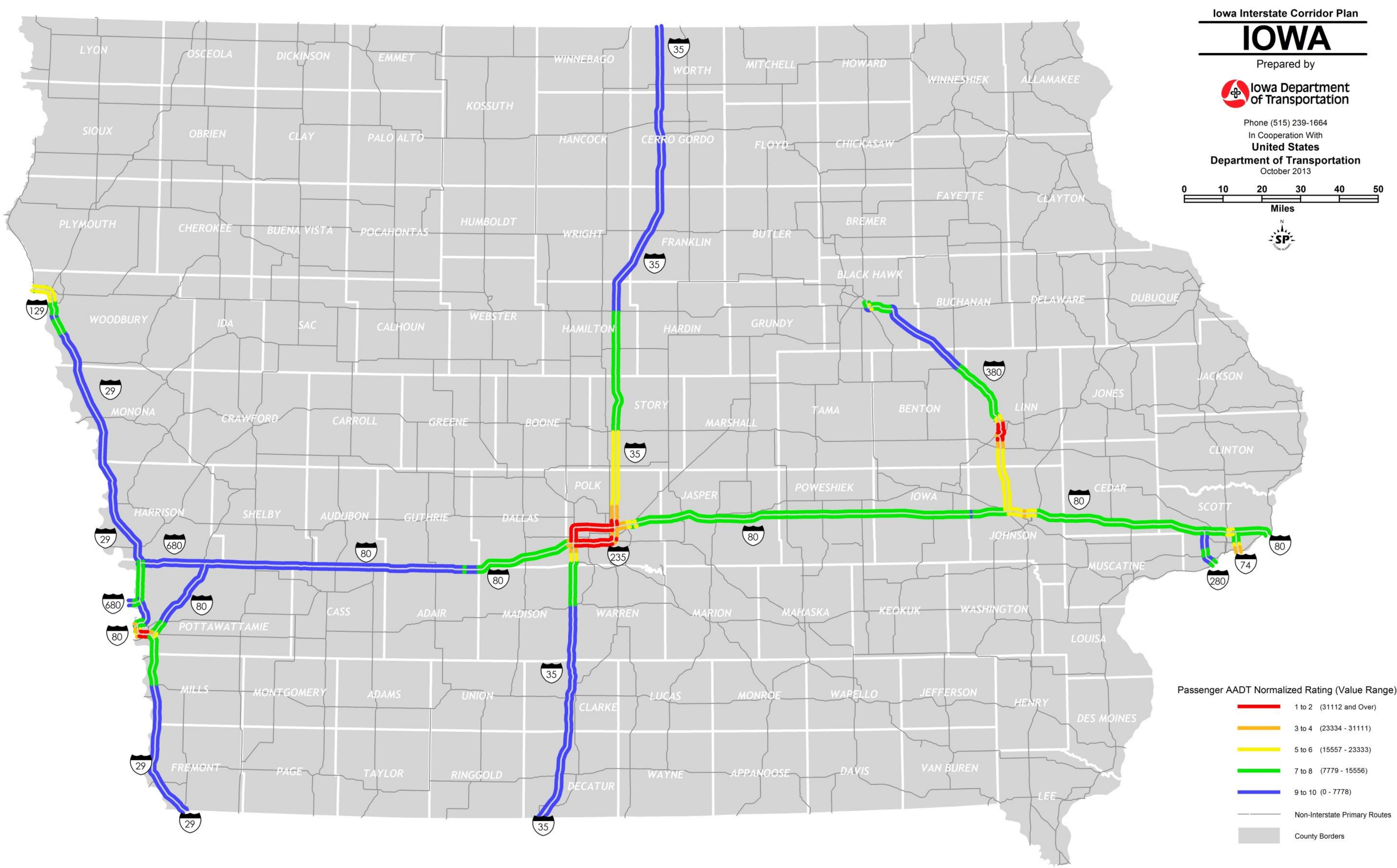

**Figure 6.8: Statewide Congestion Index (V/C)**

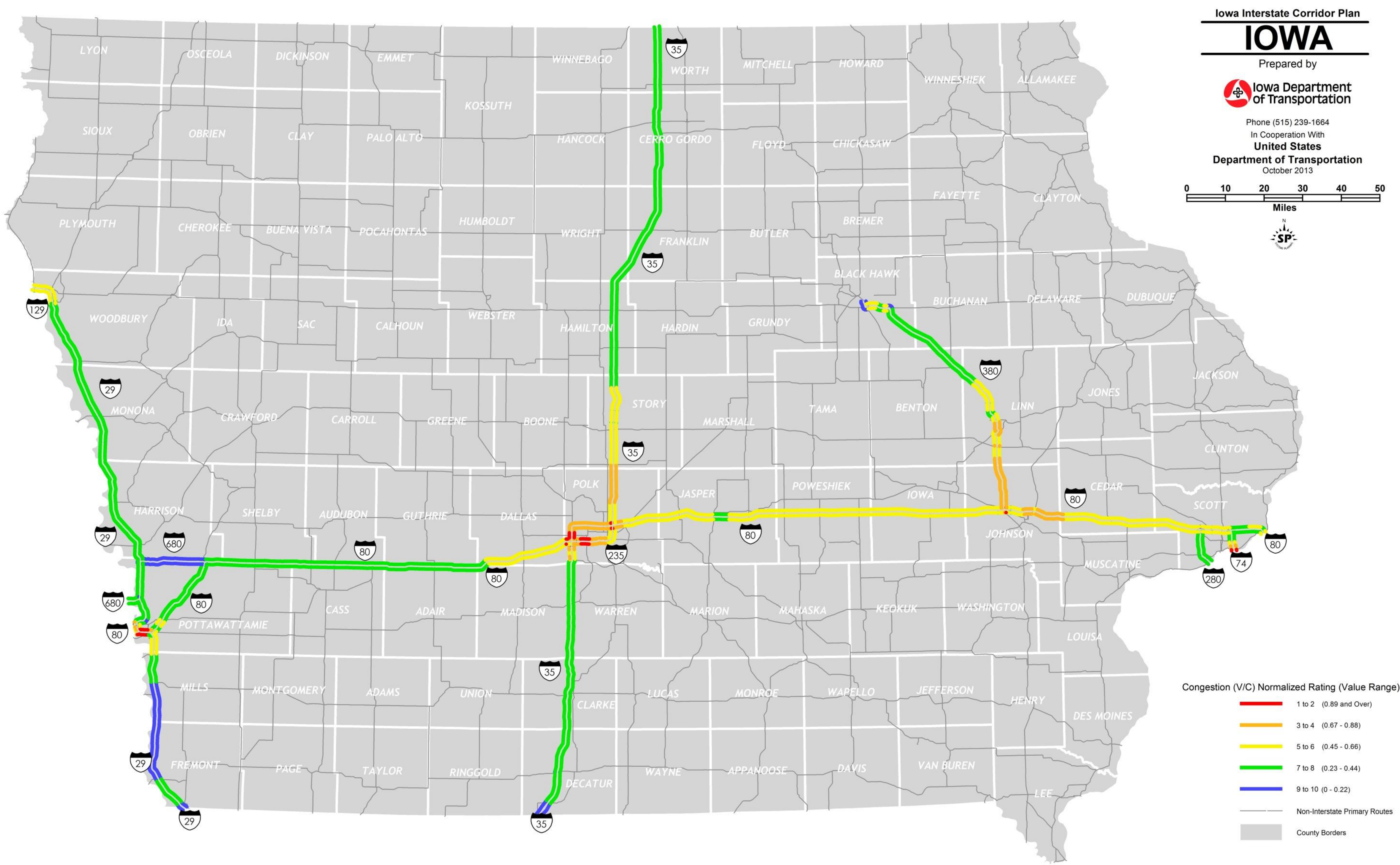

Figure 6.9: Statewide ICE rating with SD/FO bridges

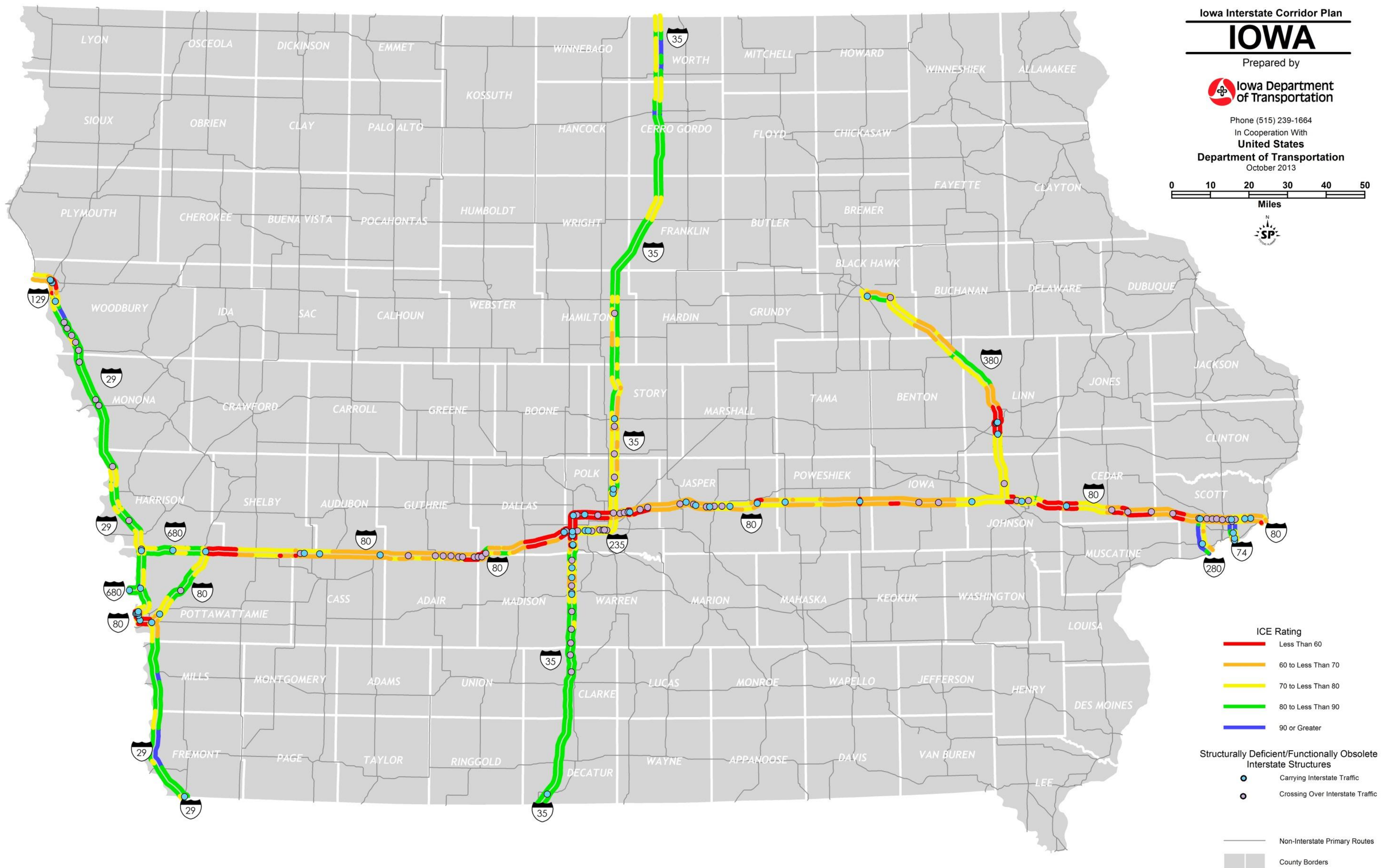

**Figure 6.10: Statewide ICE rating with fatal/major injury crashes**

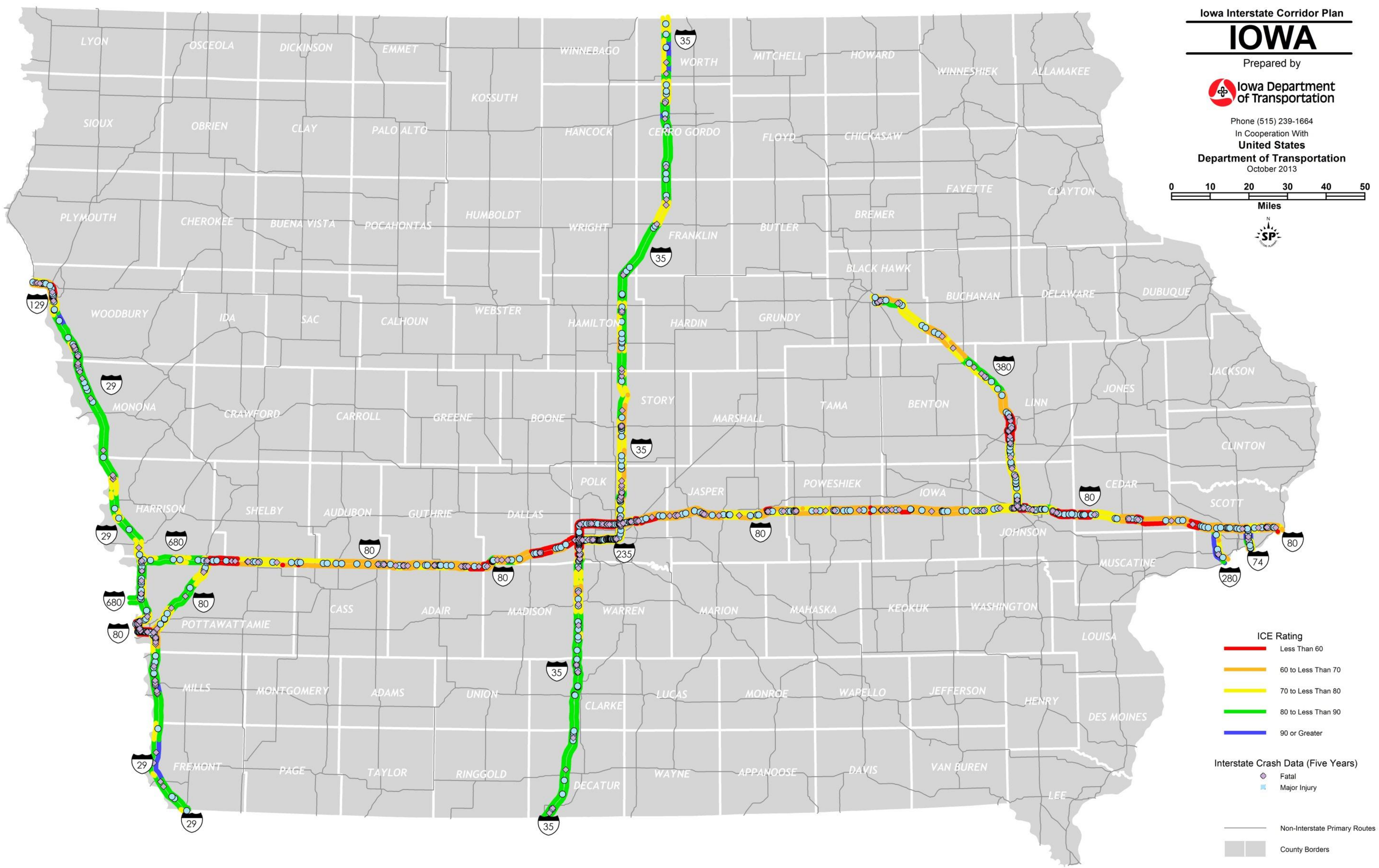

**Figure 6.11: Bottom 25 percent of system by ICE rating with Five Year Program projects**

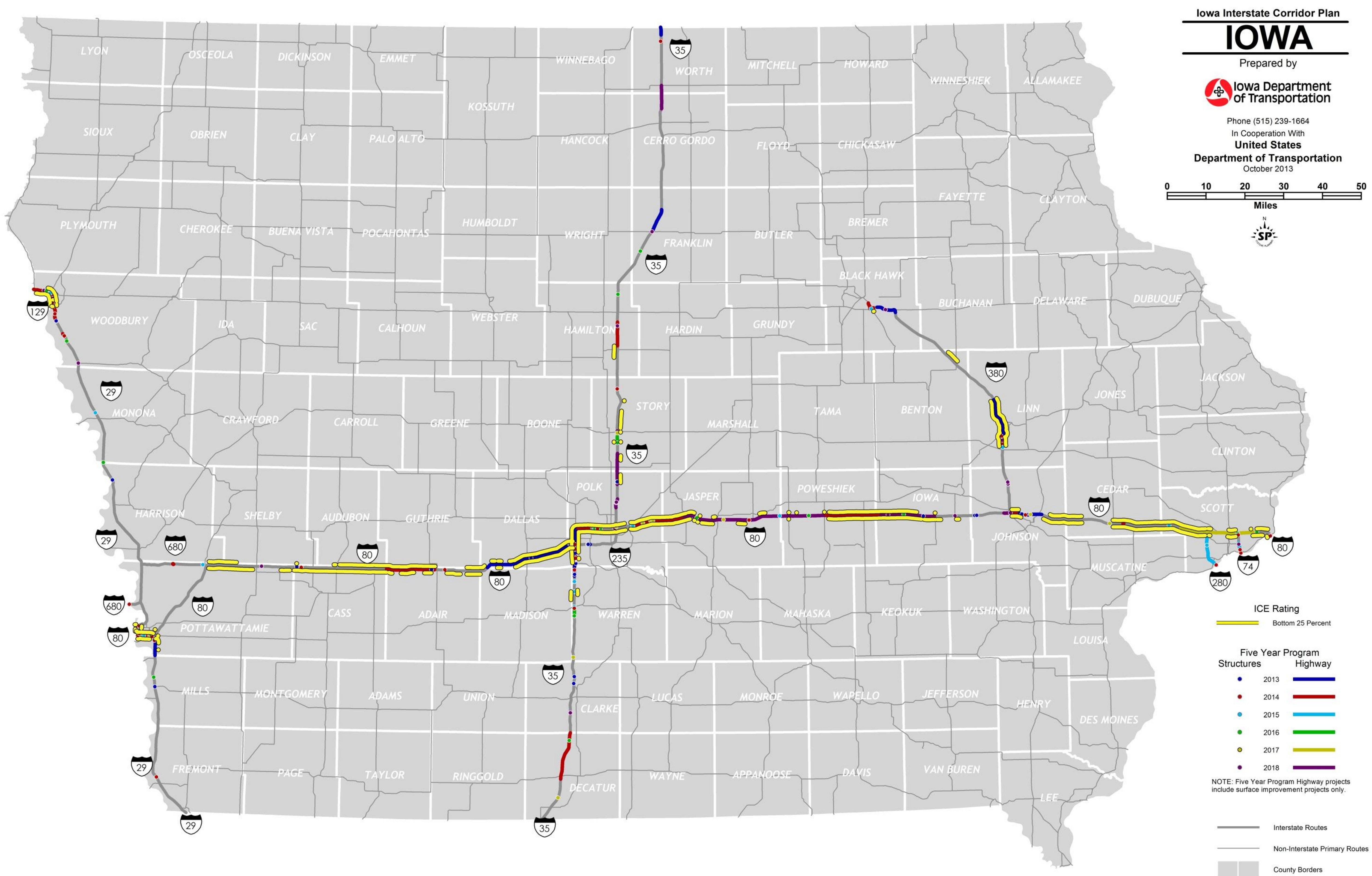

**Figure 6.12: Bottom 5 percent of system by ICE rating with Five Year Program projects**

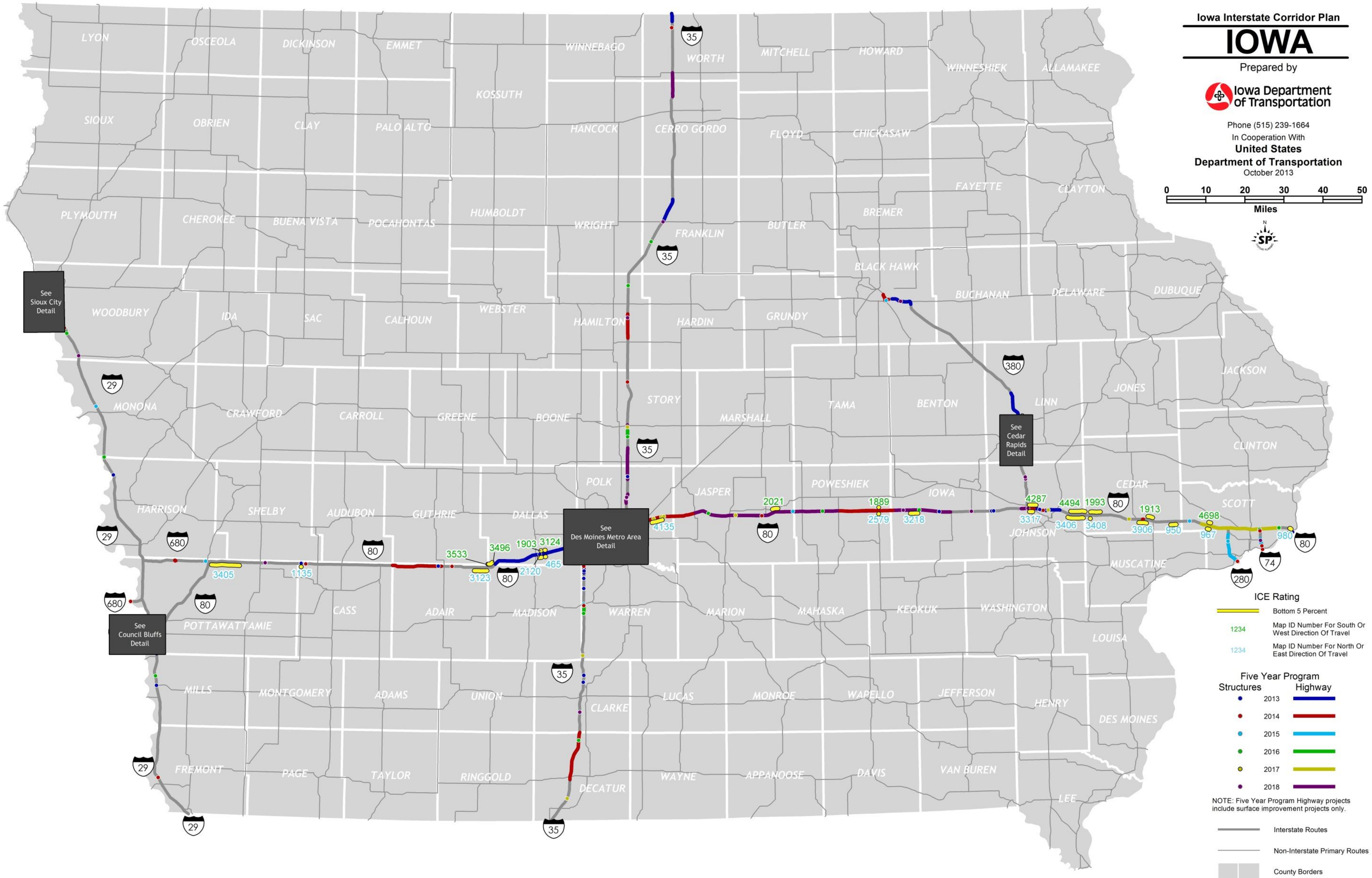

**Figure 6.13: Bottom 5 percent of system by ICE rating with Five Year Program projects, metro details**

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As previously noted, Figures 6.12 and 6.13 are tied by the map ID number to the segments highlighted in Table 6.2 below. Note that, for this table listing, segments that are independent for analysis purposes but contiguous geographically were merged in Figures 6.12 and 6.13 and assigned a common identifier. Table 6.2 notes this map ID number, but lists the independent segments included in each grouping as a separate record. This was done to communicate any differences that may exist among the merged segments. Table 6.2 is sorted by route, county, map ID, and then ICE rating.

