Introduction

The roads and bridges of a region are the backbone of its transportation network. The characteristics of a roadway, such as its classification and traffic volume, are important to determining its needs and solutions. The conditions of a roadway are critical for the efficient movement of people and goods. Bridges are also crucial for making sure that people and goods can get to where they need to be, especially in a tri-state region. DMATS is also a leader in Intelligent Transportation Systems (ITS) infrastructure, so ensuring the completeness of the network can help poise the region as an example for others to follow.

This chapter will analyze the characteristics and condition of the roads and bridges within the DMATS transportation network.

Federal Functional Classification

Roadways are assigned a functional classification category based on the type of service they provide. Roadways provide two basic types of service: land access and mobility. The degree to which a roadway provides access and/or mobility determines its functional classification. The key to planning an efficient roadway system is finding the appropriate balance between mobility and accessibility. A roadway's assigned functional classification is referred to as its Federal Functional Classification or FFC. Below are descriptions of each of the classifications.

Classification	Characteristics
Principal Arterial	• Primarily serve as mobility function • Minimal land access • Serves rapid movement and people and goods for extended distances • High-capacity, high-speeds • Ex. US Highway 20
Minor Arterial	• Interconnects with and augments principal arterials • Serves intercommunity trips of moderate length • Primarily used for mobility, but provides more land access than a principal arterial • Ex. John F. Kennedy Road in City of Dubuque

Collector Streets	• Channel trips between local streets and arterials • Balance between mobility and land access • Parking and direct driveway access to street usually allowed • Usually wider, have higher capacity and permit somewhat higher speeds than local street network. • Broken down into two categories in rural areas, Major Collectors and Minor Collectors • Ex. Chaney Road in City of Dubuque
Local Streets	• Primarily provide local land access • Lowest level of mobility • Uncontrolled intersections • Posted speed limits of 25 mph or less • Few restrictions on parking • Not a significant consideration in metropolitan planning

The Federal Highway Administration uses functional classification to determine if a roadway is eligible for federal funds. The routes that are eligible and not eligible are depicted in the below table.

Eligible	Not Eligible
Principal Arterial	Rural Minor Collectors
Minor Arterial	Local Streets
Major Collectors	
Urban Minor Collectors	

The map below shows the roadways in Dubuque categorized by their Federal Functional Classification.

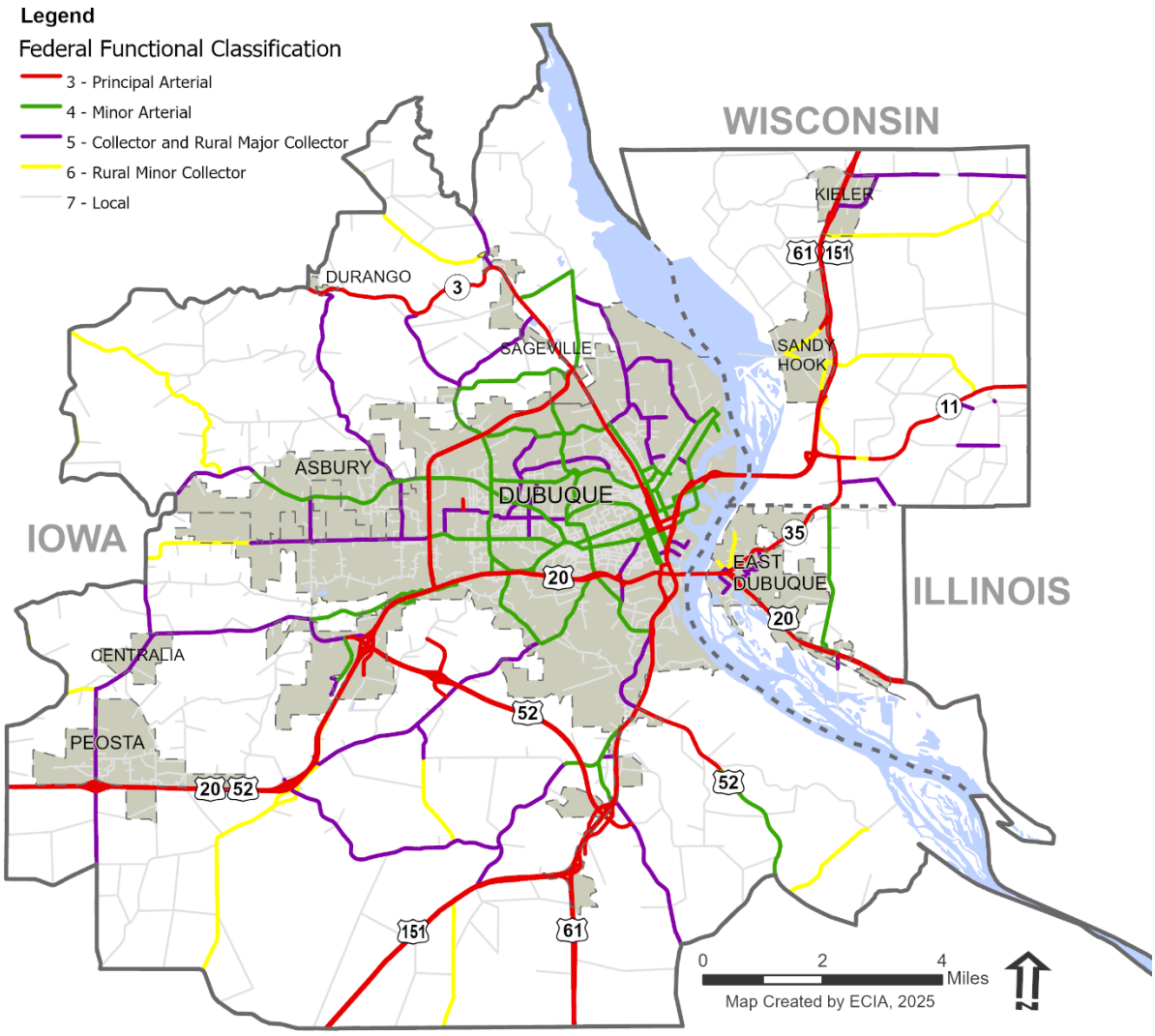

Figure 7.1. DMATS Federal Functional Classification
Source: Iowa DOT, Illinois DOT, Wisconsin DOT

Traffic Volume

Transportation planners use average annual daily traffic (AADT) to measure the use of the roadway system. AADT is an annualized measure of traffic volume on a road segment. AADT numbers are based on traffic counts that local and Iowa DOT engineers periodically collect on area roads. Traffic counts provide onetime

"snapshot" views of traffic on area roads that traffic engineers then extrapolate into an annualized daily average using a mathematical process. This plan reports 2021 traffic data as 2021 is the base year for the DMATS Travel Demand Forecast Model. The below map displays the 2021 traffic volumes from the Iowa DOT that is used to input into the Travel Demand Forecast Model.