**Table 6.2: Bottom 5 percent of system by ICE rating**

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 1412 | POTT. | I 29 S | 56.5 | 2 | 8 | 4 | 8 | 6 | 7 | 7 |
| 2477 | POTT. | I 29 N | 55.0 | 8 | 7 | 5 | 2 | 4 | 4 | 3 |
| 3512 | POTT. | I 29 S | 54.0 | 8 | 6 | 4 | 3 | 6 | 5 | 3 |
| 3842 | POTT. | I 29 S | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3842 | POTT. | I 29 S | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3842 | POTT. | I 29 S | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3842 | POTT. | I 29 S | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3842 | POTT. | I 29 S | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3842 | POTT. | I 29 S | 58.0 | 8 | 10 | 5 | 2 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 54.0 | 8 | 9 | 5 | 1 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 56.5 | 8 | 10 | 5 | 1 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 56.5 | 8 | 10 | 5 | 1 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 56.5 | 8 | 10 | 5 | 1 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 56.5 | 8 | 10 | 5 | 1 | 1 | 2 | 1 |
| 3969 | POTT. | I 29 S | 56.5 | 8 | 10 | 5 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 55.5 | 8 | 9 | 6 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 58.0 | 8 | 10 | 6 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 58.0 | 8 | 10 | 6 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 58.0 | 8 | 10 | 6 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 58.0 | 8 | 10 | 6 | 1 | 1 | 2 | 1 |
| 4923 | POTT. | I 29 N | 58.0 | 8 | 10 | 6 | 1 | 1 | 2 | 1 |
| 4928 | POTT. | I 29 N | 57.5 | 8 | 10 | 6 | 1 | 1 | 1 | 1 |
| 4928 | POTT. | I 29 N | 57.5 | 8 | 10 | 6 | 1 | 1 | 1 | 1 |
| 4928 | POTT. | I 29 N | 57.5 | 8 | 10 | 6 | 1 | 1 | 1 | 1 |
| 4928 | POTT. | I 29 N | 57.5 | 8 | 10 | 6 | 1 | 1 | 1 | 1 |
| 2339 | WOODBURY | I 29 N | 57.5 | 5 | 6 | 4 | 8 | 6 | 6 | 6 |
| 2341 | WOODBURY | I 29 N | 57.5 | 5 | 6 | 4 | 8 | 6 | 6 | 6 |
| 502 | POLK | I 35 N | 55.5 | 8 | 3 | 6 | 7 | 5 | 4 | 4 |
| 692 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 692 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 761 | POLK | I 35 N | 54.5 | 7 | 9 | 5 | 2 | 1 | 1 | 3 |
| 761 | POLK | I 35 N | 57.0 | 7 | 10 | 5 | 2 | 1 | 1 | 3 |
| 761 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 1760 | POLK | I 35 N | 53.0 | 8 | 8 | 5 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 54.5 | 7 | 9 | 6 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 54.5 | 7 | 9 | 6 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 57.0 | 7 | 10 | 6 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 58.0 | 8 | 10 | 5 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 58.0 | 8 | 10 | 5 | 1 | 1 | 1 | 3 |
| 1760 | POLK | I 35 N | 58.0 | 8 | 10 | 5 | 1 | 1 | 1 | 3 |
| 3596 | POLK | I 35 S | 52.0 | 7 | 8 | 6 | 1 | 1 | 1 | 3 |
| 3596 | POLK | I 35 S | 55.5 | 7 | 10 | 5 | 1 | 1 | 1 | 3 |
| 3596 | POLK | I 35 S | 55.5 | 7 | 10 | 5 | 1 | 1 | 1 | 3 |
| 3596 | POLK | I 35 S | 57.0 | 7 | 10 | 6 | 1 | 1 | 1 | 3 |
| 3596 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 1 | 1 | 2 | 4 |
| 3627 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3627 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3630 | POLK | I 35 S | 54.5 | 7 | 9 | 5 | 2 | 1 | 1 | 3 |
| 3630 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 2 | 1 | 1 | 3 |
| 3630 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 2 | 1 | 1 | 3 |
| 3630 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3719 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3719 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3719 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 48.0 | 5 | 10 | 4 | 1 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 48.0 | 5 | 10 | 4 | 1 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 48.0 | 5 | 9 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 48.0 | 5 | 10 | 4 | 1 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 49.5 | 5 | 9 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 49.5 | 5 | 10 | 4 | 2 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 49.5 | 5 | 10 | 4 | 2 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 49.5 | 5 | 10 | 4 | 2 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 49.5 | 5 | 10 | 4 | 2 | 1 | 1 | 2 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 50.5 | 5 | 10 | 4 | 2 | 1 | 1 | 3 |
| 3734 | POLK | I 35 N | 52.0 | 5 | 10 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 52.0 | 5 | 10 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 52.0 | 5 | 10 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 52.0 | 5 | 10 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 52.0 | 5 | 10 | 4 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 53.5 | 7 | 8 | 5 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 56.0 | 5 | 10 | 4 | 3 | 3 | 3 | 5 |
| 3734 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 3734 | POLK | I 35 N | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4056 | POLK | I 35 S | 54.5 | 4 | 6 | 6 | 7 | 5 | 5 | 5 |
| 4232 | POLK | I 35 S | 49.5 | 5 | 10 | 5 | 1 | 1 | 1 | 2 |
| 4232 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4232 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 49.5 | 5 | 10 | 5 | 1 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 49.5 | 5 | 9 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 49.5 | 5 | 10 | 5 | 1 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 51.0 | 5 | 10 | 5 | 2 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 51.0 | 5 | 10 | 5 | 2 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 51.0 | 5 | 10 | 5 | 2 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 51.0 | 5 | 10 | 5 | 2 | 1 | 1 | 2 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4244 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4247 | POLK | I 35 S | 56.0 | 7 | 10 | 1 | 4 | 2 | 4 | 3 |
| 4259 | POLK | I 35 S | 51.0 | 5 | 9 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 4259 | POLK | I 35 S | 52.0 | 5 | 10 | 5 | 2 | 1 | 1 | 3 |
| 4259 | POLK | I 35 S | 53.5 | 5 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 53.5 | 5 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 53.5 | 5 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 53.5 | 5 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 53.5 | 5 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 57.5 | 5 | 10 | 5 | 3 | 3 | 3 | 5 |
| 4259 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4259 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4327 | POLK | I 35 N | 51.0 | 7 | 10 | 1 | 2 | 1 | 1 | 3 |
| 4327 | POLK | I 35 N | 51.0 | 7 | 10 | 1 | 2 | 1 | 1 | 3 |
| 4327 | POLK | I 35 N | 51.0 | 7 | 10 | 1 | 2 | 1 | 1 | 3 |
| 4327 | POLK | I 35 N | 58.0 | 7 | 10 | 1 | 4 | 2 | 4 | 5 |
| 4362 | POLK | I 35 S | 56.5 | 7 | 9 | 5 | 2 | 1 | 3 | 4 |
| 4362 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 1 | 1 | 2 | 4 |
| 4362 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 1 | 1 | 2 | 4 |
| 4362 | POLK | I 35 S | 57.0 | 7 | 10 | 5 | 1 | 1 | 2 | 4 |
| 4364 | POLK | I 35 S | 53.0 | 7 | 9 | 5 | 1 | 1 | 1 | 3 |
| 4364 | POLK | I 35 S | 54.5 | 7 | 9 | 6 | 1 | 1 | 1 | 3 |
| 4364 | POLK | I 35 S | 55.5 | 7 | 10 | 5 | 1 | 1 | 1 | 3 |
| 4364 | POLK | I 35 S | 58.5 | 7 | 10 | 5 | 2 | 1 | 2 | 4 |
| 4659 | POLK | I 35 S | 50.5 | 4 | 5 | 6 | 7 | 5 | 4 | 4 |
| 4660 | POLK | I 35 S | 52.5 | 4 | 5 | 6 | 7 | 5 | 6 | 5 |
| 3123 | ADAIR | I 80 E | 54.5 | 1 | 8 | 8 | 3 | 8 | 9 | 7 |
| 3123 | ADAIR | I 80 E | 57.0 | 1 | 9 | 8 | 3 | 8 | 9 | 7 |
| 1135 | CASS | I 80 E | 57.5 | 6 | 6 | 5 | 3 | 8 | 9 | 7 |
| 950 | CEDAR | I 80 E | 56.5 | 6 | 8 | 5 | 1 | 7 | 8 | 5 |
| 1913 | CEDAR | I 80 W | 56.5 | 6 | 8 | 5 | 1 | 7 | 8 | 5 |
| 1993 | CEDAR | I 80 W | 56.5 | 6 | 8 | 5 | 1 | 7 | 8 | 5 |
| 3408 | CEDAR | I 80 E | 56.5 | 6 | 8 | 5 | 1 | 7 | 8 | 5 |
| 3906 | CEDAR | I 80 E | 56.5 | 6 | 8 | 5 | 1 | 7 | 8 | 5 |
| 465 | DALLAS | I 80 E | 52.0 | 4 | 7 | 5 | 3 | 8 | 7 | 5 |
| 1903 | DALLAS | I 80 W | 51.5 | 5 | 7 | 3 | 3 | 8 | 7 | 5 |
| 2120 | DALLAS | I 80 E | 52.0 | 4 | 7 | 5 | 3 | 8 | 7 | 5 |
| 2943 | DALLAS | I 80 W | 57.5 | 5 | 9 | 3 | 3 | 8 | 7 | 6 |
| 3124 | DALLAS | I 80 W | 51.5 | 5 | 7 | 3 | 3 | 8 | 7 | 5 |
| 3496 | DALLAS | I 80 W | 56.0 | 1 | 10 | 5 | 4 | 8 | 8 | 7 |
| 3496 | DALLAS | I 80 W | 56.0 | 1 | 10 | 5 | 4 | 8 | 8 | 7 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 3692 | DALLAS | I 80 W | 52.0 | 5 | 10 | 3 | 3 | 4 | 3 | 2 |
| 3692 | DALLAS | I 80 W | 52.0 | 5 | 10 | 3 | 3 | 4 | 3 | 2 |
| 3692 | DALLAS | I 80 W | 56.0 | 5 | 10 | 3 | 3 | 6 | 5 | 4 |
| 3695 | DALLAS | I 80 W | 55.0 | 5 | 10 | 3 | 3 | 4 | 3 | 5 |
| 3695 | DALLAS | I 80 W | 55.5 | 5 | 10 | 3 | 3 | 4 | 4 | 5 |
| 3697 | DALLAS | I 80 W | 55.5 | 5 | 10 | 3 | 3 | 4 | 4 | 5 |
| 4305 | DALLAS | I 80 E | 53.0 | 4 | 10 | 3 | 3 | 4 | 4 | 5 |
| 4318 | DALLAS | I 80 E | 56.5 | 4 | 10 | 3 | 3 | 8 | 7 | 5 |
| 4318 | DALLAS | I 80 E | 56.5 | 4 | 10 | 3 | 3 | 8 | 7 | 5 |
| 4740 | DALLAS | I 80 E | 57.5 | 4 | 10 | 3 | 3 | 8 | 7 | 6 |
| 4740 | DALLAS | I 80 E | 57.5 | 4 | 10 | 3 | 3 | 8 | 7 | 6 |
| 4740 | DALLAS | I 80 E | 57.5 | 4 | 10 | 3 | 3 | 8 | 7 | 6 |
| 4740 | DALLAS | I 80 E | 57.5 | 4 | 10 | 3 | 3 | 8 | 7 | 6 |
| 4740 | DALLAS | I 80 E | 57.5 | 4 | 10 | 3 | 3 | 8 | 7 | 6 |
| 4742 | DALLAS | I 80 E | 57.0 | 4 | 10 | 3 | 3 | 7 | 7 | 6 |
| 4746 | DALLAS | I 80 E | 49.5 | 4 | 10 | 3 | 3 | 4 | 3 | 2 |
| 4746 | DALLAS | I 80 E | 52.5 | 4 | 10 | 3 | 3 | 4 | 3 | 5 |
| 4746 | DALLAS | I 80 E | 52.5 | 4 | 10 | 3 | 3 | 4 | 3 | 5 |
| 4746 | DALLAS | I 80 E | 53.0 | 4 | 10 | 3 | 3 | 4 | 4 | 5 |
| 4746 | DALLAS | I 80 E | 53.5 | 4 | 10 | 3 | 3 | 6 | 5 | 4 |
| 4746 | DALLAS | I 80 E | 57.0 | 4 | 10 | 3 | 3 | 7 | 7 | 6 |
| 3218 | IOWA | I 80 E | 58.0 | 4 | 7 | 8 | 3 | 8 | 8 | 6 |
| 2021 | JASPER | I 80 W | 58.5 | 7 | 6 | 5 | 3 | 8 | 8 | 6 |
| 3317 | JOHNSON | I 80 E | 53.5 | 2 | 10 | 7 | 2 | 5 | 5 | 5 |
| 3317 | JOHNSON | I 80 E | 53.5 | 2 | 10 | 7 | 2 | 5 | 5 | 5 |
| 3317 | JOHNSON | I 80 E | 53.5 | 2 | 10 | 7 | 2 | 5 | 5 | 5 |
| 3317 | JOHNSON | I 80 E | 56.0 | 3 | 10 | 7 | 2 | 5 | 5 | 5 |
| 3317 | JOHNSON | I 80 E | 57.0 | 3 | 10 | 7 | 2 | 5 | 5 | 6 |
| 3317 | JOHNSON | I 80 E | 57.0 | 3 | 10 | 7 | 2 | 5 | 5 | 6 |
| 3406 | JOHNSON | I 80 E | 56.0 | 6 | 9 | 4 | 1 | 7 | 7 | 4 |
| 3406 | JOHNSON | I 80 E | 58.5 | 6 | 10 | 4 | 1 | 7 | 7 | 4 |
| 4287 | JOHNSON | I 80 W | 49.5 | 1 | 10 | 6 | 2 | 5 | 5 | 5 |
| 4287 | JOHNSON | I 80 W | 50.0 | 1 | 10 | 6 | 2 | 4 | 5 | 6 |
| 4287 | JOHNSON | I 80 W | 50.5 | 1 | 10 | 6 | 2 | 5 | 5 | 6 |
| 4287 | JOHNSON | I 80 W | 50.5 | 1 | 10 | 6 | 2 | 5 | 5 | 6 |
| 4287 | JOHNSON | I 80 W | 52.0 | 2 | 10 | 6 | 2 | 5 | 5 | 5 |
| 4287 | JOHNSON | I 80 W | 52.0 | 2 | 10 | 6 | 2 | 5 | 5 | 5 |
| 4287 | JOHNSON | I 80 W | 52.0 | 2 | 10 | 6 | 2 | 5 | 5 | 5 |
| 4287 | JOHNSON | I 80 W | 52.0 | 1 | 10 | 6 | 2 | 5 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 52.5 | 1 | 10 | 6 | 2 | 6 | 6 | 7 |
| 4287 | JOHNSON | I 80 W | 53.0 | 1 | 10 | 6 | 2 | 6 | 7 | 7 |
| 4494 | JOHNSON | I 80 W | 58.5 | 6 | 10 | 4 | 1 | 7 | 7 | 4 |
| 4494 | JOHNSON | I 80 W | 58.5 | 6 | 10 | 4 | 1 | 7 | 7 | 4 |
| 4494 | JOHNSON | I 80 W | 58.5 | 6 | 10 | 4 | 1 | 7 | 7 | 4 |
| 3496 | MADISON | I 80 W | 54.5 | 1 | 10 | 5 | 3 | 8 | 8 | 7 |
| 3533 | MADISON | I 80 W | 54.5 | 1 | 10 | 5 | 3 | 8 | 8 | 7 |
| 3533 | MADISON | I 80 W | 56.0 | 1 | 10 | 5 | 4 | 8 | 8 | 7 |
| 3450 | POLK | I 80 E | 56.5 | 3 | 10 | 7 | 2 | 4 | 5 | 6 |
| 3450 | POLK | I 80 E | 56.5 | 3 | 10 | 7 | 2 | 4 | 5 | 6 |
| 3450 | POLK | I 80 E | 58.5 | 3 | 10 | 7 | 3 | 6 | 6 | 5 |
| 3697 | POLK | I 80 W | 55.5 | 5 | 10 | 3 | 3 | 4 | 4 | 5 |
| 4085 | POLK | I 80 W | 47.5 | 2 | 6 | 7 | 3 | 8 | 7 | 5 |
| 4085 | POLK | I 80 W | 53.0 | 2 | 10 | 7 | 2 | 4 | 5 | 5 |
| 4085 | POLK | I 80 W | 53.0 | 2 | 10 | 7 | 2 | 4 | 5 | 5 |
| 4085 | POLK | I 80 W | 57.0 | 2 | 10 | 7 | 3 | 6 | 6 | 6 |
| 4085 | POLK | I 80 W | 57.5 | 2 | 10 | 7 | 3 | 8 | 7 | 5 |
| 4135 | POLK | I 80 E | 57.5 | 5 | 9 | 4 | 3 | 7 | 7 | 5 |
| 4305 | POLK | I 80 E | 57.5 | 7 | 10 | 1 | 3 | 4 | 4 | 5 |
| 4469 | POLK | I 80 W | 57.5 | 2 | 10 | 7 | 3 | 8 | 7 | 5 |
| 5040 | POLK | I 80 E | 48.5 | 3 | 5 | 7 | 3 | 8 | 7 | 6 |
| 3405 | POTT. | I 80 E | 48.0 | 1 | 8 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 3405 | POTT. | I 80 E | 53.0 | 1 | 10 | 4 | 3 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 56.0 | 1 | 10 | 4 | 5 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 56.0 | 1 | 10 | 4 | 5 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 56.0 | 1 | 10 | 4 | 5 | 7 | 9 | 7 |
| 3405 | POTT. | I 80 E | 56.5 | 1 | 10 | 4 | 5 | 8 | 9 | 7 |
| 3521 | POTT. | I 80 E | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3521 | POTT. | I 80 E | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3521 | POTT. | I 80 E | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3992 | POTT. | I 80 W | 56.0 | 8 | 10 | 5 | 1 | 1 | 1 | 1 |
| 3992 | POTT. | I 80 W | 57.5 | 8 | 10 | 6 | 1 | 1 | 1 | 1 |
| 3995 | POTT. | I 80 W | 58.0 | 8 | 8 | 5 | 3 | 2 | 4 | 3 |
| 4324 | POTT. | I 80 E | 56.5 | 8 | 8 | 5 | 2 | 1 | 3 | 4 |
| 5053 | POTT. | I 80 W | 58.5 | 8 | 10 | 5 | 2 | 1 | 3 | 1 |
| 5053 | POTT. | I 80 W | 58.5 | 8 | 10 | 5 | 2 | 1 | 3 | 1 |
| 1889 | POWESHIEK | I 80 W | 58.5 | 5 | 8 | 5 | 3 | 8 | 8 | 6 |
| 2579 | POWESHIEK | I 80 E | 51.0 | 5 | 5 | 5 | 3 | 8 | 8 | 6 |
| 967 | SCOTT | I 80 E | 58.5 | 5 | 10 | 5 | 1 | 6 | 8 | 5 |
| 967 | SCOTT | I 80 E | 58.5 | 5 | 10 | 5 | 1 | 6 | 8 | 5 |
| 980 | SCOTT | I 80 E | 55.5 | 6 | 5 | 6 | 3 | 7 | 8 | 7 |
| 4698 | SCOTT | I 80 W | 58.5 | 5 | 10 | 5 | 1 | 6 | 8 | 5 |
| 4457 | WOODBURY | I 129 E | 56.5 | 3 | 8 | 1 | 9 | 6 | 8 | 7 |
| 1762 | LINN | I 380 N | 45.0 | 2 | 9 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 1762 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 1762 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 1762 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 1762 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 1762 | LINN | I 380 N | 49.0 | 2 | 10 | 1 | 6 | 3 | 4 | 5 |
| 1762 | LINN | I 380 N | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 42.5 | 3 | 7 | 1 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 44.5 | 3 | 9 | 1 | 6 | 1 | 1 | 3 |
| 2785 | LINN | I 380 N | 45.0 | 3 | 8 | 1 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 45.0 | 3 | 8 | 1 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 2785 | LINN | I 380 N | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 2785 | LINN | I 380 N | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 2785 | LINN | I 380 N | 47.5 | 3 | 8 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 2785 | LINN | I 380 N | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 50.5 | 3 | 10 | 1 | 6 | 2 | 3 | 5 |
| 2785 | LINN | I 380 N | 51.0 | 3 | 10 | 1 | 6 | 3 | 3 | 5 |
| 2785 | LINN | I 380 N | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2785 | LINN | I 380 N | 54.5 | 4 | 10 | 3 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 54.5 | 4 | 10 | 3 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 54.5 | 4 | 10 | 3 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 54.5 | 4 | 10 | 3 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 54.5 | 4 | 10 | 3 | 6 | 2 | 2 | 4 |
| 2785 | LINN | I 380 N | 55.5 | 4 | 10 | 3 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 55.5 | 4 | 10 | 3 | 6 | 2 | 2 | 5 |
| 2785 | LINN | I 380 N | 56.5 | 4 | 10 | 3 | 6 | 3 | 3 | 5 |
| 2785 | LINN | I 380 N | 56.5 | 4 | 10 | 3 | 6 | 3 | 3 | 5 |
| 2785 | LINN | I 380 N | 56.5 | 4 | 10 | 3 | 6 | 3 | 3 | 5 |
| 2785 | LINN | I 380 N | 56.5 | 4 | 10 | 3 | 6 | 3 | 3 | 5 |
| 2785 | LINN | I 380 N | 58.0 | 4 | 10 | 3 | 6 | 3 | 4 | 6 |
| 2869 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 2869 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 2869 | LINN | I 380 N | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 2869 | LINN | I 380 N | 49.0 | 2 | 10 | 1 | 6 | 3 | 4 | 5 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 2869 | LINN | I 380 N | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 2869 | LINN | I 380 N | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 2869 | LINN | I 380 N | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 2869 | LINN | I 380 N | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 4891 | LINN | I 380 S | 42.0 | 3 | 8 | 1 | 6 | 1 | 1 | 3 |
| 4891 | LINN | I 380 S | 46.5 | 3 | 9 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 4891 | LINN | I 380 S | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 4891 | LINN | I 380 S | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 4891 | LINN | I 380 S | 47.0 | 3 | 10 | 1 | 6 | 1 | 1 | 3 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 47.5 | 2 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 2 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.0 | 3 | 10 | 1 | 6 | 1 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 4891 | LINN | I 380 S | 48.5 | 3 | 10 | 1 | 6 | 2 | 1 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 2 | 10 | 1 | 6 | 3 | 4 | 5 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 49.0 | 2 | 10 | 1 | 6 | 3 | 4 | 5 |
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |