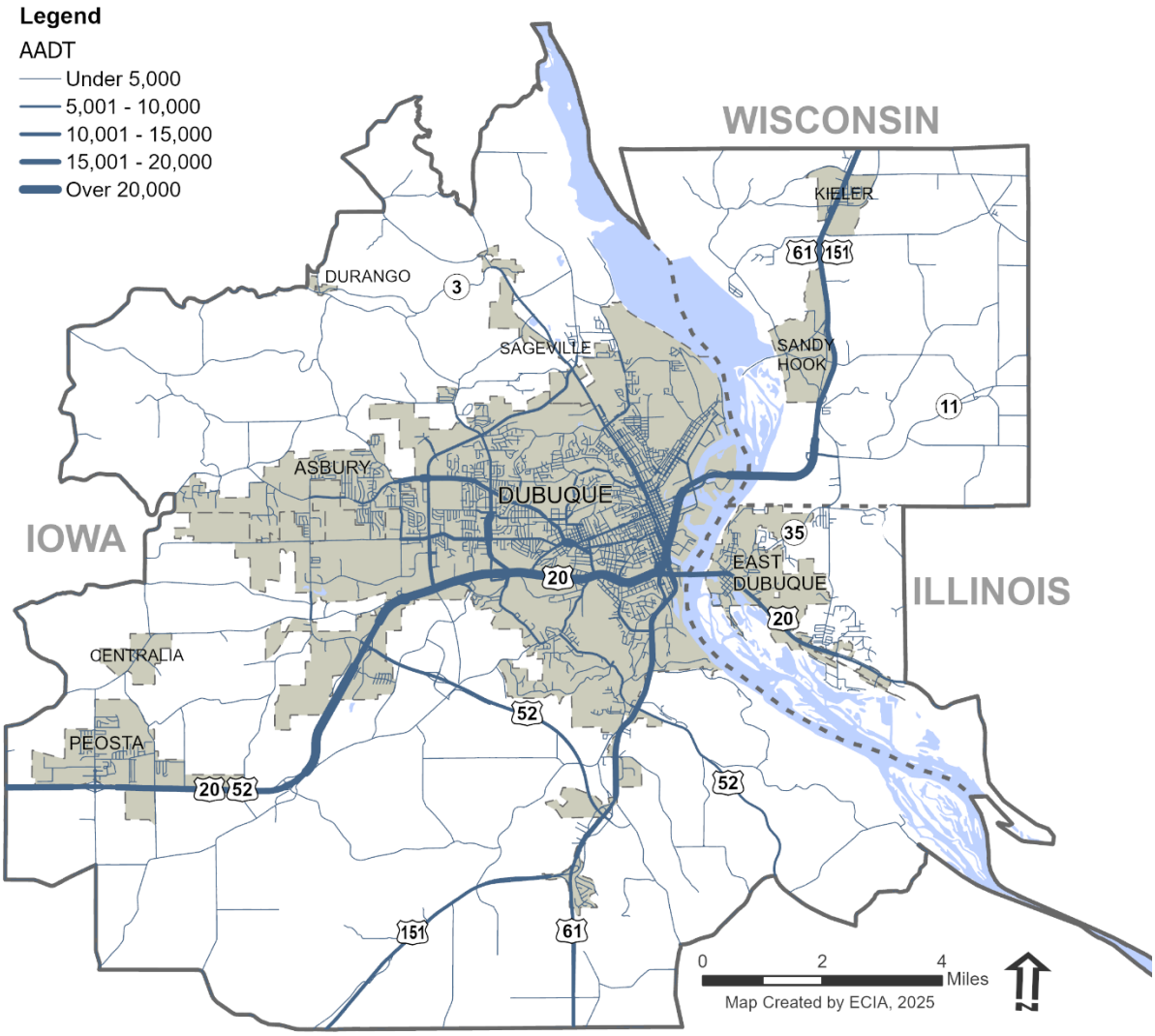

Figure 7.2. 2021 DMATS AADT
Source: Iowa DOT, Illinois DOT, Wisconsin DOT

Roadway Conditions

Pavement Condition Index

Pavement Condition Index (PCI) is a numerical rating system that assesses pavement health through identifying surface distresses (cracks, potholes, rutting) during visual surveys. The measurement scale is from 0 to 100, with 0 indicating worst and 100 indicating new/excellent pavement. PCI can be used by agencies to identify roads that need maintenance and/or rehabilitation. Below is a chart showing the percentage of DMATS roads by PCI as well as a map showing the DMATS road network by PCI. PCI is only calculated by the Iowa and Wisconsin DOTs, the Illinois DOT does not collect PCI data.

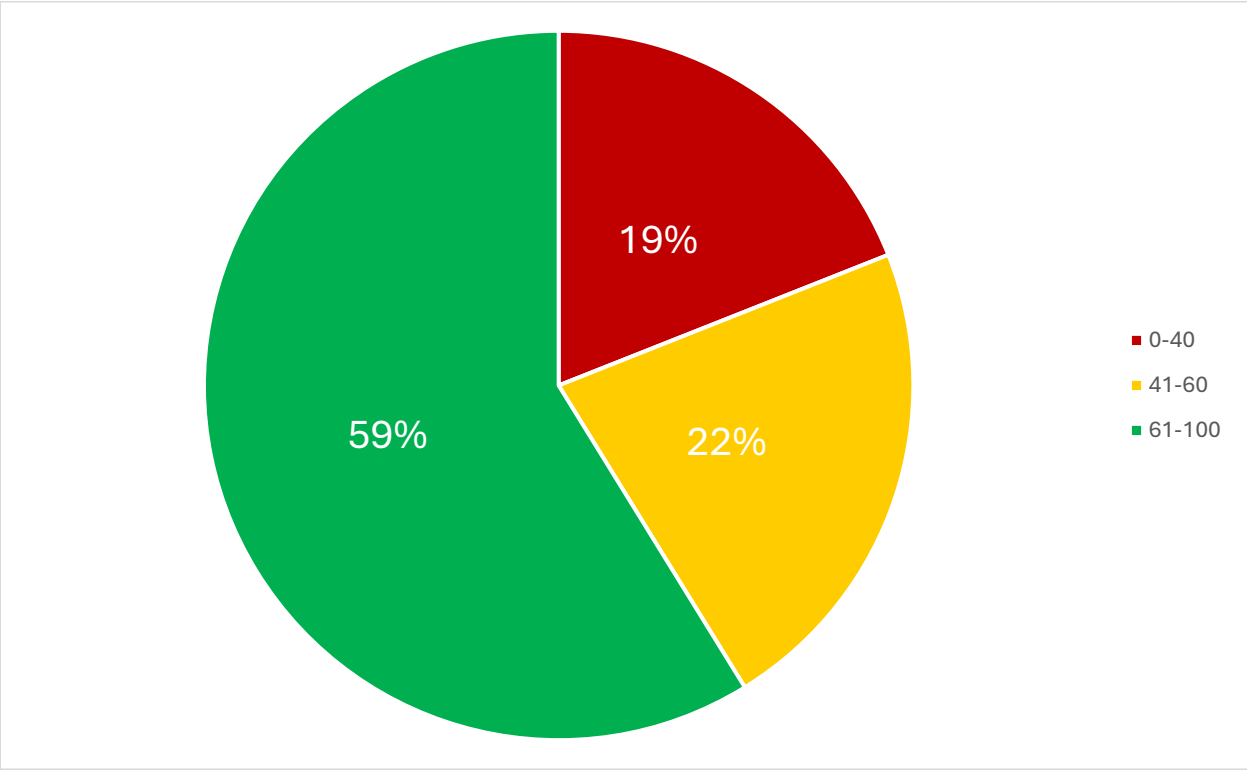

Figure 7.3. Percentage of DMATS Roads by PCI
Source: Iowa DOT, Wisconsin DOT

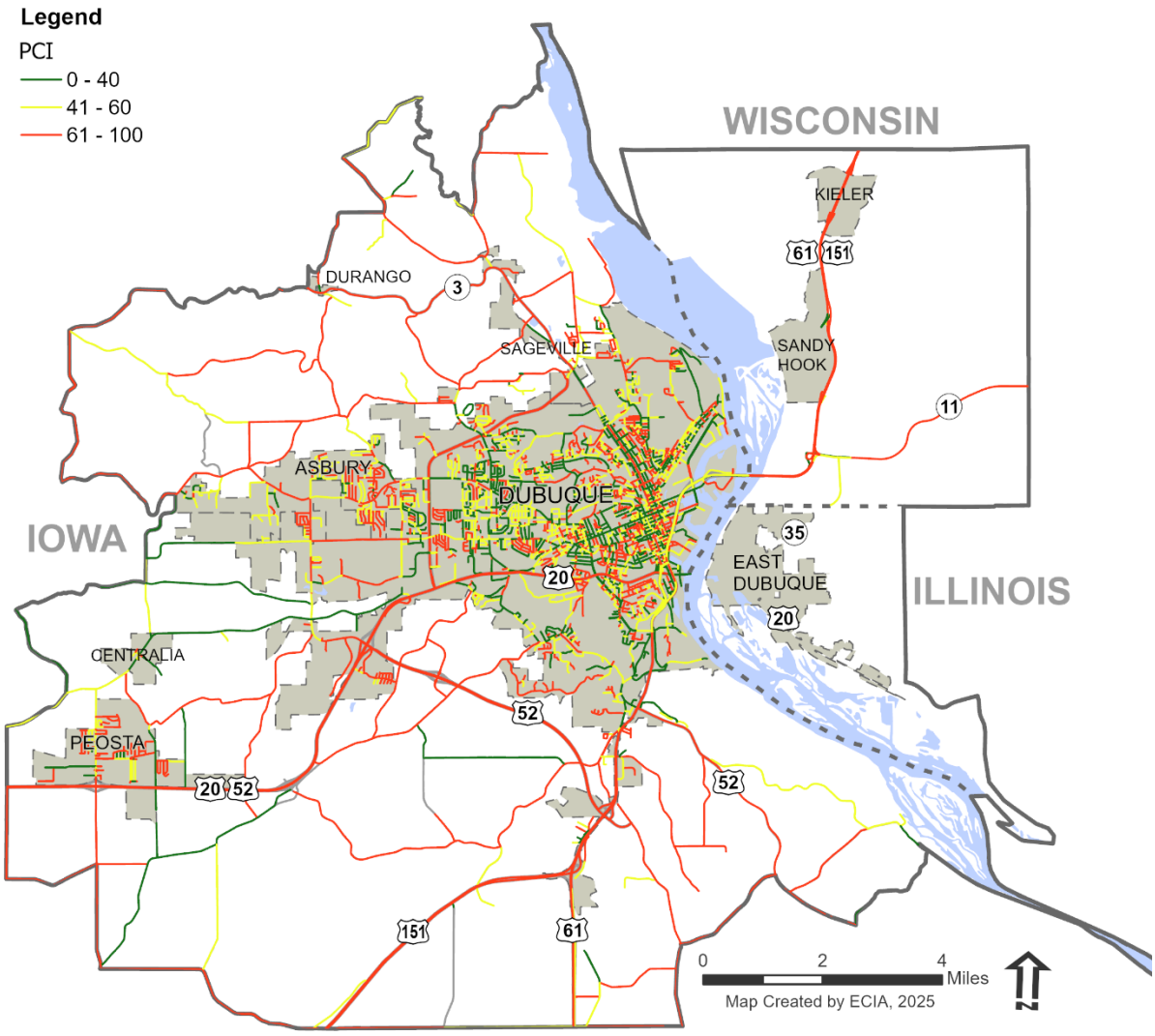

Figure 7.4. DMATS PCI in Iowa and Wisconsin
Source: Iowa DOT, Wisconsin DOT

International Roughness Index

International Roughness Index (IRI) is a global standard for measuring road surface roughness. IRI is measured using a continuous profile along the road that is then analyzed to summarize qualities of pavement surface deviations that can impact vehicle suspension movement. IRI is useful to help assess pavement ride quality, with a higher IRI indicating rougher road surfaces. Below is a chart showing the percentage of DMATS roads by IRI as well as a map showing the DMATS road network by IRI.