| Map ID | County | Route | ICE | PCI | SIA | IRI | Combo | Single | Pass. | V/C |
|---|---|---|---|---|---|---|---|---|---|---|
| 4891 | LINN | I 380 S | 49.0 | 3 | 10 | 1 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 50.0 | 3 | 10 | 1 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 50.0 | 2 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 4891 | LINN | I 380 S | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 4891 | LINN | I 380 S | 50.5 | 3 | 10 | 1 | 6 | 2 | 3 | 5 |
| 4891 | LINN | I 380 S | 50.5 | 2 | 10 | 1 | 6 | 4 | 4 | 6 |
| 4891 | LINN | I 380 S | 51.0 | 3 | 10 | 1 | 6 | 3 | 3 | 5 |
| 4891 | LINN | I 380 S | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 52.5 | 3 | 10 | 1 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 53.0 | 4 | 10 | 2 | 6 | 2 | 2 | 4 |
| 4891 | LINN | I 380 S | 54.0 | 4 | 10 | 2 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 54.0 | 4 | 10 | 2 | 6 | 2 | 2 | 5 |
| 4891 | LINN | I 380 S | 55.0 | 4 | 10 | 2 | 6 | 3 | 3 | 5 |
| 4891 | LINN | I 380 S | 55.0 | 4 | 10 | 2 | 6 | 3 | 3 | 5 |
| 4891 | LINN | I 380 S | 55.0 | 4 | 10 | 2 | 6 | 3 | 3 | 5 |
| 4891 | LINN | I 380 S | 55.0 | 4 | 10 | 2 | 6 | 3 | 3 | 5 |
| 4891 | LINN | I 380 S | 56.5 | 4 | 10 | 2 | 6 | 3 | 4 | 6 |
| 4891 | LINN | I 380 S | 57.5 | 4 | 10 | 2 | 6 | 4 | 5 | 6 |
| 4891 | LINN | I 380 S | 57.5 | 4 | 10 | 2 | 6 | 4 | 5 | 6 |
| 4891 | LINN | I 380 S | 57.5 | 4 | 10 | 2 | 6 | 4 | 5 | 6 |
| 2594 | POTT. | I 480 W | 58.5 | 4 | 10 | 1 | 9 | 5 | 4 | 4 |
| 2594 | POTT. | I 480 W | 58.5 | 4 | 10 | 1 | 9 | 5 | 4 | 4 |
| 2594 | POTT. | I 480 W | 58.5 | 4 | 10 | 1 | 9 | 5 | 4 | 4 |
| 3203 | POTT. | I 480 E | 48.5 | 4 | 6 | 1 | 9 | 5 | 4 | 4 |
| 3203 | POTT. | I 480 E | 58.5 | 4 | 10 | 1 | 9 | 5 | 4 | 4 |
| 3203 | POTT. | I 480 E | 58.5 | 4 | 10 | 1 | 9 | 5 | 4 | 4 |