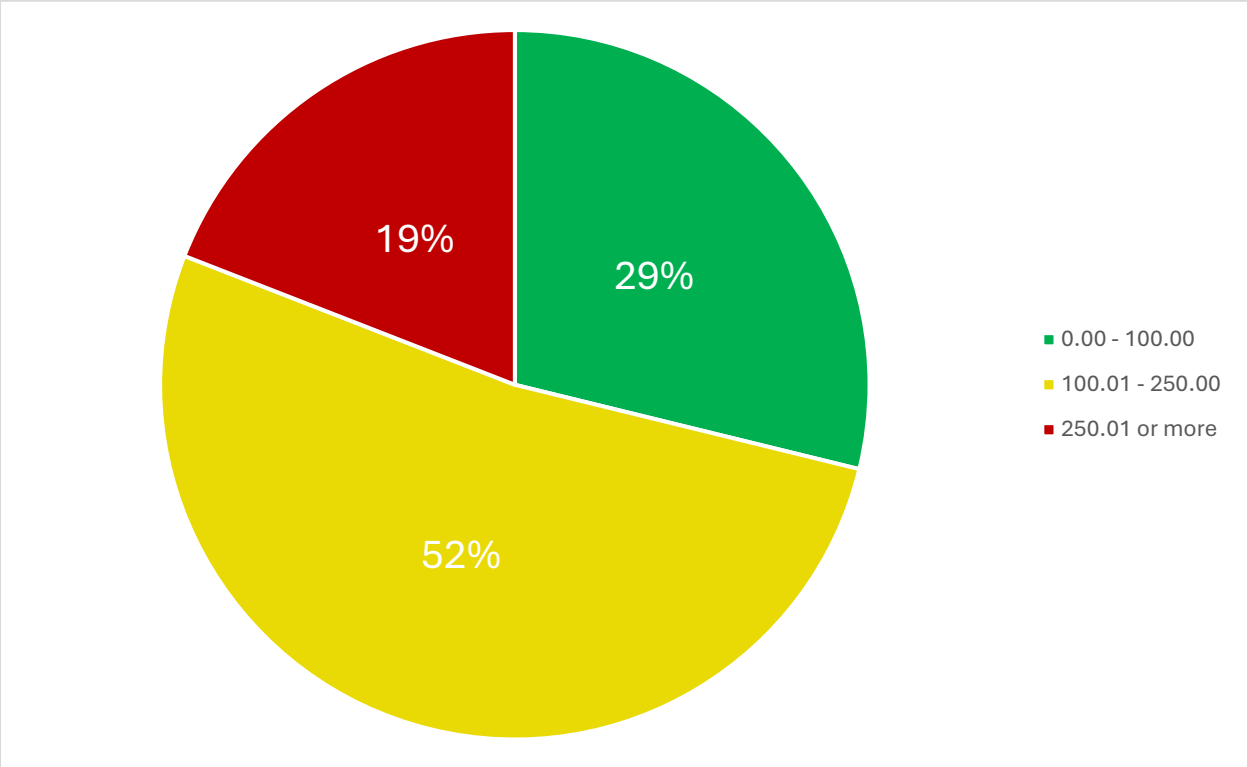

Figure 7.5. Percentage of DMATS Roads by IRI
Source: Iowa DOT, Wisconsin DOT

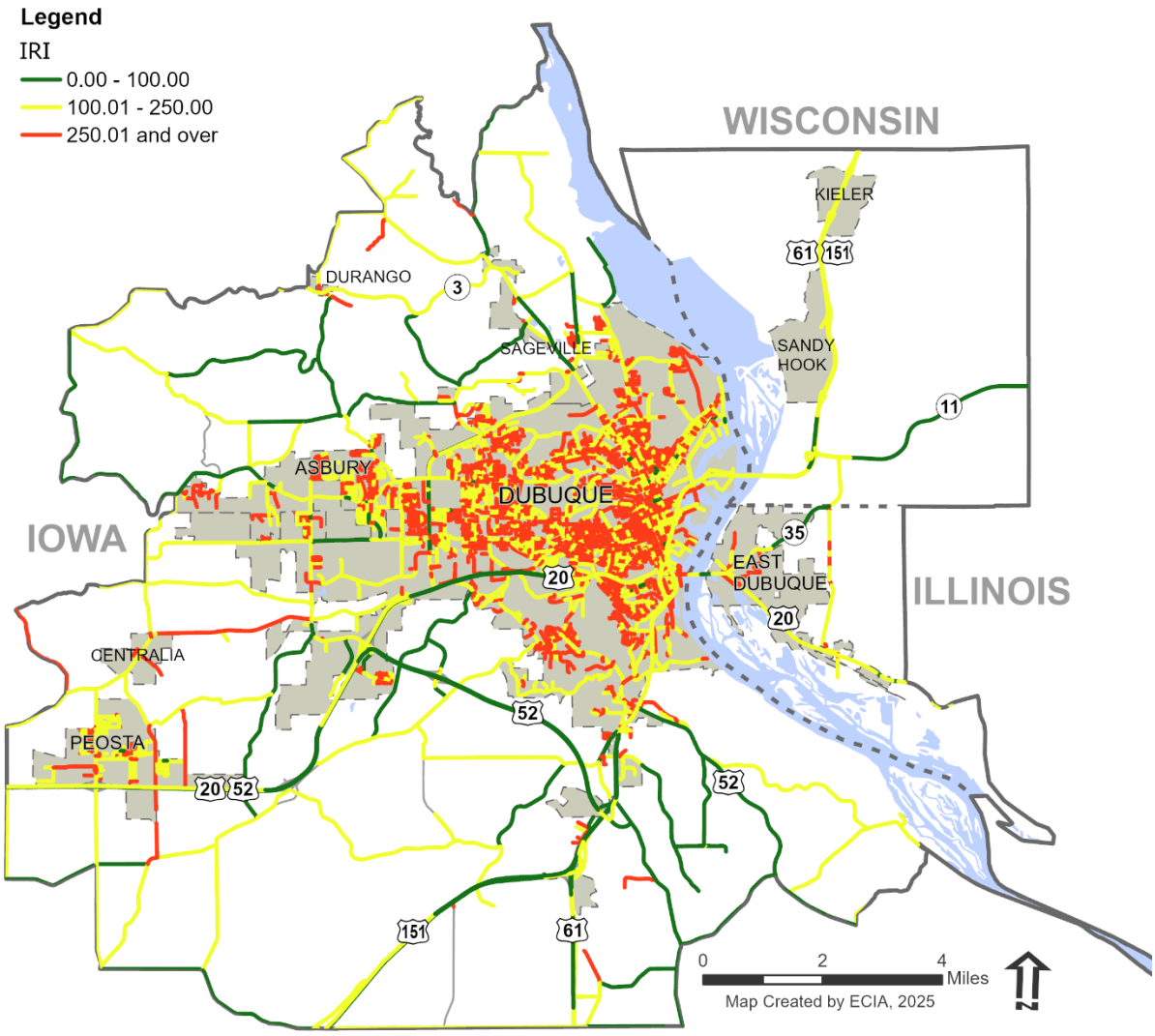

Figure 7.6. DMATS IRI in Iowa and Wisconsin
Source: Iowa DOT, Wisconsin DOT

Bridges

Especially in a tri-state region, bridges are vital to ensure the efficient movement of both people and goods. This section goes over measures of bridge conditions from the Federal Highway Administration's National Bridge Inventory to analyze the suitability of the DMATS region's bridges.

Posted and Closed

Some bridges in the DMATS region limit the kind of traffic that goes through them. **Posted** bridges have signs that state the maximum allowable weight for a vehicle to travel on them, while **closed** bridges are inaccessible to vehicles. Below is a map that shows the posted and closed bridges in the DMATS area.

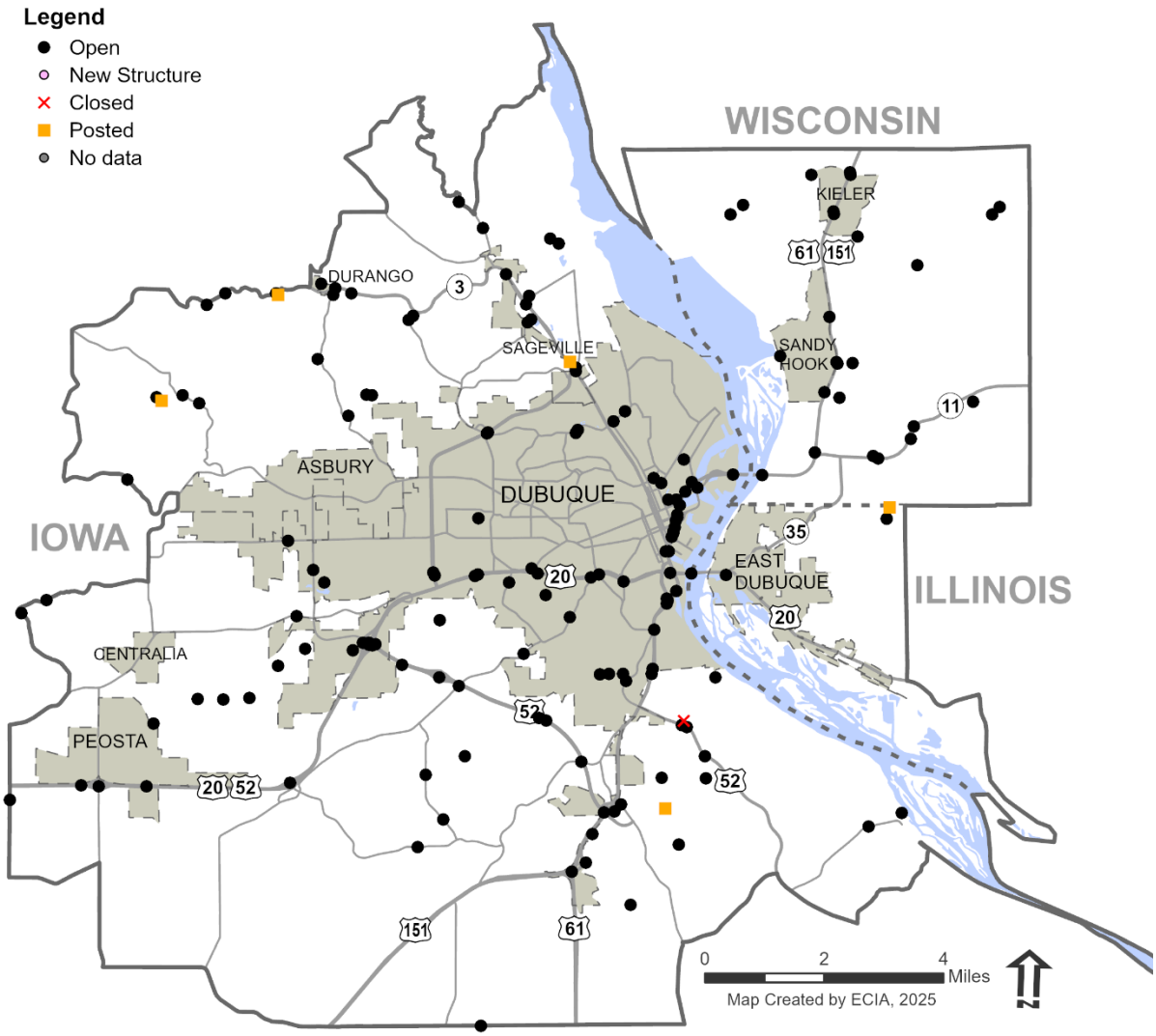

Figure 7.7. DMATS Posted and Closed Bridges
Source: FHWA, National Bridge Inventory

Bridge Condition

The Federal Highway Administration uses a classification system to place every bridge into one of three categories, Good, Fair and Poor. The classification system is based on 4 condition ratings scored from 1 to 7, and the bridge is classified based on the lowest rating. If the lowest rating is greater than or equal to 7, the bridge is classified as Good, if the lowest rating is 5 or 6 it is classified as Fair, and if the

lowest rating is 4 or below the bridge is classified as Poor. Below is a map showing the bridges in the DMATS area by bridge condition.