Source: Iowa DOT

## 6.3 Data summarizations

The information contained in this section further summarizes the information presented in map and table form in section 6.2. This summary information is presented by interstate route and for the interstate system as a whole.

As shown in Table 6.3, interstate routes I-29, I-35, I-74, I-235, I-280, and I-680 have an average ICE rating that is higher than the systemwide average of 75.31. Interstate routes I-80, I-129, I-380, and I-480 have an average ICE rating that is lower than the systemwide average.

It should be noted that the average ICE rating by route was also analyzed in more detail by route direction. With one exception, all directional ratings were very similar for each route. The only exception was route I-280, where the average rating for the southbound direction was much higher due to recent reconstruction.

**Table 6.3: Average ICE rating, weighted by segment length**

| Route | Average ICE rating |
|---|---|
| I-29 | 82.65 |
| I-35 | 79.78 |
| I-74 | 86.43 |
| I-80 | 67.88 |
| I-129 | 63.58 |
| I-235 | 78.23 |
| I-280 | 82.41 |
| I-380 | 72.01 |
| I-480 | 64.52 |
| I-680 | 82.52 |
| **Systemwide** | **75.31** |

**Source: Iowa DOT**

As shown in Table 6.4, less than 40 percent of the interstate system has an ICE rating above 80. Interstate routes I-29, I-35, I-74, I-280, and I-680 have a larger percentage of route mileage above an ICE rating of 80. Interstate routes I-80, I-129, I-235, I-380, and I-480 have a smaller percentage of route mileage above a rating of 80.

**Table 6.4: Percentage of mileage by ICE rating cohorts**

| Route | <60 | 60 to <70 | 70 to <80 | 80 to <90 | 90+ |
|---|---|---|---|---|---|
| I-29 | 1.68% | 4.45% | 19.85% | 67.45% | 6.57% |
| I-35 | 6.32% | 5.14% | 26.74% | 59.35% | 2.46% |
| I-74 | 0.00% | 2.60% | 13.59% | 28.85% | 54.96% |
| I-80 | 12.69% | 49.23% | 32.94% | 5.14% | 0.00% |
| I-129 | 0.00% | 100.00% | 0.00% | 0.00% | 0.00% |
| I-235 | 0.00% | 0.54% | 75.65% | 22.54% | 1.28% |
| I-280 | 0.00% | 4.87% | 35.75% | 21.11% | 38.26% |
| I-380 | 9.44% | 23.12% | 50.75% | 15.75% | 0.93% |
| I-480 | 24.37% | 37.10% | 38.53% | 0.00% | 0.00% |
| I-680 | 0.00% | 0.47% | 20.90% | 75.76% | 2.88% |
| **Systemwide** | **7.68%** | **22.82%** | **30.72%** | **35.78%** | **3.00%** |

**Source: Iowa DOT**

Finally, Table 6.5 expands on the information presented in Table 6.3 by dividing the longer interstate routes (i.e., I-29, I-35, I-80, and I-380) into smaller corridors that are more homogenous in terms of their overall characteristics. The shorter interstate routes were not divided into smaller corridors. The resulting 21 corridors (including the full length of the shorter routes) were then ranked in priority order by average ICE rating.

Again, as previously noted in section 6.2, the ICE ratings presented in this chapter are based on 2012 conditions and do not reflect improvements made during the 2013 construction year. The footnotes in Table 6.5 identify routes/corridors that, across most or all of their length, were improved during the 2013 construction year and/or are programmed in the 2014-2018 Five Year Program. This does not reflect smaller more spot-specific projects within each corridor.

**Table 6.5: Priority corridors by average ICE rating, weighted by segment length**

| Rank | Route/corridor | Average ICE rating |
|---|---|---|
| 1 [1] | I-380 (junction of US 30 to junction of IA 100) | 51.59 |
| 2 | I-35 (west junction of I-80/I-235 to east junction of I-80/I-235) | 55.74 |
| 3 | I-129 (full route) | 63.58 |
| 4 | I-480 (full route) | 64.52 |
| 5 | I-80 (junction of I-380 to Illinois state line) | 66.17 |
| 6 [2] | I-29 (junction of US 20 to South Dakota state line) | 67.90 |
| 7 | I-80 (east junction of I-35/I-235 to junction of I-380) | 67.94 |
| 8 | I-80 (Nebraska state line to west junction of I-35/I-235) | 68.79 |
| 9 | I-380 (junction of IA 100 to Waterloo) | 72.85 |
| 10 | I-35 (east junction of I-80/I-235 to junction of US 30) | 74.72 |
| -- | **Systemwide** | **75.31** |
| 11 | I-380 (junction of I-80 to junction of US 30) | 77.28 |
| 12 | I-29 (east junction of I-29/I-80 to junction of I-680) | 77.74 |
| 13 | I-235 (full route) | 78.23 |
| 14 | I-35 (junction of US 30 to junction of US 20) | 78.70 |
| 15 [3] | I-280 (full route) | 82.41 |
| 16 | I-680 (full route) | 82.52 |
| 17 | I-35 (Missouri state line to west junction of I-80/I-235) | 83.00 |
| 18 | I-35 (junction of US 20 to Minnesota state line) | 83.37 |
| 19 | I-29 (Missouri state line to east junction of I-29/I-80) | 84.29 |
| 20 | I-29 (junction of I-680 to junction of US 20) | 84.51 |
| 21 | I-74 (full route) | 86.43 |

[1] The northern portion of this corridor was improved with a pavement rehab project in program year 2013. The remaining southern portion will be improved with a pavement rehab project in program year 2014.
[2] The full length of this corridor will be improved with grade and pave projects in program years 2013 through 2018.
[3] The eastbound portion of this corridor was improved with a grade and pave project in program year 2012. The remaining westbound portion will be improved with a grade and pave project in program year 2015.

As indicated in the introduction to this plan, one of the primary needs to be addressed through this planning effort was to identify priority corridors that should be considered for more in-depth, near-term study. With this in mind, Table 6.5 identifies several such corridors with an average ICE rating lower than the systemwide average of 75.31. The vast majority of these locations are accounted for by the corridors that make up the length of I-80 (including the I-35/I-80 duplicate route through the Des Moines metropolitan area). In addition, I-35 from Des Moines to Ames and portions of I-380 are also identified.

The following summarizes the more significant priority corridors from Table 6.5 that were not recently improved and are not programmed for improvements across most or all of their length.