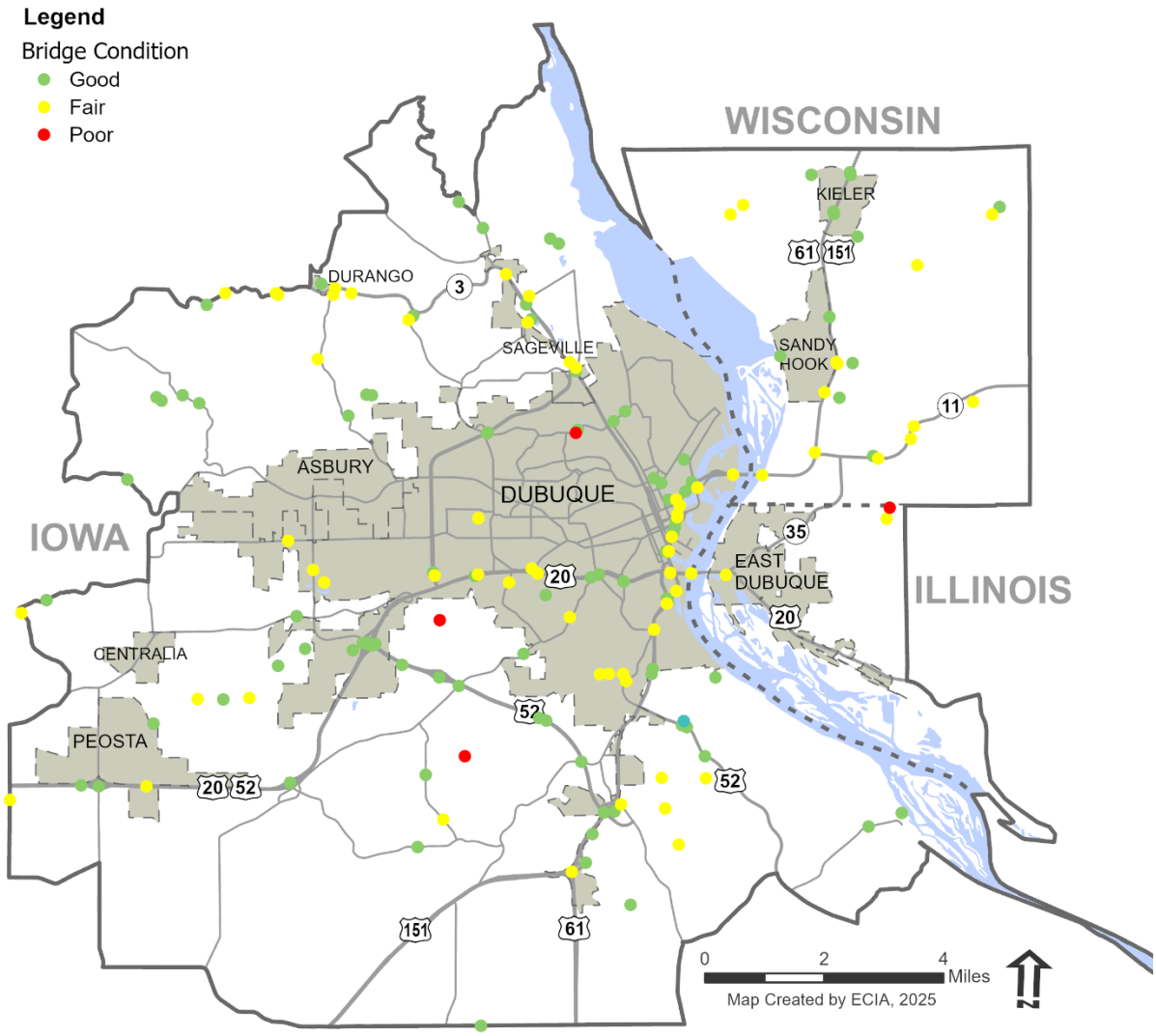

Figure 7.8. DMATS Bridge Condition
Source: FHWA, National Bridge Inventory

ITS Infrastructure

DMATS had worked on partners to invest in the region's Intelligent Transportation Systems (ITS) infrastructure. ITS is the integration of advanced technologies into transportation infrastructure, which includes cameras and other sensors that monitor traffic conditions.