### I-35 (west junction of I-80/I-235 to east junction of I-80/I-235)

- Many segments with an ICE rating lower than 60 (Figure 6.1)
- Higher than average combination truck AADT, and among the highest systemwide (Figure 6.5)
- Higher than average single-unit truck AADT, and among the highest systemwide (Figure 6.6)
- Higher than average passenger AADT, and among the highest systemwide (Figure 6.7)
- Higher than average congestion index, and among the highest systemwide (Figure 6.8)
- Many segments identified among the bottom 25% and 5% of the system (Figures 6.11 and 6.13)

### I-80 (junction of I-380 to Illinois state line)

- Many segments with an ICE rating lower than 60 (Figure 6.1)
- Higher than average combination truck AADT, and among the highest systemwide (Figure 6.5)
- Higher than average congestion index, and among the highest systemwide (Figure 6.8)
- Many segments identified among the bottom 25% and 5% of the system (Figures 6.11 and 6.12)

### I-80 (east junction of I-35/I-235 to junction of I-380)

- Many segments with an ICE rating between 60 and 70 (Figure 6.1)
- Higher than average combination truck AADT (Figure 6.5)
- Higher than average congestion index (Figure 6.8)
- Many segments identified among the bottom 25% of the system (Figure 6.11)

### I-80 (Nebraska state line to west junction of I-35/I-235)

- Many segments with an ICE rating between 60 and 70 (Figure 6.1)
- Higher than average combination truck AADT (Figure 6.5)
- Many segments identified among the bottom 25% and 5% of the system (Figures 6.11 and 6.12)

### I-380 (junction of IA 100 to Waterloo)

- Many segments with an ICE rating between 60 and 80 (Figure 6.1)
- Lower than average IRI, and among the lowest systemwide (Figure 6.4)
- Some segments identified among the bottom 25% of the system (Figure 6.11)

### I-35 (east junction of I-80/I-235 to junction of US 30)

- Many segments with an ICE rating between 60 and 80 (Figure 6.1)
- Higher than average single-unit truck AADT (Figure 6.6)
- Higher than average passenger AADT (Figure 6.7)
- Higher than average congestion index, and among the highest systemwide (Figure 6.8)
- Some segments identified among the bottom 25% of the system (Figure 6.11)

# 7. Future activity

The analysis contained in the preceding chapters sought to answer the fundamental planning question presented in Chapter 1 related to investment in the interstate system: Where do we need to be looking to next? Going forward, there are some issues that should be taken into consideration as this plan is implemented.

## 7.1 Periodic reevaluation

Given the nature of this interstate condition evaluation tool, the working group felt it was necessary to define a set schedule for a periodic reevaluation and update. After all, planning tools are only as good as the data that they are derived from, and it is critical that the most recent data available be routinely incorporated into this plan. Taking into account the critical data used in the development of this plan, an annual update would seem to be most logical as a majority of the data is updated on an annual basis.

With that in mind, the next step was to identify an approximate date when all relevant annual data updates could be expected to be complete. In discussing this with the various stewards of this data, it was determined that, in a typical year, all data could be expected to be available by July 1. Table 7.1 below then builds from this date, and presents a timeline that ultimately defines when the primary outputs of this plan (i.e., maps and interstate segment listings) would be updated and available for review.

**Table 7.1: Annual reevaluation and update timeline**

| Update milestone | Anticipated annual date |
| --- | --- |
| Updated input data available | July 1 – August 1 |
| Data processing complete | September 1 |
| Plan outputs updated | October 1 |

**Source: Iowa DOT**

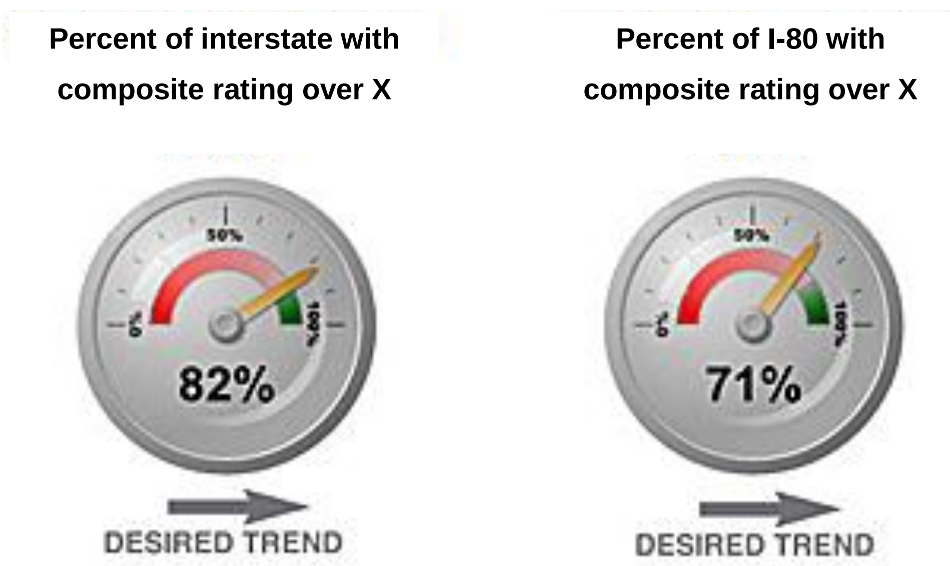
With an anticipated completion date of October 1 for the update to all relevant plan outputs, the timeline allows this information to be considered with each annual programming cycle, which is typically initiated towards the end of the calendar year. Another benefit of an annual update cycle is that it allows for trend analysis, which is discussed in the following section.

## 7.2 Trend analysis

The routine update discussed in the previous section, coupled with a consistent evaluation structure, would allow for trend analysis to be incorporated into planning efforts going forward. Utilizing the composite ratings presented in Chapter 6, trends could be calculated both by route and on a system level. This would allow decision-makers to gauge both the rate of deterioration for specific segments, as well as the impact of their investments on the system over time.

In addition to simple trend analysis, this data could be used as part of a broader performance measurement process. As decision-makers become more familiar with the composite ratings presented in this plan, the establishment of system performance targets that would utilize these ratings could eventually be considered. Ultimately, this performance information could be communicated in a more user-friendly format outside of this plan, perhaps through some sort of performance "dashboard." An example of what such a dashboard could look like is shown in Figure 7.1.

**Figure 7.1: Example performance dashboard**




**Source: Iowa DOT**

## 7.3 Policy considerations

In the conclusion to Chapter 6, several priority interstate corridors were identified that should be considered for more in-depth, near-term study, with the ultimate goal of informing the programming process. These studies would examine a variety of environmental, design, and engineering-related issues and alternatives. This in-depth examination is necessary to begin identifying specific project solutions for the priority corridors identified in this plan.

Framing these studies are some critical system-level policy considerations that will guide this in-depth, corridor and project-level alternatives analysis. The Iowa DOT has identified the following policy considerations as being critical to the interstate system. Note that these considerations serve as a current baseline or default position, and do not preclude the department from reexamining these issues in the future.

### On-alignment investment

While investments in off-alignment alternatives (i.e., parallel, non-interstate routes and other modal options) are appropriate considerations, it is worth noting that, in evaluating alternative investments, traffic diversion strategies (to these non-interstate routes and other modal options) have done little to affect growth patterns on the interstate system. This appears likely to continue for the foreseeable future, and this conclusion is supported by recent analysis.

Recently, the Iowa DOT's statewide travel analysis model (iTRAM) was used to examine the impacts of capacity expansion on non-interstate routes to traffic on the parallel interstate route. Using a 2035 forecast year, five different capacity expansion scenarios were examined to identify possible traffic diversion impacts. Expansions to U.S. 20 and U.S. 30 were examined for their impact to I-80, and expansions to U.S. 69 were examined for their impact to I-35. All scenarios involved expansion to four lanes and a free-flow speed of 65 miles per hour.

As the summary data contained in Table 7.2 illustrates, the estimated impact of these various capacity expansions to traffic on the parallel interstate route is negligible. For U.S. 20 and U.S. 69 scenarios, the percent change in daily vehicle miles traveled (VMT) on the parallel interstate route was less than four percent when compared to the no-build scenario. While the percent change for the U.S. 30 scenarios was greater (likely due, in large part, to geographic proximity), these estimated decreases in interstate traffic would not warrant such substantial off-alignment infrastructure investment. Also, while this analysis examined the impact of highway capacity investment, it can be reasonably assumed that investment in analogous modal options would have no greater impact to interstate traffic than these highway scenarios.

**Table 7.2: Off-alignment capacity expansion scenarios**

| Expansion scenario | Interstate route impacted | Estimated daily VMT on interstate route (2035) | Percent change |
|---|---|---|---|
| No-build | I-80 | 10,439,498 | -- |
| U.S. 20 (full route) | I-80 | 10,431,976 | -0.07% |
| U.S. 30 (I-35 to Illinois state line) | I-80 | 9,816,529 | -5.97% |
| U.S. 30 (full route) | I-80 | 9,371,354 | -10.23% |
| | | | |
| No-build | I-35 | 7,514,652 | -- |
| U.S. 69 (I-80 to Ames) | I-35 | 7,343,036 | -2.28% |
| U.S. 69 (I-80 to U.S. 20) | I-35 | 7,218,903 | -3.94% |

**Source: Iowa DOT**

While there may be locations where it is more plausible to investigate off-alignment alternatives, these are likely limited to more urbanized sections of interstate. Therefore, the Iowa DOT does not consider off-alignment alternatives to be a worthwhile investment for addressing traffic issues on the interstate system.

## Tolling

Tolling is generally defined as the implementation of fees to travel across a bridge or along a road segment. Over the years, the Iowa DOT has examined the issue of tolling in several studies, primarily within the context of revenue generation. Most recently, tolling was addressed in the 2008 and 2011 Road Use Tax Fund (RUTF) studies submitted to the Iowa Legislature. The 2011 RUTF study followed very closely on the guiding principles and recommendations that resulted from the extensive work of the Governor's Transportation 2020 Citizen Advisory Commission (CAC). As they relate to the issue of tolling, the most pertinent guiding principle contained in these parallel reports was the following.

> *"Continue Iowa's long-standing tradition of state roadway financing coming from pay-as-you-go financing. Iowa must not fall into the situation that other states are currently facing where the majority of their new program dollars are utilized to pay the debt service of past bonding."*

Given the significant outlay of funds that would be necessary to build the infrastructure needed to initiate and administer a tolling program, there are few scenarios that exist where bonding would not be required to facilitate this level of capital investment. As a result, tolling would contradict this guiding principle, which was communicated by the public to the CAC and strongly endorsed by the Iowa DOT in the 2011 RUTF study. This study summarized the advantages and disadvantages of tolling as follows.

### Advantages

- Specific road segments/corridors generate their own revenue.

### Disadvantages

- Requires enabling legislation.
- Expensive to initiate due to needed capital investment.
- Ongoing administrative costs.
- Requires sufficient traffic levels to generate enough revenue to pay for the cost of tolling, along with the maintenance and construction costs; Iowa may not have any reasonable corridors meeting requirements.
- Public resistance may lead to adjustments in travel patterns to avoid tolls.
- There are federal restrictions in some cases.

Regarding federal restrictions, MAP-21 did add some flexibility to tolling eligibilities. Tolling of newly constructed lanes added to existing toll-free lanes is now permitted under Section 129(a)(1)(B) so long as the facility has the same number of toll-free lanes after construction as it did prior. Tolling for initial construction of highways, bridges, and tunnels on the interstate system is also now permitted under Section 129(a)(1)(A). So, while eligibility restrictions have been relaxed, the requirement to maintain the same number of toll-free lanes makes the return on investment required to break even extremely difficult to achieve.

The 2008 RUTF study, which was the immediate predecessor to the most recent RUTF study, highlighted similar advantages and disadvantages of tolling. In addition, as part of the overall analysis conducted by the study committee, tolling was evaluated in more detail and an analysis was conducted on the viability of tolling specific roadways and bridges in Iowa. The conclusion of this analysis was the following.

> *"…it would not be viable to toll Iowa facilities due to the high cost of capital to implement tolls, the relatively low traffic levels, and corresponding toll rates that would be required to cover operating and capital costs."*

In 2012, the Iowa DOT updated the state transportation plan, *Iowa In Motion – Planning Ahead 2040*. The implementation section of this document included a discussion of possible revenue-generating mechanisms. The discussion focused on mechanisms that have the potential flexibility to be applied to funding shortfalls that exist across multiple transportation modes, not just highways. As the use of toll revenue is generally restricted to debt service and operations and maintenance of the toll facility, tolling was not included in the state transportation plan as a possible revenue-generating mechanism.

While a seemingly plausible funding strategy that may be worth reexamining at spot locations in the future, it is not expected that sufficient revenues could be generated via tolling to pay for the associated implementation, administration, construction, and maintenance costs. Therefore, the Iowa DOT reaffirms these principles and conclusions and does not consider tolling and the infrastructure to support it a worthwhile investment on the interstate system.

### Truck-only lanes

Truck-only lanes are interstate lanes dedicated for the use of trucks only. The purpose of truck-only lanes is to separate trucks from other traffic and thereby enhance safety, stabilize the flow of traffic, and improve travel time reliability. While truck-only lanes have proven to be a viable improvement strategy in limited applications across the country, most states have a variation that restricts trucks to certain lanes, but also allows other vehicles to utilize those lanes. As an improvement strategy, truck-only lanes would be most beneficial if applied across the interstate system or, at a minimum, across a full interstate route.

Truck-only lanes are potentially feasible for congested highways where truck volumes are at or near 30 percent of the total vehicle mix, peak volumes exceed 1,800 vehicles per lane-hour, and off-peak volumes exceed 1,200 vehicles per lane-hour. Similar feasibility thresholds are supported by several other state DOTs. With few exceptions, the portions of Iowa's interstate system that meet these thresholds are limited to I-80. On I-80, approximately 45 percent of the route has combination truck AADT that is at or above 30 percent of total AADT. However, when the peak and off-peak volume thresholds are also applied, there are no segments of I-80 that meet all three criteria in combination. In other words, the interstate route that carries Iowa's most significant truck traffic fails to meet these feasibility thresholds, thus making the feasibility of even corridor-level application minimally defensible.

In addition to the limited operational feasibility, the financial feasibility of truck-only lanes may be even more difficult to support. Most state DOTs have concluded that tolling would be necessary to finance at least the initial construction of truck-only lanes. This conclusion was shared by a 2005 report submitted to Iowa State University's Midwest Transportation Consortium. Various studies from around the country have estimated the per-mile cost of truck-only lanes as approaching $10 million in rural areas and up to $30 million in urban areas. A 2008 study by Georgia DOT estimated that a truck-only lanes network would consume over 14 years of the state's entire allocation of federal IM, NHS, and STP transportation dollars, illustrating the intense level of financial commitment that would be needed to construct truck-only infrastructure. In addition, various studies have concluded that the most cost-effective approach to truck-only lanes is to construct them with barrier separation in the existing median. This approach contradicts the Iowa DOT's preferred median treatment outside of urbanized areas, which is to maintain an open median.

As previously noted, truck-only lanes are typically pursued as a strategy for stabilizing traffic flow and improving travel time reliability. As the priority corridors identified in Chapter 6 are evaluated in more detail, additional factors could be examined in order to analyze whether truck-only lanes, express toll lanes for trucks, or restricted lanes for trucks would be necessary to achieve stable and consistent traffic flow. If such analysis, coupled with an examination of ongoing national research, suggests that stable conditions are not achievable without the application of these alternatives, each could be examined on a section-by-section basis.

### Rural overhead structures and rest areas

It is worth noting that the Iowa DOT is currently investigating policy positions in regards to the propagation of rural bridge structures, both on and over the interstate system, as well as rest area investment strategies. Development is in the early stages and it is anticipated that these policies will be further illustrated in future plan updates.

## 7.4 Design considerations

Similar to the policy considerations identified in the previous section, this section highlights a number of design considerations that are critical to the interstate system. With these issues, the derived benefit is more realized when the treatment is considered at a system level, rather than at spot locations. These considerations include the following.

### Intelligent transportation systems

ITS and incident management considerations should be given during the planning stages of each section of interstate. In 2007, the *Iowa Statewide Intelligent Transportation Systems Architecture* was developed to provide a roadmap for intelligent transportation systems deployment and integration in Iowa over a 10-year period. This architecture described the "big picture" for ITS deployment in terms of individual components that would address identified transportation problems and needs. The architecture represented a shared vision of how each agency's systems would work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in Iowa.

ITS architectures are intended to be living documents that change as stakeholders and needs change. As the 2007 statewide architecture has not been maintained, it is no longer considered to be a current document, particularly in terms of identified projects and project sequencing. However, these concepts, in combination with a review of current regional ITS architectures and relevant planning documents, can still be useful for informing the planning process. Efficiencies that may be gained by including ITS implementation during early planning should be considered during further study of the priority interstate corridors identified in Chapter 6.

### Interchange type

Given that each situation is unique, adopting a single preferred interchange type for the interstate system as a whole is not possible. With that said, it is preferable to select a diamond interchange type and avoid, to the extent possible, two- and three-quadrant interchanges. In addition, it is preferable to minimize the number of access points to the interstate system in order to optimize safety and mobility.

Two- and three-quadrant interchanges can serve as impediments to freight movement, particularly with oversized loads. These interchange types make it more difficult for oversized loads to avoid, if necessary, the overhead structures at an interchange by utilizing the ramps. In addition, diamond interchanges offer a number of other advantages, including the following.

- Most common interchange type, which meets driver expectations.
- Well suited for both rural and urban applications.
- Adaptable in major-minor road crossings.
- Lower cost than other interchange types.
- Requires less right-of-way than other interchange types.

### Level of service

While the 2011 AASHTO Design Guide recommends level of service (LOS) C on rural freeways and LOS C or D on urban freeway corridors, the 2011 "Green Book" has not been adopted by FHWA through formal rulemaking. In the absence of adoption by FHWA, the Iowa Division has agreed to consider LOS C in spot locations within rural freeway corridors and LOS D in spot locations within urban freeway corridors.

Careful consideration should be given at the beginning of planning review to select the most appropriate level of service for each section of the interstate. That said, the Iowa DOT agrees with the flexibility established within the 2011 AASHTO Design Guide, and encourages formal adoption and consideration during further study of the priority interstate corridors identified in Chapter 6.

In addition, it is common practice to analyze 20-year traffic projections in determining the appropriate scale of capacity improvements. However, the interstate system is often expected to operate for a much longer duration. As a result, it is preferable to use 30-year traffic projections in further study of the priority interstate corridors identified in Chapter 6 to better position these facilities for possible future expansion.

### Median treatment

While each location is unique and exceptions are prevalent, it is advisable to include guidance regarding median treatments. Utilizing barrier treatments to close the median in an area where right-of-way is limited or highly developed, such as urbanized areas, can provide a great deal of benefit. In other areas, the costs of maintaining storm water drainage, median barrier, and other median infrastructure is excessive in comparison to an open median. In addition, lack of snow storage with a closed median is a concern and significantly increases maintenance costs.

As a result, a closed median will generally not be considered outside of urbanized areas unless right-of-way limitations preclude an open median. A constructability and staging review should be conducted as further study of the priority interstate corridors identified in Chapter 6 is initiated. A consistent median width that allows flexibility in maintenance of traffic and staging should be adopted for the interstate system as a whole as early as possible in the planning process.

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