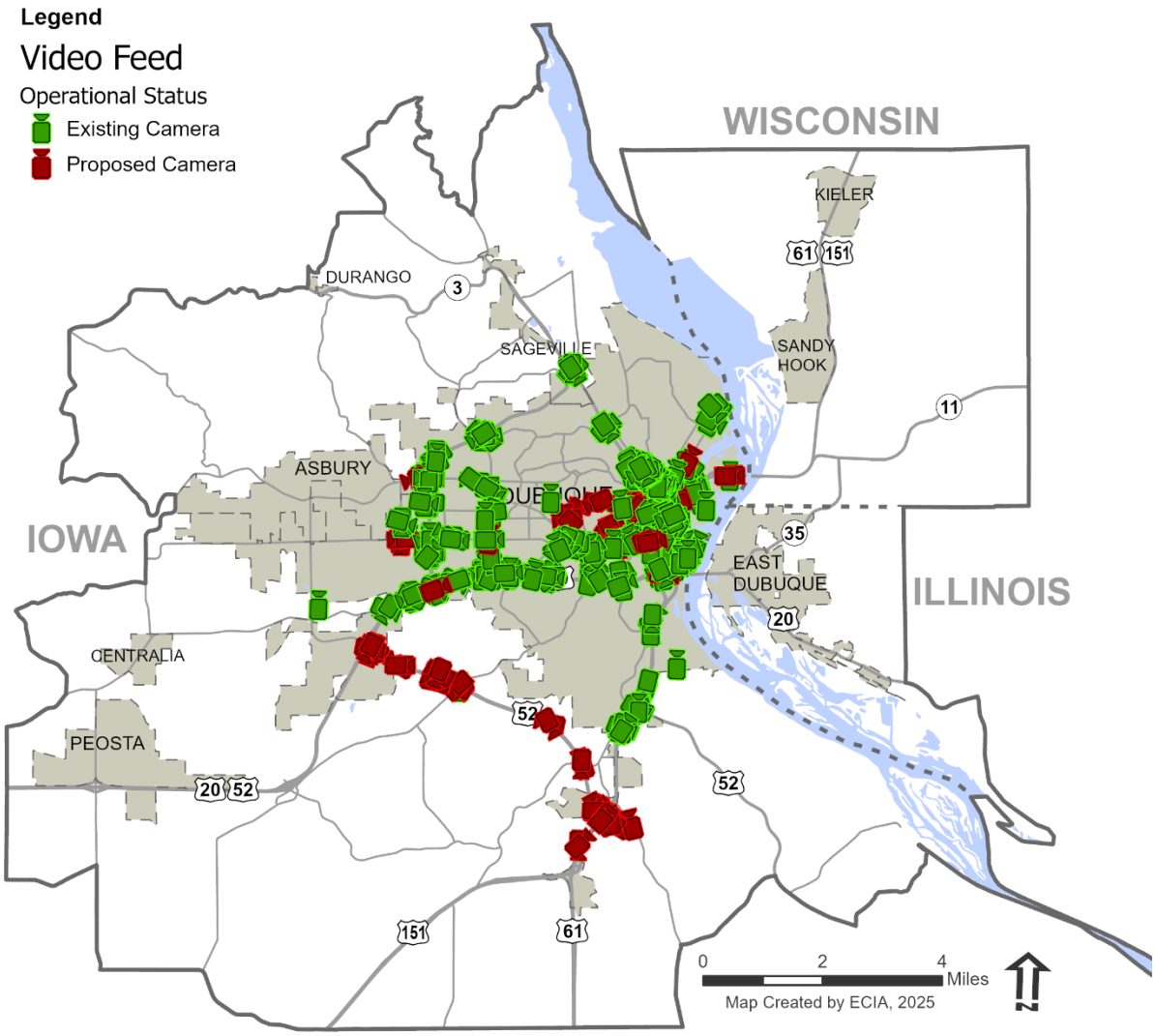

Figure 7.9. DMATS Camera Network
Source: City of Dubuque GIS

These cameras and other sensors then connect to a network of fiber optic cables and wireless communication devices that deliver data to a central operations center where the data is processed and put to use. The City of Dubuque has constructed a fiber optic network along the region's major corridors and the downtown area. The City has also installed fiber optic conduit and advanced ITS components into all new or reconstructed traffic signal controllers throughout the city. The City has installed fiber optic conduits under all new roadways to accommodate future fiber. Below is a map showing the City's fiber optic network

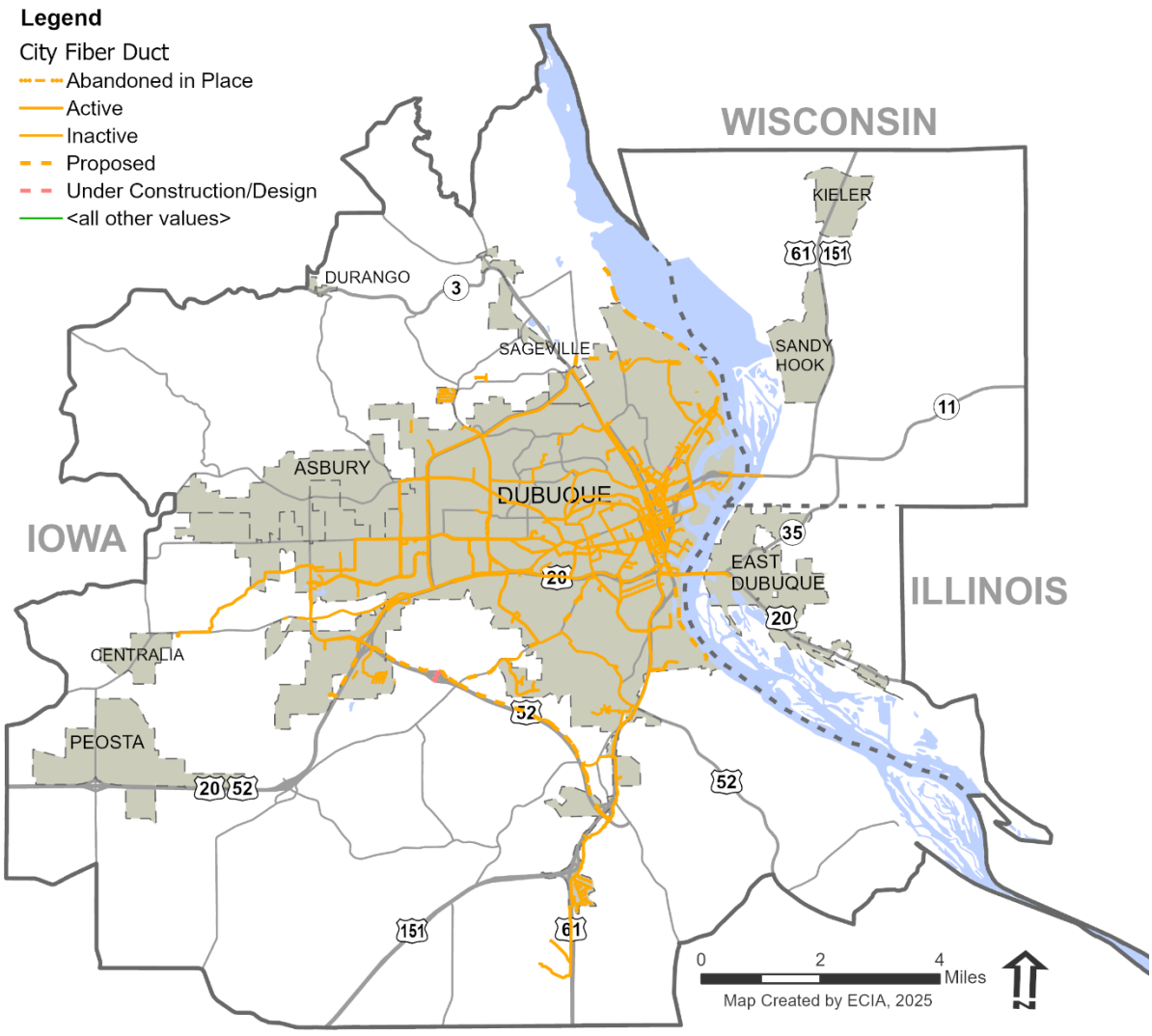

Figure 7.10. DMATS Fiber Network
Source: City of Dubuque GIS

The City of Dubuque has invested in a robust Traffic Operations System that uses advanced communication technologies along with state of the art traffic control equipment that allows management of the operations via a Traffic Operations Center (TOC) located at City Hall.

Within the region, communities have utilized ITS for other applications including traffic counts for project planning, traffic signal timing and coordination, and motorist notifications through dynamic message sign (DMS) boards.

STREETS Project

The Smart Traffic Routing with Efficient and Effective Traffic Systems or STREETS project represents the future of the DMATS area's traffic management efforts. Dubuque has been a leader in the use of ITS technology to manage and operate its traffic signal network. The implementation of these technologies has resulted in reduced delay on some of the area's most heavily traveled corridors. The goals of the STREETS project are to serve as a framework for other small urban areas through:

- Reducing wear and tear on major corridors
- Reducing congestion
- Improving travel times
- Improving safety
- Reducing emissions
- Enhanced system monitoring capabilities

The infrastructure of the STREETS project is composed of

- A first-of-its-kind, fully-automated traffic control program
- Utilization of AI based video analytics to collect real time traffic conditions
- Simulation of future traffic conditions (based on real time modeling)
- Automatic adjustment of signal timing for maximum efficiency during unusual events or traffic conditions
- Dissemination of travel times along the major routes in the region to support dynamic routing.

This infrastructure allows the transportation network to dynamically react to events and congestion detected by the microsimulation model and proactively change signal timing based on predicted traffic flow data while disseminating congestion and alternate route information for motorists. The ultimate deployment will cover 15 corridors with 72 primary signalized intersections and an additional 48 secondary signalized intersections within the City of Dubuque. Below is a map showing the intersections that will be covered by the STREETS project.

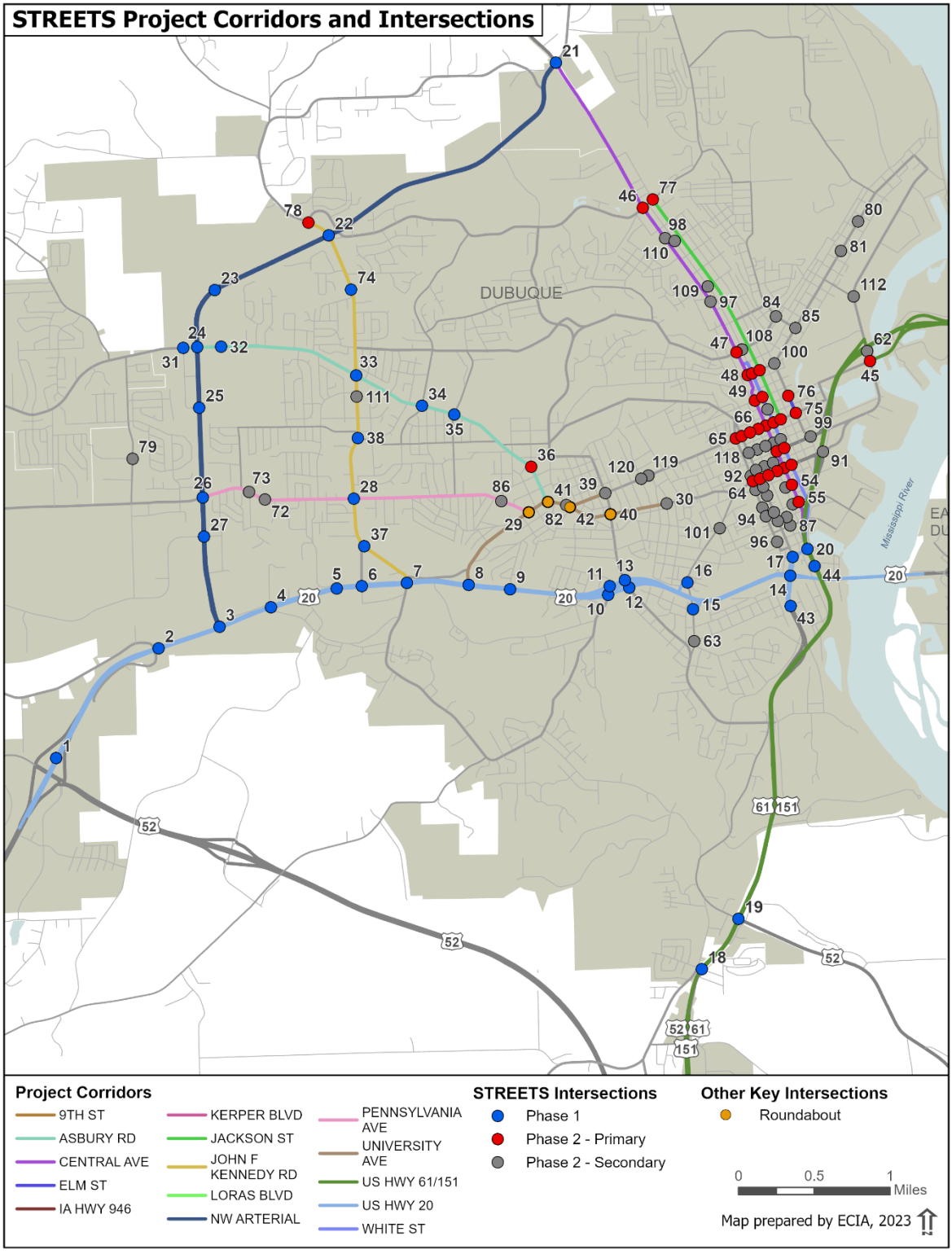
STREETS Project Corridors and Intersections
DUBUQUE
Mississippi River
Project Corridors
9TH ST
ASBURY RD
CENTRAL AVE
ELM ST
IA HWY 946
KERPER BLVD
JACKSON ST
JOHN F KENNEDY RD
LORAS BLVD
NW ARTERIAL
PENNSYLVANIA AVE
UNIVERSITY AVE
US HWY 61/151
US HWY 20
WHITE ST
STREETS Intersections
Phase 1
Phase 2 - Primary
Phase 2 - Secondary
Other Key Intersections
Roundabout
0
0.5
1
Miles
Map prepared by ECIA, 2023

Figure 7.11. STREETS Project Intersections
Source: DMATS

Metro Dubuque Traffic Data Aggregation for Connected Vehicles

One of the issues with the STREETS project was its ability to communicate information to drivers when more are relying on in-vehicle navigation such as Google Maps and Waze for routing purposes. These platforms would not be using the information within the STREETS project for routing purposes, greatly reducing the potential impact of the project.

In October 2023 DMATS applied for a SMART Grant through the US DOT that would help support the ultimate goal of the STREETS project. The long-term goal of this initiative was to deliver near real-time transportation information directly to vehicles over the cellular network. For this DMATS partnered with Parsons and Harman, a Samsung subsidiary, to develop an open and standardized data set for integration and distribution for use in a prototype display for vehicle infotainment system integration. This would help communicate incidents, planned events, and signal timings directly to the vehicle's interface. Below is an example of the interface in practice.

Figure 7.12. SMART Grant Demonstration
Source: DMATS

DMATS is currently seeking funding for Phase 2 of the project, which would include more detailed information and allow for integration into third-party applications.